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Procedural Options to Reduce the Risk of Injury from Products Installed in Residences

S. Wayne Stiefel, Clark W. Hand, Donald W. Corrigan

Hazard Analysis Section
Product Systems Analysis Division
Institute for Applied Technology
National Bureau of Standards
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Prepared for
Bureau of Engineering Sciences
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U.S. DEPARTMENT OF COMMERCE, Rogers C.B. Morton, *Secretary*
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ABSTRACT

The Consumer Product Safety Commission's (CPSC) list of consumer products with high relative incidence of reported injuries includes many products which are integral parts of the consumer's residence, such as stairs, doors, architectural glass, furnaces and water heaters. The safety aspects of these products are influenced by on-site construction practices and design considerations which are regulated through local building codes. The problem is to identify operational methods the CPSC can employ in dealing with unreasonable hazards associated with component parts of residential units.

This report identifies, for products installed in homes, (1) the product history stages, (2) institutional groups, (3) hazard sources, and (4) countermeasures available to the CPSC. It structures relationships among these four elements for evaluating the impacts of alternative countermeasures. Current mechanisms for control of products installed in homes are presented and sixteen potential countermeasures are postulated.

Key words: Building codes; Consumer Product Safety Act; product safety; residence-related products; residential safety; safety implementation approaches; safety standards.

SUMMARY

Background

The Consumer Product Safety Commission (CPSC) has determined a ranking of products based upon data concerning frequency and severity of accidental injuries. These data are derived from the National Electronic Injury Surveillance System (NEISS). The ranking has focused attention upon a group of products which are integral parts of residential households. Some of these products have traditionally been regulated either totally or in part by building codes of over 18,000 municipalities in the United States who have the authority to adopt and enforce building codes. Inherent weaknesses in this traditional system have created a level of risk for which the CPSC may develop and enforce new safety standards relating to residential product hazards.

Objective

This study was undertaken to identify and explicate some practicable methods by which the CPSC could procedurally implement its standards and other appropriate actions for components of residential units. The study of these methods included:

(1) Product history stages, hazard sources, institutional groups, and countermeasures available to the CPSC;

(2) The relationships among these four areas as they pertain to or are influenced by countermeasures;

(3) Investigation of current mechanisms for control of residential product components;

(4) Evaluation of alternative countermeasures for the control, reduction or elimination of residential hazards.

Evaluation

Product History

Products are created by a sequential process which may introduce hazards at stages prior to, during, and after installation. The alternatives for CPSC include each of these stages as subjects for action separately or in combination to effect control of identified levels of risk.

Characterization of Hazard Sources

Hazards may derive from (1) defective or improper materials, (2) faulty or inferior design in assembly, construction, or installation, (3) inadequate maintenance, (4) misuse, (5) inadequate or misleading product information, (6) faulty or inferior placement, and (7) normal wear.

Countermeasures

The following sixteen countermeasures were developed from a study of the stages of product history, institutional control group characteristics and the Consumer Product Safety Act (CPSA). Some are presented as possible courses of action and others derive directly from the wording of the Act.

1. Develop product safety performance standards which would preempt state, county, or municipal regulations and attempt enforcement through one of the following:

    a. Federal inspection staff.

    b. In the case of product safety performance standards issued by the Commission, encourage state and/or local governments to adopt and enforce identical standards pursuant to Section 26(a) of the Act.

    c. Develop and/or fund state product certification programs under Section 14(b) of the Act.

    d. Encourage local inspectors to bring violations to the attention of CPSC for action.

    e. Publicize regulations and allow individual homeowners to bring violations to CPSC attention or sue on their own behalf.

    f. Require builder to certify to the first purchaser of a home that he has met all applicable safety standards.

2. Commission employees of state and local agencies to conduct examinations, investigations, and inspections pursuant to Section 29(a) (2) of the Act.

3. Develop model laws, regulations, and standards, and encourage their uniform adoption by state or local governments, whichever is appropriate.

4. Coordinate and cooperate with other Federal agencies (e.g., with FHA regarding minimum property standards, and with FTC and FCC regarding advertising).

5. Encourage or effect the development and implementation of more effective maintenance and safety-oriented performance testing programs.

6. Improve information dissemination or education with the aid of governments, manufacturers, retailers, special interest groups, media, etc.

7. Require informative and truthful labeling of a product having safety hazards.

8. Require public notice of defect, or failure to comply with product safety rule, and/or require individual notice to purchasers pursuant to Section 15(c) of the Act.

9. Take court action to effect injunction, seizure or condemnation.

10. Recall, and refund monies to owner.

11. Ban the sale and distribution of particular product(s).

12. In lieu of CPSC court action, seek written assurances from suspected violators of future compliance, when appropriate.

13. Encourage court action to be brought on the part of private citizens to enforce a consumer product safety rule or an order under Section 15 of the Act.

14. Alter on-site product(s) to remedy extant defects by:

    a. On-site repair, component replacement, retrofitting.

    b. Recall of product for in-plant repair, component replacement, retrofitting.

15. Replace on-site products(s) to remedy extant defects by:

    a. Removal of original product for replacement with another of the same product category.

    b. Removal of product for replacement with another product of a different category.

16. Seek to amend present Federal legislation or develop new legislation to give CPSC more authority to implement countermeasures (e.g., develop legislation to allow the licensing of professional workmen or require homeowners to certify their dwelling units meet all applicable safety standards prior to transfer of ownership).

Study Limitation

This study has not assessed the relative effectiveness of alternative approaches for any given product component hazard. Factors relevant in the selection of alternatives include product characteristics, hazard sources and institutional flexibility. Any regimen considered by CPSC must accommodate required procedures and provide estimates of factors of time, cost, effectiveness, performance, and administration.

Acknowledgment

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1. INTRODUCTION

1.1. Project Background

The Consumer Product Safety Commission has determined a ranking of products ordered by a measure of accidental injury frequency and severity, based on data derived from the National Electronic Injury Surveillance System (NEISS). This ranking (called the Consumer Product Hazard Index) has focused attention on a group of products which are integral parts of a consumer's residence. Among the first 50 products ranked by NEISS in FY74 are a dozen such product categories. The items by category are:

- stairs, ramps, and landings
- doors, other than glass
- architectural glass
- bathtub and shower structure
- space heaters and heating stoves
- swimming pools (in ground)
- floors and flooring materials
- fences (nonelectric)
- furnaces and floor furnaces
- water heaters
- porches, balconies, open side floors
- outside structures (walls, terraces, etc.)

These products (the safety aspects of which are influenced by on-site construction practices and by architectural design) have traditionally been regulated by building codes. There are over 18,000 municipalities in the United States with the authority to adopt and enforce building codes. With the exception of a few states which have promulgated their own codes, local jurisdictions possess autonomy in the adoption and enforcement of building codes. This is an area where the Federal Government has had no direct legal jurisdiction. Its involvement has been primarily limited to developing minimum property standards used for obtaining federally-insured housing loans (i.e., Federal Housing Administration and Veterans' Administration) and construction activities for government-owned residential housing (e.g., Department of Defense and General Services Administration).

The Commission must address itself to fundamental questions which relate to these products and conditions. The questions raised are legal, technical and procedural, and most generally relate to:

(1) When is a product a consumer product (jurisdictional) ?;
(2) When there is a safety problem with a product, what should be done about it (technical) ?; and
(3) When a potential solution to the problem has been identified, how should it be implemented (procedural)?

This report will address the technical and procedural solutions and alternatives for correcting or alleviating residential product component hazards.

1.2. Scope of Project

The project's objective is to identify practicable methods for use by the CPSC in dealing with unreasonable hazards associated with component parts of residential units and to develop techniques for assessing their relative effectiveness. This report (representing the first phase of project work) deals with defining those alternatives available to the CPSC and discusses their feasibility in light of the residential construction environment.

1.3. General Approach

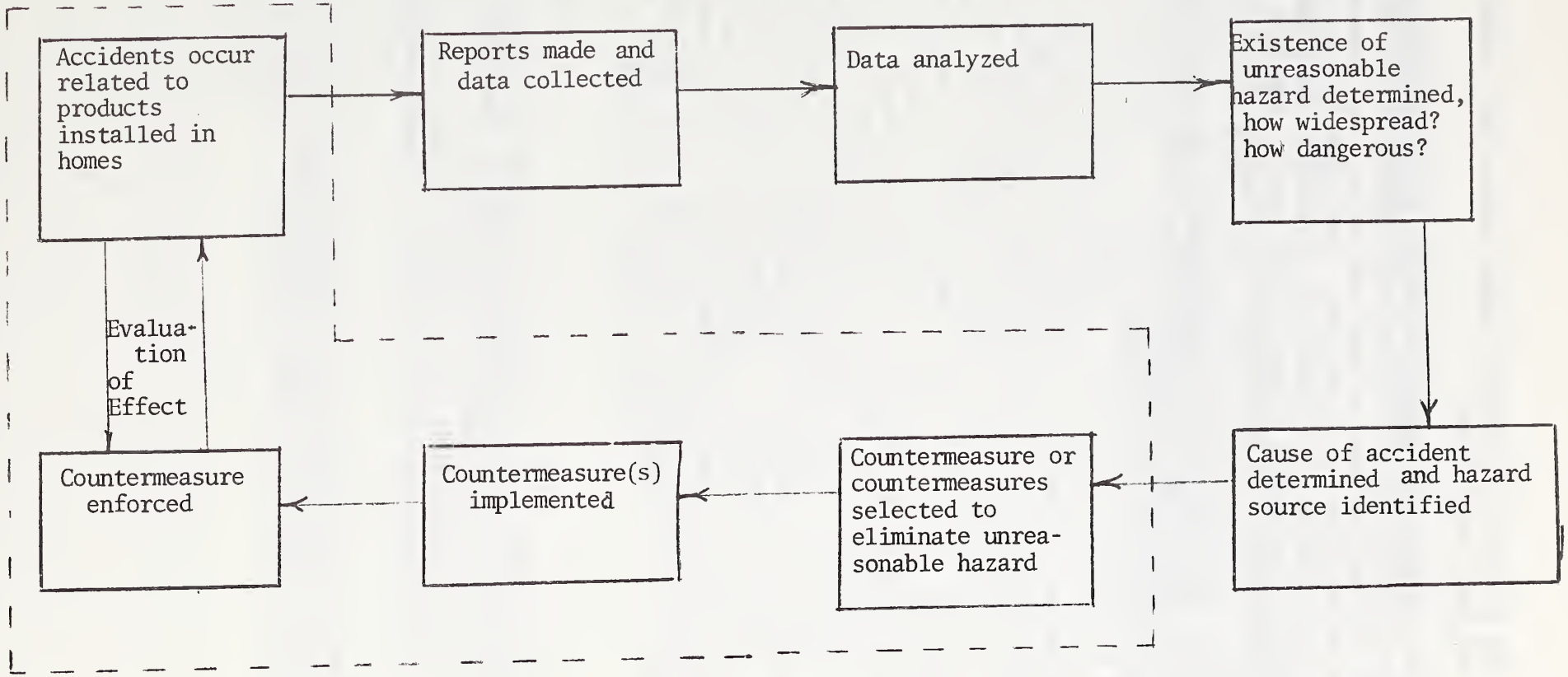
In order to structure our evaluation, the steps which normally are followed in the regulatory process for detection and elimination of unreasonable hazards associated with consumer products are depicted as a flow chart in Figure 1.3. This flow chart illustrates the necessary steps for detection of a problem and actions required to regulate or control products to effect a reduction in accident occurrence. The major emphasis for our study will involve those steps which fall within the dotted lines in Figure 1.3. These activities are concerned with taking appropriate action once a product hazard has been identified and a determination has been made that an unreasonable hazard exists. The study will not develop or evaluate processes for: accident data analysis, determination of the existence and extent of unreasonable hazards, identification of hazard sources, or the selection of an appropriate set of countermeasures. These processes are recognized as essential to successful regulation and a gap in any step may render the process unworkable. The study will be concerned with the generic identification of hazard sources and the selection of appropriate responses to the extent that this is necessary for the purposes of establishing the likelihood of the CPSC utilizing particular countermeasures. The distinction here acknowledges that to adequately assess appropriate actions for each product (as is being accomplished by CPSC on a product-by-product basis) would require a level of effort beyond that which is appropriate for this project and would divert attention from identifying major procedural options.

Section 1 outlined the project's scope and general approach. Section 2 presents descriptive material on:

(1) The major events in a residential product's "history"--its life cycle;
(2) The generic sources of hazards which can lead to accidents;
(3) The alternative countermeasures which are available to the Commission to reduce injury causing accidents; and

Figure 1.3.

Regulatory Process for Detection and Elimination of Unreasonable Hazards



(4) The various institutional groups which affect products and their regulation.

Section 3 examines in general terms the relationship between the product history stages, hazard sources, countermeasures and the institutional groups. The Section indicates at what step during, and subsequent to, a product's introduction into a residence, the hazard sources are introduced, and by what entity. Information is provided on which countermeasures might be applied to alleviate a given hazard source, when in a product's history a countermeasure could be applied, and through which entities.

Section 4 discusses various countermeasures and makes some judgments regarding their feasibility and appropriateness within the institutional environment in which CPSC must operate.

2. PRESENTATION OF PRODUCT HISTORY STAGES HAZARD SOURCES, COUNTERMEASURES AND INSTITUTIONAL GROUPS

2.1. Product History Stages

Products are subjected to many processes which may introduce hazards at stages prior to, during and after, installation. Attempts to study intervention strategies applied to the removal of hazard sources must consider the particular stage at which intervention would most effectively result in injury reduction. In the case of products installed in homes, the listing of product history stages (Table 2.1.) is intended to be general and as all-inclusive as possible. The stages specified in the product history represent the major phases in the product's "life cycle" from the input of raw materials (pre-manufacture materials processing) through disposal of recycling. The product history can be constructed for a particular product through a selection of the appropriate combination of stages. For purposes of analyses the product history is divided into two phases to identify when hazard sources are introduced and where countermeasures can be applied. The first phase, Manufacture-Sales, includes all stages involved in the preparation and sale of the product or its major components: pre-manufacture materials processing, manufacture, packaging, transportation, storage (before delivery to the builder), merchandising and assembly (before delivery). The second phase, Building-Utilization, differentiates the products installed in residences from other products and includes: architectural design, storage, on-site assembly, installation and construction of products. Utilization applies to those stages in which the owner or others implement some action concerning the product. These actions include use, maintenance, storage, disposal and recycling. Following are brief descriptions of each stage. The enumeration follows Table 2.1.

Manufacture-Sales:

I. Pre-Manufacture Materials Processing. This stage involves the manufacturer's development of the basic materials used in the product manufacturing process. "Basic materials" are defined as any distinct elements which are combined or altered in the manufacturing process to form an unpackaged product. They may thus include products made by other manufacturers.

II. Manufacture. In this stage, the basic materials are combined, and/or altered, in the fashion specified by the manufacturer, using his tools and labor resources. Some labeling of the product may also be involved in this stage.

III. Packaging. The manufactured product (assembled, or unassembled) is packaged in this stage. The packaging may not only prepare the product for transportation and storage, but it may also include labeling of the packaging.

IV. Transportation. This stage may occur at three points in the product history. The primary transportation is from the manufacturer to the storage area (e.g., a wholesaler's warehouse, or a retailer's storage). The product may also be transported from storage to the merchandiser, and from the merchandiser to the builder or consumer.

V. Storage. Stored products, either by the distributor or the consumer, may develop hazards which occur because of possible interactions with other products, the environment of their storage, or actor groups.

VI. Merchandising. In this stage, the product is promoted and sold by retailers and others. Thus, not only is the actual sale to the purchaser involved, but also the advertising and explanations of the product.

Building-Utilization:

VII. Architectural Design. This stage encompasses the planning and design aspects of the building process. It includes the work of architects, contractors, among others, who develop the situation which allows the builders to engage in the building stages.

VIII. Building. This stage involves the on-site preparation of the product for utilization. Building may involve some combination of product assembly, construction and installation, as well as any planning for such actions.

IX. Use. Included in this stage are all actions by consumers involving some use of the product. Also included here are aspects of the product's history in which the product has the potential to be used, though it is not in use (e.g., standing stairways which are vacant, but which can be used, would be included in this stage, as opposed to "Storage").

X. Maintenance. Products requiring maintenance may involve some type of controlled maintenance procedures.

Table 2.1.

Product History Stages

I. Pre-manufacture materials processing

II. Manufacture

III. Packaging

IV. Transportation

V. Storage

- A. Before delivery to builder
- B. When after delivery—other product(s), and/or natural environment, and/or other actor(s) interact with product
- C. After delivery—product does not interact

VI. Merchandising

VII. Architectural Design

VIII. Building

- A. Before delivery to the builder
- B. When delivery
  1. "Builder(s)" and/or other product(s), natural environment, other actor(s) interact with product
  2. Product and "builder" interact only with each other

IX. Use

- A. User(s) and/or other product(s), natural environment, other actor(s) interact with product
- B. Product and user(s) interact only with each other

X. Maintenance

- A. Actor(s) and/or other product(s), natural environment, other actor(s) interact with product
- B. Product and actor(s) interact only with each other

XI. Disposal

- A. Disposer(s) and/or other product(s), natural environment, other actor(s) interact with product
- B. Product and disposer(s) interact only with each other

XII. Recycling

XI. Disposal. Disposal by the consumer is the discharge of the product from any further ownership or control on his part. It will usually involve disposal of the product in the local mixed refuse disposal system, but it can also include the giving away, or sales of the product by the consumer, the return of the product for recycling, or abandonment.

XII. Recycling. Certain manufacturing processes deal with the recycling of used products. These products would be turned over by the consumer to some type of clearinghouse which would collect the products for return to the manufacturer for preparation for redistribution to consumers. Recycling may also involve certain portions of the original product.

2.2. Characterization of Hazard Sources

A hazard source is defined as an event in the product history which contributes significantly to a product-related accident. The derivation of the hazard source list, in Table 2.2., was based upon an examination of CPSC in-depth investigatory reports as well as other data sources pertinent to our list of products.[1] Hazard sources associated with products installed in homes are characterized in the following paragraphs:

A. Defective Materials. By "defective materials", is meant the existence on the building site, or in the finished home, of products, or component parts thereof, which are broken or altered in some manner which makes them unsuitable for safe use. The defect(s) may be caused in any stage prior to the stage in which the accident occurs (e.g., a manufacturer poking a hole in the service piping for a gas water heater's gas intake). Although this discussion concentrates on problems which arise after the product or components are delivered to the construction site--that is, problems with the builders, users, and so on--defects may be caused in the manufacture and sales stages. In this case, we may consider two parties to be at fault: the manufacturer, who inadvertently created the defect; and, the builder, who allowed the defective product to be installed.

B. Improper Materials. "Improper materials" may occur from two sources. First, they may be integrated as component parts of a product by the manufacturer (in a manner which may make the product "defective"

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[1]See Appendix A for a general discussion of the various sources of data used to support this portion of the study.

Table 2.2.

Hazard Sources

A.	Defective materials
B.	Improper materials
C.	Faulty design in assembly, construction, installation
D.	Inferior assembly (workmanship)
E.	Inferior construction (workmanship)
F.	Inferior installation (workmanship)
G.	Inadequate maintenance
H.	Misuse prior to the accident sequence
I.	Misuse during the accident sequence
J.	Inadequate or misleading information about the products proper use, hazards, maintenance, assembly, installation, etc.
K.	Placement of product such that interaction with the natural environment, other factor(s), or other product(s) creates a hazard
L.	"Normal" wear

and delivered to the construction site. Second, they may be designated by the building planners, and implemented by the builders, into a product which, because of their existence, becomes unsafe for use. "Improper materials" are therefore materials which are integrated into a product in its construct or alteration (in the design phases by the planners, or in the construct or alteration phases by the builders, users, maintainers, disposers, or recyclers). They are materials which, after their delivery to the construction site, cannot be deemed "defective" but exist as unsafe materials because of the negligence, bad planning, oversight, etc., of those involved in subsequent product history stages.

C. Faulty Design in Assembly, Construction, Installation. Faulty design is attributed to the building planning stages. The faulty design may involve the actual design of the product itself, the placement of the product in a manner which causes it to interact with its environment in an unsafe manner, or the misinterpretation that the product will be used generally in a way in which, in actuality, it will not.

D. Inferior Assembly (Workmanship). Inferior workmanship in assembly involves actions by the builders or workmen in which they perform their duties in a manner which is contrary to that prescribed by the planners and makes the final product unsafe for use. "Inferior" thus is associated with workmanship which does not meet properly followed practices.

E. Inferior Construction (Workmanship). Inferior workmanship in construction follows the same basic definition as that for inferior workmanship in assembly. The workmen do not follow what would be deemed to be proper procedures for the construction of a safe product.

F. Inferior Installation (Workmanship). Inferior workmanship in installation also follows the basic definitions as that for both assembly and construction. Installation, as the term is used here, is distinguished from construction in the sense that it involves working with a product which is, for the most part, prefabricated before the installation is begun.

G. Inadequate Maintenance. Inadequate maintenance involves the maintenance of a product in a manner which does not follow prescribed methods and leaves the product unsafe for use. Note that the product may, or may not, have been unsafe before the maintenance was undertaken.

H. Misuse Prior to the Accident Sequence. Misuse is herein defined as the use of a product in a manner in which it was not intended to be used, and in a manner which creates the strong likelihood or the actual occurrence of an accident. Misuse is subdivided into simple misuse and negligent misuse. In general, negligent misuse differs from simple misuse in the sense that the person committing the misuse in a negligent manner was aware before and during the action that the misuse was happening, and that it might clearly lead to an accident.

I. Misuse During the Accident Sequence. Misuse is defined as above, in "H". Misuse during the accident sequence may provoke different responses, in terms of countermeasures, than misuse prior to the accident sequence.

J. Inadequate or Misleading Information About the Product's Proper Use, Hazards, Maintenance, Assembly, Installation, etc. Inadequate or misleading information indicates failure to distribute information that should have been given to the consumer, or the act of distributing information that was misleading to the consumer. Inadequate information may further involve either the distribution of too little information, or the lack of distribution entirely. The agents involved in such actions may be the manufacturer, the packagers, the retailers, the building planners, the builders, the owner, the maintainers, the disposers, or the recyclers.

K. Placement of Product Such That Interaction with the Natural Environment, Other Actor(s), or Other Product(s) Creates A Hazard. Such placement may occur in the building, storage, use, maintenance, or disposal stages, If such placement is done during the building stage, and is contrary to established accepted practices, it may be considered as inferior construction or installation.

L. "Normal" Wear. All products undergo wear as a result of either their use under normal circumstances or their existence in their environment. Though this is an expected result, excessive amounts of normal wear may present a serious hazard. It is assumed here that a product experiencing normal wear has been used and maintained in a proper fashion. As such, actions to alleviate wear hazards might be the replacement of component parts, or the replacement or removal of the entire product.

2.3. Countermeasures

Countermeasures are responses available to the CPSC to reduce injury-causing accidents through the alleviation or removal of suspected or identified hazard sources. A set of potential countermeasures (Table 2.3.) has been developed based primarily on the provisions of the Consumer Product Safety Act of 1972 (CPSA). The countermeasures listed are intended to present a general category of responses and may be made more specific to fit particular circumstances. Section 4 of this report gives a general treatment on their implementation.

2.4. Hazard Source and Countermeasure Groups

Crucial to an analysis of decision alternatives concerning products, hazard sources and countermeasures is an understanding of the agents and institutions involved in the entire process. It is necessary to consider:

(1) Whether or not party was injured; and

(2) Whether or not a party was an expert in performing certain tasks (e.g., installation, maintenance) which could affect the performance of the product.

The various hazard source groups are shown in Table 2.4.1.

The countermeasure groups include both those who may be involved in the introduction of hazard sources and who may become involved as a result of countermeasure implementation. The countermeasure groups were based on the following interactions:

(1) Those groups most likely to be involved in the implementation of the countermeasures. These are the groups with which the CPSC will have to work.
(2) Those groups who will most likely be directly affected by the implementation of a countermeasure. These are the groups that the CPSC must consider in assessing the impact of countermeasures upon them.

The list of countermeasure groups, is shown in Table 2.4.2. This list is to be considered as an extension of the hazard source groups of Table 2.4.1. Appendix B discusses the relevant activities of what might be considered the most important groups relative to the regulation of the building and related industries and their bearing on the safety of products installed in homes.

Table 2.3.

Countermeasures Available to the CPSC

1. Develop product safety performance standards which would preempt state, county or municipal regulations and attempt enforcement through one of the following:

   a. Use Federal inspection staff.
   b. In the case of product safety performance standards issued by the Commission, encourage state and/or local governments to adopt and enforce identical standards pursuant to Section 26(a) of the Act[2].
   c. Develop and/or fund state product certification programs Section 14(b).
   d. Encourage local inspectors to bring violations to CPSC for proper action.
   e. Publicize regulations and allow individual homeowners to bring violations to CPSC attention or sue on their own behalf.
   f. Require builder to certify to the first purchaser of a home that he has met all applicable safety standards.

2. Commission employees of state and local agencies to conduct examinations, investigations, and inspections pursuant to Section 29(a) (2).

3. Develop model laws, regulations, and standards, and encourage their uniform adoption by either state or local governments, whichever is appropriate.

4. Coordination and cooperation with other Federal agencies (e.g., with FHA regarding minimum property standards, and with FTC and FCC regarding advertising).

5. Encourage or effect the development and implementation of more effective maintenance and safety-oriented performance testing programs.

6. Improve information dissemination or education with the aid of governments, manufacturers, retailers, special interest groups, media, etc.

7. Require the labeling of a product regarding safety hazards.

continued

[2]Section numbers refer to the Consumer Product Safety Act of 1972.

Table 2.3.

Countermeasures Available to the CPSC (continued)

8. Require public notice of defect, or failure to comply with product safety rule, and/or require individual notice to purchasers pursuant to Section 15(c).

9. Take court action to effect injunction, seizure or condemnation.

10. Require recall, and the refund in monies to owner.

11. Ban the sale and distribution of particular product(s).

12. In lieu of CPSC court action, seek written assurances from suspected violators of future compliance, when appropriate.

13. Publicize consumer product safety rules and orders under Section 15 of CPSA so that citizens may bring court actions to achieve enforcement.

14. Alter product(s) already installed on-site to remedy extant defects.

    a. On-site repair, component replacement, retrofitting.
    b. Recall of product for in-plant repair, component replacement, retrofitting.

15. Replace product(s) already installed on-site to remedy extant defects.

    a. Removal of original product for replacement with another of the same product category.
    b. Removal of product for replacement with another product of a different category.

16. Seek to amend present Federal legislation or develop new legislation to give CPSC more authority to implement countermeasures (e.g., develop legislation to allow the licensing of professional workmen or require homeowners to certify their dwelling units meet all applicable safety standards prior to transfer of ownership).

Table 2.4.1.

Hazard Source Groups

I. Pre-manufacture materials processors

II. Primary manufacturers, processor

III. Packagers

IV. Transporters

V. Wholesale operations management

VI. Warehouse operators

VII. Promotion, advertising personnel

VIII. Retail operations management

IX. Salesman

X. Retail product assemblers

XI. Building planners (contractors, architects, etc.)

XII. Builders

A. Owner

1. Injured party (a. Expert, b. Nonexpert)
2. Not injured (a. Expert, b. Nonexpert)

B. Injured party other than owner

1. Expert
2. Nonexpert

C. Other than owner and/or injured party

1. Expert
2. Nonexpert

XIII. Users, Storers

A. Owner

1. Injured party
2. Not injured

B. Injured party other than owner

continued

Table 2.4.1.

Hazard Source Groups (Continued)

C. Other involved party (not included in A or B)

XIV. Maintainers

A. Owner

1. Expert
2. Nonexpert

B. Injured party other than owner

1. Expert
2. Nonexpert

C. Other involved party (not included in A or B)

1. Expert
2. Nonexpert

XV. Disposers (may include landfill incinerator operators, etc.)

A. Owner

1. Injured party
2. Not injured

B. Injured party other than owner
C. Other involved party (not included in A or B)

XVI. Recyclers

Table 2.4.2.

Countermeasure Groups

These groups include those specified in the Hazard Source Groups (I thru XVI) plus the following:

XVII. Federal government (other than regulatory commissions)

- A. Federal executive branch officials whose domains may in some way involve safety aspects of products under consideration. Departments represented include HUD (plus FHA), VA, GSA, DoD, DoC, HEW, DoJ.
- B. Congress (members plus staff)
- C. U.S. Court officials
- D. Federal product safety-related regulatory agencies

XVIII. State governments

- A. State executive branch officials whose domains are in building regulation, and/or product safety (including prosecutors)
- B. State legislatures (members plus staff)
- C. State Court officials

XIX. Local governments

- A. Local executive branch officials whose domains are in building regulation, and/or product safety (including prosecutors)
- B. Local legislatures (members plus staff)
- C. Local Court officials

XX. Private lawyers, law firms

XXI. Model code associations

XXII. Voluntary standard-setting associations (ASTM, etc.)

XXIII. Consumer interest groups

XXIV. Professional trade and business associations

XXV. Media

XXVI. Independent testing laboratories (UL, Good Housekeeping, etc.)

XXVII. Banks

XXVIII. Insurance companies

3. RELATIONSHIPS AMONG PRODUCT HISTORY STAGES, HAZARD SOURCES, COUNTERMEASURES AND INSTITUTIONAL GROUPS

3.1. Basis for Structuring Conceptual Relationships

From the previous definitions of hazard sources (Section 2.2.) it is possible to structure a conceptual guide concerning the hazard sources and available countermeasures. The guide is presented in matrix format and is intended to depict the interactions which are possible among the product history stages, hazard sources, countermeasures and institutional groups. The objective is to present a format for recognizing: (1) where in a product's history, and by whom, a particular hazard source might be introduced; (2) which countermeasures should be considered[3]; and (3) which groups either participate in, or are affected by, the introduction of countermeasures(s). The tables discussed below are based upon information sources such as the various accident data bases and literature sources on the organizations involved. When specific cases are considered, these tables may be used to guide the formulation of pertinent information for a specific product hazard and its associated set of circumstances.

3.2. Relationship Among Hazard Sources, Product History Stages and Institutional Groups

Table 3.2.1 (Hazard Source by Product History Stage) indicates where in the product history a given hazard source may be introduced, and which processes must be investigated in order to respond to resulting hazards.

Table 3.2.2. (Hazard Source by Hazard Source Groups) distinguishes which institutional groups (from Table 2.4.1) may be involved with the introduction of a hazard source. For a given hazard source, investigators can use this information to ascertain which groups' actions need to be analyzed.

The combination of relationships presented in Tables 3.2.1. and 3.2.2. provides information which should aid in the process of addressing the total range of possible hazard sources associated with products installed in homes. The outcome of such investigations should enable the enumeration of hazard sources and institutional groups associated with their introduction.

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[3]The determination of which countermeasures should be considered is based solely on their projected applicability in reducing injuries attributed to a given hazard source. No economic, political or social considerations are taken into account in this determination.

Table 3.2.1. Hazard Sources by Product History Stage

Hazard Sources:	I. Pre-man. Processing	II. Manufacture	III. Packaging	IV. Transportation	V. Stor. A. Before Del.	B. Aft. Del.	C. Aft. Del.-Inter.	VI. Merchandising	VII. Archit. Design	VIII. Building	A. Bef. Del.	B. Aft. Del-Inter.	C. Aft. Del.-No Int.	IX. Use A. Interaction	B. No Interaction	X. Mainten. A. Interact.	B. No Interact.	XI. Dispos. A. Interact.	B. No Interact.	XII. Recycling	B. No Interaction
A. Defec. Materials	X	X	X	X	X			X		X	X	X									
B. Impr. Materials	X	X	X							X	X	X									
C. Faulty Design		X							X												
D. Infer. Assembly		X								X	X	X									
E. Infer. Constr.										X	X	X									
F. Infer. Install.										X	X	X									
G. Inad. Maintenance																X	X				
H. Misuse Prior 1. Simple Misuse						X	X									X	X	X	X	X	X
2. Neg. Misuse						X	X									X	X	X	X	X	X
I. Misuse During 1. Simple Misuse						X	X									X	X	X	X	X	X
2. Neg. Misuse						X	X									X	X	X	X	X	X
J. Inad. Information		X	X					X		X	X	X						X	X		
K. Prod. Placement						X	X		X	X	X	X		X	X	X	X	X	X	X	X
L. Normal Wear						X	X							X	X						

Table 3.2.2. Hazard Sources by Hazard Source Group

Hazard Sources:	I. Pre-manufact. Processors	II. Manufacturers	III. Packagers	IV. Transporters	V. Wholesale Op. Management	VI. Warehouse Operators	VII. Promo. Adver. Personnel	VIII. Retail Op. Management	IX. Salesmen	X. Retail Prod. Assemblers	XI. Building Planners	XII. Builders: A. Owner; 1. Injured a. Expert; b. Non-expert; 2. Not Injured a. Expert; b. Non-expert	XII. Builders: B. Not Owner; 1. Expert; 2. Non-expert	XII. Builders: C. Other; 1. Expert; 2. Non-expert	XIII. A. Users, Storers; 1. Owner; 1. Injured; 1. Expert	XIII. A. Users, Storers; 1. Owner; 1. Injured; 2. Non-expert	XIII. A. Users, Storers; 1. Owner; 2. Not Injured; 1. Expert	XIII. A. Users, Storers; 1. Owner; 2. Not Injured; 2. Non-expert	XIII. B. Not Owner-Injured; 1. Expert	XIII. B. Not Owner-Injured; 2. Non-expert	XIII. C. Other; 1. Expert	XIII. C. Other; 2. Non-expert	XIV. A. Maintainers; 1. Owner; 1. Injured; 1. Expert	XIV. A. Maintainers; 1. Owner; 1. Injured; 2. Non-expert	XIV. A. Maintainers; 1. Owner; 2. Not Injured; 1. Expert	XIV. A. Maintainers; 1. Owner; 2. Not Injured; 2. Non-expert	XIV. B. Injured, Not Owner; 1. Expert; 1. Expert	XIV. B. Injured, Not Owner; 1. Expert; 2. Not Expert	XIV. B. Injured, Not Owner; 2. Not Expert; 1. Expert	XIV. B. Injured, Not Owner; 2. Not Expert; 2. Not Expert	XIV. C. Other; 1. Expert	XIV. C. Other; 2. Not Expert	XV. A. Disposers; 1. Owner; 1. Injured	XV. A. Disposers; 1. Owner; 2. Not Injured	XV. B. Injured-Not Owner	XVI. C. Other; Recyclers
A. Defec. Materials	X	X	X	X		X			X	X	X	X	X	X	X	X	X	X	X															
B. Impr. Materials		X									X																							
C. Faulty Design											X																							
D. Infer. Assembly												X	X	X	X	X	X	X	X															
E. Infer. Constr.												X	X	X	X	X	X	X	X															
F. Infer. Install.												X	X	X	X	X	X	X	X															
G. Inad. Maint.																								X	X	X	X	X	X					
H. Misuse Prior 1. Simple Misuse																				X	X	X	X							X	X	X	X	
2. Neg. Misuse																				X	X	X	X							X	X	X	X	
I. Misuse During 1. Simple Misuse																				X	X	X	X							X	X	X	X	
2. Neg. Misuse																				X	X	X	X							X	X	X	X	
J. Inad. Info.	X	X	X		X		X	X	X	X	X																							
K. Prod. Placement				X	X							X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
L. Normal Wear	X	X	X	X		X				X										X	X	X	X	X	X	X	X	X	X					

3.3. Relationship Between Hazard Sources and Countermeasures

Table 3.3. (Hazard Source by Countermeasure) shows which countermeasures previously listed in Table 2.3. are potentially useful in alleviating a hazard source. Once hazard sources have been identified, applicable countermeasures that deserve investigation can be selected. Table 3.3. provides a guide for such determinations.

3.4. Relationship Among Countermeasures, Product History Stages and Institutional Groups

Table 3.4.1 (Countermeasures by Product History Stages) indicates what stages of the product history a given countermeasure is likely to affect. By "affect", is meant the alteration of the typical operations in a stage as the direct result of a countermeasure. Efforts to assess the impact of particular countermeasure choices can be facilitated through use of this Table. Although specific details may be lacking, the areas for investigation are made known.

Table 3.4.2. (Countermeasures by Countermeasure Groups) points out the nature of the involvement of various institutional groups in the implementation of countermeasures. The intention was to make this Table generally apply to the generic category of residential products. However, it is recognized that the situation may be altered when a specific product and even a specific circumstance for the product is considered. In fact, this might be considered a strong point of the method for providing a framework for consideration of the implication of alternative actions. The Table gives a general indication of the groups likely to be involved in many cases. The following notation is used to indicate the degrees of involvement of the institutional groups:

(1) Direct involvement in the implementation process (marked D);
(2) Indirect involvement in the implementation process (marked I); or
(3) Directly affected by the implementation of a countermeasure (marked A).

Table 3.3. Hazard Sources by Countermeasure

Hazard Sources:	1. Dev. Perfor. Stds.	a. Fed. Staff	b. State Adoption	c. State Certification	d. Local Inspection	e. Homeowner Action	f. Builder Certif.	2. Commis. State Empl.	3. Devel. Model Laws	4. Coord., Coop. W/Fed.	5. Better Maint., Test.	6. Improve Info., Educ.	7. Require Labelling	8. Public Not. of Viol.	9. Court Action	10. Recall, Refund	11. Ban	12. Violators' Writ. As.	13. Priv. Citi. Ct. Act.	14. Alter Prod. Instal.	a. On-site	b. Recall to Plant	a. Replace Product	b. Same Prod. Cat.	b. Different Cat.	16. Amend. Fed. Legis.
A. Defen. Materials	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X			X
B. Impr. Materials	X	X	X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X			X
C. Faulty Design	X	X	X	X	X	X	X	X	X		X		X		X	X	X	X	X	X	X	X	X			X
D. Infer. Assembly	X	X	X	X	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X	X	X			X
E. Infer. Constr.	X	X	X	X	X	X	X	X	X		X		X	X	X		X	X	X	X	X	X	X			X
F. Infer. Install.	X	X	X	X	X	X	X	X	X		X	X	X	X			X	X	X	X	X	X	X			X
G. Inad. Maintenance								X	X	X	X	X	X				X	X								X
H. Misuse Prior 1. Simple Misuse									X		X	X														X
2. Neg. Misuse									X		X	X														X
I. Misuse During 1. Simple Misuse									X		X	X														X
2. Neg. Misuse									X		X	X														X
J. Inad. Information							X	X	X		X	X	X				X	X								X
K. Prod. Placement	X	X	X	X	X	X	X	X	X		X	X	X					X	X							X
L. Normal Wear	X	X	X	X	X	X		X	X	X	X	X											X	X	X	X

Table 3.4.1. Countermeasures by Product History Stages

Countermeasures:	I. Pre-man. Processing	II. Manufacture	III. Packaging	IV. Transportation	V. Stor. A. Before Del.	B. Aft. Del.-Inter.	C. Aft. Del.-No Int.	VI. Merchandising	VII. Architectural	VIII. Building Design	A. Before Delivery	B. Aft. Del.-Inter.	C. Aft. Del.-No Inter.	IX. Use A. Interaction	B. No Interaction	X. Maintenance A. Interact.	B. No Interaction	XI. Disposal A. Interact.	B. No Interaction	XII. Recycling
1. Dev. Profor. Stds. A. Fed. Staff	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	
B. State Adoption	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	
C. State Certification	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	
D. Local Inspection	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	
E. Homeowner Action	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	
F. Builder Certification	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	
2. Commission State/Loc. Employees	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	
3. Develop Model Laws	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	
4. Cood./Coop. with Fed. Agencies	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	
5. Better Maintenance Test										X	X	X			X	X				
6. Improve Inform. Education						X	X						X	X						
7. Require Labelling		X	X					X	X	X	X	X			X	X				
8. Public Notice of Violation		X	X					X		X	X	X			X	X				
9. Court Action	X	X	X		X			X	X	X										
10. Recall, Refund Monies				X				X			X	X					X	X	X	
11. Ban	X	X	X	X	X			X												
12. Violators' Written Assurances	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	
13. Private Citizen Court Action	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	
14. Alter Prod. Instal. A. On-site									X	X	X	X								
B. Recall to Plant		X		X						X	X	X								
15. Replc. Prod. A. Same Prod. Cat.		X		X						X	X	X					X	X		
B. Different Category		X		X						X	X	X					X	X		
16. Amend Federal Legislation	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	

Table 3.4.2. Countermeasures by Countermeasure Groups

Countermeasures:	I. Pre-manufacture Processors	II. Manufacturers	III. Packagers	IV. Transporters	V. Wholesale Op. Management	VI. Warehouse Operators	VII. Promo. Adver. Personnel	VIII. Retail Op. Management	IX. Salesmen	X. Retail Prod. Assemblers	XI. Building Planners	XII. Builders A. Owner 1. Injured a. Expert	b. Non-Expert 2. Not Injured a. Expert	b. Non-Expert B. Not Owner 1. Expert	2. Non-Expert 2. Non-Owner-Injured C. Other 1. Expert	2. Non-Expert XIII. Users 1. Non-Expert 1. Storers A. Owner 1. Injured	2. Not Injured B. Not Owner-Injured C. Other 1. Expert	2. Non-Expert XIV. Maintainers A. Owner 1. Expert	2. Not Expert B. Injured, Not Expert 1. Expert	2. Not Expert C. Other 1. Expert	2. Not Expert XV. Dispsers A. Owner 1. Injured	2. Not Injured B. Injured-Not Owner C. Other XVI. Recyclers	A. Federal Government A. Executive	B. Congress C. U.S. Courts D. Regulatory Agencies	A. State Governments A. Executive	B. Legislative C. Courts A. Local Governments A. Executive	B. Legislative C. Courts XX. Private Law Firms	XXI. Model Code XXII. Std. Associations	XXIII. Consumer Infor. Gp's. XXIV. Prof. Trd. & Bus. Assoc.	XXV. Media XXVI. Independent Test Labs.	XXVII. Banks XXVIII. Insurance Co's.
1. Dev. Profor. Stds. A. Fed. Staff	D	D	D		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A									A	A	A	A	A	D			I	I					A	I	I	I	D	I	I	A	A
B. State Adoption	D	D	D		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A									A	A	A	A	A	I	I		I	D	D	A	I	D	A	A	I	I	I	D	I	I	A	A
C. State Certif.	D	D	D		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A									A	A	A	A	A	D	D		I	D	D	A			A	A	I	I	I	D		D	A	A
D. Local Inspection	D	D	D		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A									A	A	A	A	A	I	I		I	D	I		D		A	A	I	I	I	D		I	A	A
E. Homeowner Action	D	D	D		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	D	D	D	D					D	D	A	A	A	D		I	I	D			D	D		D	I	I	I	D	D	I	A	A
F. Builder Certif.	D	D	D		A		A	A	A	A	A	D	D	D	D	D	D	D	D													A	D			I	D	I		D			A	I	I	I	D		I	I	I
2. Commission State/ Local Employees	A	A	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	D				A	A	A	A	A	A	A	A	A	D	I			D	I		D									I
3. Develop Model Laws	A	A	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	D	D		I	D	D	A	D	D		I	I	I	I	D	I	I		I
4. Good./Coop. with Fed. Agen.	A	A	A	A	A	A	A	A		A	A	A	A	A	A	A	A	A	A	A				A	A	A	A	A	A	A	A	A	D	D		D															I
5. Better Maint., Test							I			I		A	A	A	A	A	A	A	A	A				D	D	D	D	D	D					D			I	D	D		D	I		A	I	I	I	D	I	I		I
6. Improve Infor., Education							D	I	I										A	A	A	A												D	I			I			D				I	I	I	D	D	D	I		I
7. Require Labelling	A	A	D				D	A		A		A	A	A	A	A	A	A	A														D	D		D	D			I			A	D	D	I	D		I		I
8. Public Notice of Violation	D	D	D		I	A	A	I	A		A	A	A	A	A	A	A	A	A					A	A	A	A	A	A	A	A	A	D				I			I			A	I		I	I	I			I
9. Court Action	A	A	A	A	A	A	A	A			A	A	A	A	A	A	A	A	A	A	A	A	A										D		D		D		I			I	I			I				I
10. Recall, Refund	D	D	D		A	A	A	A											A	A	A	A											D			I	D			A				A			I	D			A
11. Ban	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A											D	I	I	I	D		A		A	I			I	A	D			A
12. Violators' Writ. As.	D	D	D		A	A		A			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A										D			I	A				A
13. Priv. Citi. Court Action	A	A	A	A	A	A		A			A	D	D	D	D	D	D	A	A	D	D	D	D	A	A	A	A	A	A	A	A	A	I		A		I			A			D			I	A	I			I
14. Alter Prod. Instal. A. On-site	D	D	I								I	D	A	D	A	D	A	D	A	A	A	A	A	A	A	A	A	A	A	A	A	A	I	I	A		I		I	I	I	I	A	A		I	A			I
B. Recall to Plant	D	D	I	I							I	D	A	D	A	D	A	D	A	A	A	A	A	A	A	A	A	A	A	A	A	A	I	I	A		I		I	I	I	I	A	A		I	A			
15. Replc. Product A. Same Prod. Cat.	D	D	I	I	A	A		I		A		I	I	I	I	I	I	I	I	A	A	A	A	A	A	A	A	A	A	A	A	A	I	I	I		I		I	I	I	I	A	A		I	A			
B. Different Cat.	D	D	I	I	A	A		I		A	I	I	I	I	I	I	I	I	I	A	A	A	A	A	A	A	A	A	A	A	A	A	I	I	I		I		I	I	I	I	A	A		I	A			
16. Amend. Fed. Legis.	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	D	I	I	I	I						A	A	A	I	D	A	A		

A - Affected by the implementation of the countermeasure

I - Indirectly involved in the implementation of the countermeasure

D - Directly involved in the implementation of the countermeasure

4. COUNTERMEASURE IMPLEMENTATION

Previous discussions of the institutional groups have been directed toward explaining their interaction with products installed in homes. The set of countermeasures listed in Table 2.3. would involve the institutional groups directly or indirectly or would affect them by changing the processes associated with the products. The depiction of these possible changes is presented in Table 3.4.2.

This section of the report will, for each countermeasure proposed, describe some of the potential reactions of affected institutional groups and describe information relevant to the countermeasures' potential for reducing injury occurrence. Further information concerning the major institutional groups having an impact upon residential construction and related industries may be found in Appendix B. (This information has been drawn upon for the following discussion.)

Projections of the number of occupied housing units based upon population projections (Appendix C) give an indication of the potential coverage which could be obtained by countermeasures impacting new construction. By conservative estimate, 30 percent of the residences in 1990 would contain new safety features required in 1975 and implemented throughout the 15 year span. This estimate assumes a high population growth rate but neglects a component for replacement housing units. It thus appears that the use of product safety performance standards or other countermeasures altering the requirements for new housing and renovated units will significantly impact the U.S. housing inventory. Replacement of items, which either wear out (furnaces, water heaters, etc.) or break (architectural glass), with products that meet safety performance standards, should further increase CPSC impact upon the residential environment.

4.1. Development of Product Safety Performance Standards (1)[4]

The establishment of a product safety performance standard will preempt state or local standards which address identical hazards. From a practical point of view the preemption could create an enforcement void, for unless the state or local jurisdiction had an identical standard, they could not enforce a standard aimed at correcting the same risk of injury covered by the CPSC safety standard. State and local jurisdictions must either adopt an identical standard or request an exemption under the provisions of Section 26(c) of the Act. This could lead to the

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[4]Numbers in parentheses refer to the countermeasures listed in Table 2.3.

conclusion that a Federal inspection staff would be required for enforcement. However, we have identified five means, in addition to Federal inspection, for the implementation of product safety performance standards. The discussion of all six options follows.

4.1.1. Use of Federal Inspection Staff (1a)

While the law is clear as to how CPSA standards will effect state standards, the manner of their enforcement is not generally spelled out. A Federal inspection staff will be necessary, of course, but the size of that force is limited from a practical standpoint. Even FDA, with one of the largest forces of Federal inspectors, must from time to time call for support from other agencies, both Federal and state, to effect a complete recall of a particular product that has been distributed all over the country. Naturally the number of Federal inspectors will have to depend somewhat on the Commission's policy regarding reliance on other agencies, but regardless of the size of the staff, the Commission may want to make use of other agency resources, especially manpower.

The size of a CPSC inspection staff required to inspect individual residences, given the number of new housing starts of between 1.5 and 2.5 million units per year, and the diffuse nature of the housing construction industry with almost 800,000 firms, makes this alternative a prohibitively expensive means of enforcement. A team of inspectors that could perform special investigations as required, or as an additional assignment for the existing CPSC compliance staff, could be a more reasonable approach for CPSC inspections.

As seen in Table 3.4.2, the major groups directly involved in implementation will be the CPSC and other Federal agencies having cognizance over housing construction or mortgage insurances. Those groups which may be indirectly involved, or involved in a supporting role, may be the corresponding state and local officials and associations dealing with model codes and standards. The organizations most likely to be directly affected by the implementation will be those groups involved in all stages of the product history, dealing with the development, production and installation of the product in a residence.

4.1.2. Encourage State, Local Adoption and Enforcement of Identical Standards (1b).

Based on the Commission's policy of cooperation with state governments, an option to be considered is to encourage the states to adopt and enforce those standards issued by the Commission. This approach, perhaps more than any others discussed in this report, may be extremely difficult to achieve because of state and local government perogatives and authority. (See Appendix B, Section B.7 for discussion of state activities.)

Local authorities, having a tendency to keep a stronger hold on the areas of responsibility left to them, and not assumed by states or the Federal Government, may be even less anxious to cooperate on a voluntary basis than the states. Furthermore, there is the operational problem of having many more individual localities to deal with than there are states.

Voluntary cooperation may be best accomplished through seeking the cooperation of organizations like the National Conference of States on Building Codes and Standards (NCSBCS). This organization is a vehicle for coordinating activities of all states involved, and is thus a means for reducing the total effort associated with a large number of municipalities. However, reliance solely upon local jurisdictions for adoption of an identical performance standard to gain coverage of the entire country is not practicable. Some jurisdictions do not have building codes covering all aspects of construction and, for instance, have adopted only electrical and/or plumbing codes. The concept of obtaining local enforcement depends upon an assumption that the framework for enforcement exists, and at present it is not true for all localities. (See B.8. in Appendix B for discussion of local regulation.)

An additional factor to be considered is the process for prosecuting violators under state or local administrative and judicial procedures. Building code violations are usually corrected soon after detection (by local inspectors) to prevent construction delays. However, the effectiveness of the inspection system may be increased if the inspection program was backed by strong penalties. In the absence of such penalties, the reliance upon having states and local governments enforce the performance standard may prove less than satisfactory.

4.1.3. Develop and/or Fund State Product Certification Programs (1c)

If the Commission desires to have states involved in product safety without the Commission's having to relinquish any control, it might consider the possibility of promoting state testing laboratories to serve as qualified "third party" certifiers of products subject to product safety standards referred to in Section 14(b) of the Act. Since all products subject to these standards will require certification according to Section 14(a) of the Act, the states could play a vital role in product safety without actually adopting an identical standard. If these state laboratories were partially Federally funded they could provide a greater degree of impartiality than might otherwise be possible, and the Commission, through various means, could be assured of their qualifications. Conceivably, these laboratories could provide a return on the represented investment through new ideas for safety and testing as a result of their experience.

4.1.4. Development of Product Safety Performance Standards--Local Inspectors Bring Violation to CPSC for Action (1d).

This program would have many of the same outside-party enlisting benefits for the Commission as the state certification programs. In this case, however, those enlisted (the local building inspectors) would clearly be acting to enforce local codes which may or may not include product safety standards. The CPSC may have to provide guidelines to the inspectors on what constitutes a suspected violation of the product performance standards. The major parties involved in implementation will be the Federal, state and local officials. The CPSA encourages the Commission to enlist the aid of the local inspectors. The state legislative and executive officers involved may have to act as the middle men, perhaps giving the localitites permission (Section 29(a) (1) of the Act) to engage in such activity, keeping the chain of communication and responsibility from Federal to state to local intact. This plan may be appealing in two ways:

(1) It is a voluntary one in which the local jurisdictions can keep their autonomy over local inspections, while, at the same time, cooperating with CPSC; and
(2) It gives them a position of relative importance in the operation.

4.1.5. Development of Product Safety Performance Standards--Publicize Regulations and Allow Individual Residents to Bring Violations to CPSC Attention or to Sue on Their Own Behalf (1e).

This countermeasure would require a much more intensive information/publicity campaign that the countermeasures discussed so far. The means for publicity could include those being used now by the Commission including the electronic media as well as written material distributed through a variety of public service organizations. It may also be feasible to require, as a part of some of the product safety rules, that written notice be provided the ultimate user of the product as to the provisions of the performance standard and the procedure for reporting violations to the CPSC.

The individual resident is the interest group member who has carried the least influence of all those involved in the product safety process because he has no organized representation. The CPSC was created with the intent of taking into consideration the bodily safety of the consumer--in this case, the individual resident and his family. However, despite the CPSC mandate to ensure adequate safety for all consumers, and despite CPSC efforts to accomplish this end, resident consumers have the least efficient vehicle for presenting their case. Some sort of working advocate, be it within the CPSC or as a fourth

party (the other three parties being the CPSC, the residents and the "violators"), could be developed. Existing consumer interest groups, standards and code-developing and adopting organizations, the media, private lawyers and consultants, and even state and local governmental officials, could all take a role in this advocacy effort. The benefit in allowing individual residents to take a role in the process is that violations which consumers find would have an improved chance to be reported.

The option of an individual suing under the provisions of the CPSA are not precluded by Commission actions. As an additional vehicle for gaining compliance, publicity concerning this alternative may prove helpful. Notwithstanding the difficulty of proving a violation, injured parties are specifically covered by Section 23 of the Act and may recover from parties willfully violating consumer product safety rules.

4.1.6. Development of Product Safety Performance Standards--Require Builder Certification of Compliance (1f).

The issuance of a performance standard, requiring testing and certification, is not the end of the Commission's involvement in the safety of products. Some checks on its effectiveness will be necessary. In fact products could present special problems where the manufacturer has no control over the uses of his product line.

There are many ways in which the Commission could get some such assurance on product use. One method would be to require that the builder relay to the first purchaser the fact that the products covered by CPSC standards were indeed certified to comply when sold to him. He could do this through his own certificate, much in the same way as a property report is required in the interstate sale of land. Consumer awareness of this requirement could also provide some check on non-complying builder or sellers, and could provide leverage for the consumer at settlement on the property. (The housing construction industry is discussed in more detail in B.1. of Appendix B.)

This countermeasure is designed to put a check on the system before the consumer becomes involved. Presumably, by certifying that products installed meet all safety standards, the builder is adding more insurance that his homes will be safe for use, within the guidelines set up by the CPSC.

Conversely, such certification gives those who bring grievance against the builder more power to make the builder correct a mistake. This, also should increase the likelihood of his work being in compliance with safety standards.

Of importance here in setting up and running such a system is the cooperation of the builders, perhaps through the existing building and trade associations, such as the National Association of Home Builders (NAHB). These groups can act as coordinators with the builders for the CPSC and as representatives to the CPSC for the builders. The efforts of the NAHB to establish a home warranty program indicates that the basic administrative capability exists within this organization. Clear guidelines on the responsibilities of the builder must be established. Furthermore, the setup of builder certification requires that a working system for processing complaints against the certifications be established.

4.2. Commissioning of State and Local Employees for Enforcement (2)

The commissioning of state and local officials to conduct examinations, investigations and inspections is designed to give the CPSC an enforcement whose organizational structure and manpower is, to a large degree, already established. Commissioning would allow state and local officials to perform specified tasks which may exceed state authority, but are fully within CPSC jurisdiction. The CPSA provides the Commission authority to make payments to state or local agencies doing the work (Section 29(a)).

The ideal situation for the CPSC in terms of Federal-state cooperation would seem to be to have one agency in each state with essentially the same statutory base. Since that is not the case, the CPSC will have to determine which agencies (and there may be several) have the authority, capability and interest in their activities. For example, the CPSC could have an interest in cooperating with health authorities, housing authorities, building authorities and fire authorities in one state concerning a single hazardous product installed in the home. Some of these authorities may be more influential at the local level, others at the state level. Even in cases where there is a state counterpart, it might still be useful to call on other state and local agencies on certain occasions.

4.2.1. Other Agency Cooperation at State and Local Levels

In view of Section 29 of the CPSA, requiring a program to promote Federal-state cooperation in furtherance of the Act, and in view of our own task to identify methods of implementing various solutions for CPSC, we considered it worthwhile to briefly inquire as to what extent, and in what manner, some other Federal agencies cooperate with state and local authorities on enforcement matters.

FDA is a good example, not only because of the amount and variety of their cooperation, but because the FDA, like the CPSC,

has statutory authority to commission state and local inspectors (see Section 29 (a) (2) of the Consumer Product Safety Act, and Section 702 (a) of the Federal Food, Drug and Cosmetic Act). The FDA work-sharing plan involves state participation in planning, surveillance and compliance in order to make the most efficient use of available Federal and state resources. Basically, it involves dividing responsibility to avoid unwarranted duplication of effort, and has the advantage of permitting both participants to retain their statutory responsibilities and authority, since each can continue some activity in all program areas. Presently 28 states are participants in formal work-sharing programs with the FDA.

In the last few years FDA has instituted a system of granting contracts to the states to assist in various programs, such as food plant sanitation inspection, medicated feed sampling and analysis, interstate travel and food service sanitation, and food surveillance sample analysis. Contracts under this program have been negotiated with 37 states.

Another program that is associated with the contract program is that of commissioning cooperating officials. There are now 372 state officials commissioned by FDA to work as Federal officers in the medicated feed program. It appears that this program is designed to supplement the inspection authority of the states while providing increased surveillance capability for FDA.

The Federal Trade Commission's cooperation with state agencies has, for the most part, been confined to information exchange such as referral of complaints, assistance in solving specific problems and informal counseling. Apparently the fact that the FTC has no authority to delegate its authority, and the difficulties in developing standards for unfair and deceptive practices, have not been conducive to true work-sharing agreements.

It is interesting to note that both the FDA and FTC have model state FDA and FTC Acts, and that the idea of uniform state laws coinciding with their Federal counterparts is considered essential to effective Federal-state cooperation by representatives of both agencies.

The Department of Agriculture has a broad range of responsibilities and functions that could involve state cooperation. Our inquiry was confined to their enforcement of the Wholesome Meat and Poultry Products Acts, which are somewhat similar to product safety regulation. The concept of both acts is to allow states to administer their own inspection programs if their requirements equal those imposed by Federal law. In addition to cooperating with the states in developing and administering their own programs, the Department is also authorized to fund up to 50% of the cost of the state program. One of the ways in which

this "matching funds" authority is used is in the case of licensing state inspectors in Federal inspection plants, with the Department of Agriculture paying half of the state inspector's salary. As is the case with FDA and FTC, cooperation presupposes the existence of adequate state enforcement authority.

The Atomic Energy Commission[4] also has several programs involving, for the most part, state Departments of Health. Their "Agreement State Program" involves turning over the licensing and regulation functions concerning source, by-product, and special materials that are in less than critical quantities. Thus far 25 states are participating. There is no AEC funding of states involved in this program.

Another AEC program that does involve cost sharing concerns radioactive environmental and effluent monitoring, whereby the 20 participating states set up instrumentation around nuclear facilities, take samples, analyze them, and furnish the data to the AEC. These data are used primarily as a check on basically the same information required to be supplied to the AEC by the licensee of the facility.

A third program of cooperation with state officials is the co-sponsorship by AEC, FDA, and EPA of a National Conference of Radiological Program Control Directors. This appears to be primarily a program of information exchange whereby the Federal agencies can discuss radiation matters within their respective jurisdictions with all the state officials concerned. The sponsorship generally involves no more Federal expenditure than the cost of travel and per diem of state officials to the sponsored meetings.

Though there are many other agencies also extensively involved in cooperation with state and local officials on a variety of subjects, such as EPA, OSHA, DOT and HUD, some preliminary comparisons are still possible. The fact that the Commission has the authority to pay for state and local assistance, and to commission state and local officials to conduct inspections, in addition to having an expressed purpose of minimizing conflicting state and local regulations, puts the CPSC, in comparison to these other Federal Agencies, in an excellent position to engage in extensive cooperative arrangements.

The Commission will also have to be particularly sensitive to the fact that, for the most part, the states do not now have one established regulatory agency with statutory authority corresponding to that of the CPSC. Since this is the case, the appropriate state agency will have to be sought out on a case by case basis.

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[4]Now called the Nuclear Regulatory Agency.

Local authorities, for the most part, do not have as extensive departmental organizations as do state governments nor have they had as much experience in working with Federal agencies. This is particularly true for localities of smaller size. Larger localities, e.g., New York City, have developed the experience and have had the Federal-local contact that many of the states have had. However, most of the localities holding jurisdiction in enforcement are of considerably smaller size. Some coordinating effort, perhaps managed by the states involved, may be necessary.

4.3. Development of Model Laws, Regulations and Standards and Encouragement of Their Adoption by State or Local Governments (3)

An alternative to mandatory standards are model standards, model laws, and regulations which the Commission could encourage the states to adopt on a uniform basis. Substantial uniformity could possibly be achieved simply through the presence of the Commission's power of preemption. Uniformity among the states allows for parallel enforcement actions reinforcing Federal and state activity to improve product safety. Widespread adoption of models might be encouraged on the same basis, with the single advantage over the mandatory standard being that it need not be identical.

The existing model building code organizations, as well as the NCSBCS, are organizations whose purpose is to develop model laws, codes and standards. These organizations are the obvious ones for the CPSC to coordinate with to encourage development and adoption of models. This avenue has been used by other Federal agencies, but, in the instances where it has been the most effective, it has also been tied in with detailed programs of Federal-state cooperation in assuring compliance with the laws. This countermeasure offers the states and the localities the option of adopting or rejecting the regulation, and it thus allows them to retain autonomy. However, in the case of model standards, it may be contrary to current CPSC preferences of having outside groups develop suggested (in this case, on a par with model) standards for CPSC review and possible acceptance. Implementation of this countermeasure would probably mean the decentralization of product safety policy and enforcement power. (See B.4. in Appendix B for discussion of code groups.)

If the Commission were to rely on the adoption of model laws, regulations or standards in lieu of the issuance of a single Federal regulation or standard, they would, in the case of products installed in the home, probably be considering adoption as part of a state or local building code. Given that, the CPSC should consider the performance of the existing model building code system discussed in B.8. of Appendix B. While the time required for adoption of a model regulation

change is a factor, it would depend upon a comparison with the time involved in the issuance of a mandatory standard by the Commission. The process of implementating a recommendated model involves the initial modification of a model building code and the adoption by a jurisdiction of the change. Both activities require time and must be successfully completed prior to implementation of the model. However, as indicated in Appendix B, the percentage of jurisdictions following model building codes at all, and the number that make recommended annual changes, may indicate to the Commission that the coverage obtained through the model law and regulation route may not be adequate. An additional factor, affected in a similar way, is the level of enforcement. As in coverage, adequacy of enforcement depends upon a comparison with what the Commission would expect to achieve if they were to promulgate a consumer product safety rule.

4.4. Coordination and Cooperation With Other Federal Agencies (4)

The CPSA requires the Commission to cooperate with a number of Federal agencies in administering its duties. For instance, the FHA and VA control over some of the new housing units and a number of occupied housing units being renovated could allow the CPSC to have an effect on the safety standards and codes used in future housing as well as existing housing. In many cases the CPSC may be able to mandate actions by other agencies in areas in which the CPSC has control, however, it may be more effective to enlist the voluntary cooperation of these agencies.

There are three agencies (FHA, VA, DOD) which presently have their own inspection staffs, or have the authority to hire outside staffs, for the inspection of residential construction. Use of these staffs in conjunction with changes made in the property specifications (to increase safety) used by these agencies would help ensure that the promulgated changes will be implemented.

The Federal Hazardous Substances Act, the Poison Prevention Packaging Act of 1970, and the Flammable Fabrics Act all name the Department of Health, Education and Welfare as the chief Federal agency responsible for carrying out the provisions of the Acts. The CPSA has subsequently transferred much of this responsibility to the CPSC. However, the legal power that remains with HEW[5], and much of the expertise and cooperative structure necessary in certain fields of investigation[6] make HEW a unique source of experience for the CPSC.

CPSC must work with all other Federal agencies engaged in both building standards and codes development and promulagation (e.g., DoC.

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[5]With the FDA for foods, drugs and cosmetics.

[6]e.g., The knowledge of the NIH staff in areas of effects of injuries on humans, which is accessible to all agencies within HEW.

EPA) and the awarding of grants for research in consumer product safety (NSF). The experience of the Building Research Advisory Board, National Academy of Sciences, in coordinating and enlisting the cooperation of other government agencies to develop a Federal Government set of property standards may provide useful insights into how the CPSC may develop good channels for cooperation within an operating framework.

Where CPSC has active cooperation with other Federal agencies, it will also have to consider the role of the state and local governments in the other agency programs. For example, if the CPSC were to seek the introduction of a particular product safety requirement into FHA's minimum property standards, the CPSC should consider what role local building inspectors might play for the CPSC that would differ from their current relationships with FHA.

One policy question that seems inextricably tied to the extent and kinds of cooperation with other Federal agencies is the extent of mandatory consumer product safety standards versus the voluntary (at least from the Commission's view) standards approach. Presumably, compliance with a product safety rule concerning a product installed in a home would be mandatory on the part of the builder regardless of any FHA or VA requirement. A decision to utilize FHA minimum property standards as a means to achieving improved safety in the home could require that the CPSC refrain from adoption of a mandatory standard for the same product. Considerable study will be needed to determine which method is most appropriate, weighing such factors as coverage obtained, levels of compliance, cost of implementation, etc. The Commission may have to consider relinquishing some authority or funding in most cooperative efforts with either Federal or state agencies. (Relevant Federal activities are noted in more detail in B.6. of Appendix B.).

4.5. Development and Implementation of More Effective Maintenance and Safety-Oriented Performance Testing Programs (5)

This countermeasure involves an effort which is designed to ensure that a product installed in the home remains in safe working order during its entire service life. Studies will be required to indicate which products require periodic maintenance, at what interval and what operations are required for safety. Such investigation may provide information relevant to initial design which may result in fewer requirements for safety oriented maintenance. Furnaces, for instance, have been tested for fuel efficiency by fuel companies. Use of natural gas and oil suppliers' personnel may be an effective avenue to accomplish safety testing. The testers would have to be educated and trained in the proper methods (once developed) for performance testing.

To accomplish this tester training, the CPSC could enlist the aid of state (perhaps universities), and possibly local officials. Other avenues would be the cooperation of trade associations and unions. In

many instances, state or local ordinances will have to be passed to ensure compliance on the part of those engaged in the maintenance or testing, and that the regulations are carried out in the prescribed manner. One option may be the licensing, following certified training, of the personnel who do the work. Some system, (such as reporting to a licensing agency), whereby a homeowner who feels that the work has not been done properly, can request a check by an independent authority, may be useful.

4.6. Improvement of Information Dissemination or Education (6)

Several possibilities fall within the category of information dissemination and education. For example, a general informational campaign to increase consumer consciousness relative to product safety, and to assist them in evaluating the comparative safety of major consumer products could be initiated. Such a campaign would go beyond the mere disclosure of known hazards and defects, and include guidelines for use by consumers that are similar to those used by CPSC in their product evaluation. Attention could be focused on those product related injuries and accidents which seem to be as much attributable to carelessness as they are to product hazards. In addition, the Commission could consider making practical recommendations for the consumer to correct or reduce hazards typically associated with certain products.

Information dissemination and education should not be limited to consumers. Awareness on the part of architects, builders, contractors, etc. that product safety is often dependent upon design and installation practices is crucial to improving these activities. The various trade and professional organizations could be contacted as both a conduit to reach the individual and as a source of material for educating the various professions involved.

The various possible uses of information dissemination and education may necessitate the involvement of many organizations: governmental departments, manufacturers, retailers, special interest groups, the media, trade and business associations, and so on. The Bureau of Information and Education at the Commission is responsible for such activities. They may decide to conduct these activities directly, with the aid of the media, or they may enlist the help of outside organizations in developing and disseminating material and programs. It may be necessary to provide incentives to certain groups to help in this dissemination, and in certain cases to encourage jurisdictions to require training of tradesmen or inspectors (e.g., to require of local inspectors that they take a course in how to check for product safety in newly-built homes).

4.7. Require the Labeling of a Product Regarding Safety Hazards (7)

The Commission may issue standards which require only labeling

or warning of hazard. Because of the detailed requirements for notice and opportunity to comment on adoption of a safety standard, the Commission may find it more difficult to issue a safety standard which is solely concerned with product labeling. The Commission should consider labeling and warnings as important adjuncts to performance requirements, if not a distinct alternative in some cases.

Section 14 (c) of the Act permits the issuance of a labeling requirement as to manufacturer identity without meeting the requirements in Section 7 for consumer product safety standards. The ability to identify the manufacturer and the time or place of manufacture, even through a code, (such as is done in the case of textiles through registration numbers with the FTC), offers at least two potential consumer benefits. Such identification could facilitate repair, replacement or refund in the event that it is required, and it could stimulate manufacturer responsibility in that private labels would no longer serve as a "shield" against consumer complaints. There is also a potential for manufacturer benefit, since in the event a "recall" is required the scope could be confined and the adequacy of notice less subject to doubt. Obviously such a requirement would not be appropriate for all products, but the Commission could begin to consider those products that might be suitable for such identification.

4.8. Require Public Notice of Defect or Failure to Comply With Product Safety Rule (8)

This countermeasure brings to public attention violations of individual hazard source groups associated with manufacturing, processing, wholesale operations managing, promotion and advertising, retailing, retail product assembling, building and maintenance. The countermeasure also conceivably will cause those groups required to post such public notices to improve their future adherence to standards and regulations.

Whether the notice is public or through private mailing will depend upon the type of substantial hazard, the speed and efficacy required by the notice, and the number of purchasers involved. If a particular product were found to be a substantial hazard, and it could be determined that the hazard is the result of a defect occurring in the manufacturing, either during a particular period or at a particular plant, then the notice might be confined to manageable limits, if the products are traceable to a place or time of manufacture. If not, it is conceivable that a more stringent action might be required.

4.9. Court Action to Affect Injunction, Seizure or Condemnation (9)

This countermeasure assumes that no actions in the product-user environment can be effected that will accomplish the desired reduction in hazard. It is designed to catch products with imminent hazards

before they are installed in the homes. It is, in effect, a ban of the sale of the product, but in an atmosphere where the product may have otherwise been put into use. The countermeasure will involve the use and cooperation of government and private law staffs for those seeking the injunction, and private law staffs for those groups seeking to block the injunction.

An injunction to restrain any violations of requirements imposed under the CPSA may be sought either by the Commission (Section 22 (a)) or by any interested person (Section 24). While similar to a ban, an injunction may be sought to:

(1) Enforce a ban against a product that could not be made sufficiently safe through a performance standard; or
(2) To prevent distribution, in effect, ban, a product that does not meet a performance standard or other safety requirement imposed under the Act.

Because an injunction cannot be applied effectively against products already installed in the home, its primary usefulness relates to products intended for such use but not yet distributed. Perhaps the primary difference between injunction and seizure is that the former would be used to prevent the introduction of products into commerce, and seizure is used to remove from commerce those items already introduced and available for sale.

4.10. Recall and Refund Monies to Owners (10)

This countermeasure assumes the prior purchase and installation of the product by the homeowner. It may be used primarily in cases where no other countermeasure can be effective to reduce existing hazards. The Commission may order repair, replacement, or refund. The subject of the order may elect to refund as one of his options. This countermeasure could involve the actions of any of the product history groups named in countermeasure (8) (requiring public notice of defect), plus the transporters, and storers. The intent of this countermeasure is covered under Section 15 (d) (e) of the Act.

4.11. Ban the Sale and Distribution of Particular Products (11)

Banning a hazardous product, as provided for in Section 8 of the CPSA, is a countermeasure designed for special cases where there is an unreasonable risk of injury sufficient to warrant a standard, but where a standard would not adequately protect the public interest. Since implementation of a ban is fairly straightforward there is little that

can be said that would be unique to products installed in the home. One action that the Commission might consider is combining the evaluation of unreasonable risks in determining whether a ban is appropriate with the review of notices of new products that the Commission may require according to Section 13 of the Act.

4.12. In Lieu of CPSC Court Action, Seek Written Assurances of Future Compliance from Suspected Violators (12)

Implementation of this countermeasure involves actions between the CPSC and suspected violators. Associated with the countermeasure should be a strong possibility that, if agreement for assurance is not secured, the suspected violator may be found in violation of the ruling involved. The assurances would be of a more private nature in the sense that the public would be made aware of the action when it is taken, but no continuing public announcements of the decisions would be made. Such actions, of course, would be kept on record by the CPSC and made available to anyone requesting them.

The Commission may consider obtaining "consent decrees" similar to those obtained by the Federal Trade Commission, whereby the parties involved provide a written promise not to perform certain acts complained of, without admitting that they have been guilty in the past. This approach would certainly be preferred by manufacturers and distributors to an injunction, and it could save time for the Commission. Naturally, this approach would not be obtainable or effective in all cases, but in some cases it might be sufficient to demonstrate the Commission's seriousness and concern, while providing producers and distributors with a "second chance".

4.13. Publicize Consumer Product Safety Rules and Orders Under Section 15 of CPSA So That Citizens May Bring Court Actions to Achieve Enforcement (13)

This countermeasure provides consumers with a means for initiating action against violators and aids the Commission in implementing a product safety rule or order. It has the benefit of involving the homeowner in the process of enforcement. However, there must be an effective mechanism to inform the consumer of the proper methods for such action, and to allow the consumer to take such action in the most expeditious manner. There is a distinct possibility that, if such a mechanism is not developed, the consumer will be reluctant to take the action. In this case, the Commission may combine this countermeasure with one that can take over in the case of consumer reluctance by having the Commission receive documented violations in the same manner as prescribed for local inspectors but administrated differently. Consumer interest groups could be of help in promoting individual efforts, and in organizing class actions where appropriate.

4.14. Alter Products Already Installed On-Site to Remedy Defects (14)

This countermeasure recognizes that changes in the physical makeup of a product, or in its placement in its environment, can reduce the hazard. Groups involved in making this judgment with the CPSC will be government and private experts in residence construction and engineering. The building planners and the builders will handle the on-site repair, and, in the case of removal to the factory, the actual removal of the product.

A requirement to either repair a product, replace it, or refund the purchase price may be imposed in cases of substantial product hazards. The person subject to the requirement has the option as to which of the three he will select, but he may be required to submit a plan for Commission approval. There is probably little the Commission can do to predict which choice will be made in any given case; however, the Commission might be able to determine which choice is preferred in a case by case basis and judge the plans submitted accordingly.

4.15. Replacement of Products Already Installed On-Site to Remedy Extant Defects (15)

Replacement of some products could conceivably require action by more than one of the hazard source groups involved in the development and sale of the product. Replacement with another product of a different type might be more complicated than replacement with a product of the same type. It might necessitate planning on the part of the manufacturer, building planner and builder to effect the installation of the new product in a manner which allows its operation to accomplish the same tasks as the old product. This countermeasure is offered along with the recall and refund of monies as options for those subjected to the Commission order. In the case of refund of monies to consumers, the original product has no designated replacement and one may not be required. However, if the affected product is a substantial hazard, the desired elimination of the hazard will not be assured by a refund to the consumer unless the return of the product is required as a condition for refund.

4.16. Amendment of Present Federal Legislation or Development of New Legislation to Give the CPSC More Authority to Implement Countermeasures (16)

One other action that the Commission might take is to seek additional statutory authority for other countermeasures. For example, the Hazardous Substances Act provides in Section 13 (a) that the Secretary may publish summary reports of any judgments, decrees, or court orders recorded under the Act including the nature of the charge and the disposition. If the Commission had such authority it might strengthen their

position in seeking compliance because of the fear of adverse publicity involved. Publication of nonconformity to a standard under Section 15 (c) of the CPSA, while not appealing to manufacturers, would probably be less damaging than publication of adverse court actions.

The seeking of new or amended legislation may be occasioned by the realization that present laws do not cover aspects desired by the Commission, or it may be necessitated by perceived weaknesses or vagueness in present laws that can be corrected only by additional legislation.

APPENDIX A.
DATA SOURCES

The data needed for a successful determination of hazard source involvement should cover the accident sequence and pertinent past history of products, persons, and environments involved in individual accidents. Most of the data sources surveyed offered very little of this information. Where data sources did afford an indication of hazard sources, at best conceivable candidates can only be estimated and often by subjective interpretation of the data presented. Following are descriptions, by name of source, of the general content of the data sources we have consulted. Selected aspects of each source are discussed to illustrate the sources' content in terms of what they offer to the report. Generalizations concerning the overall usefulness of the sources are also made. It must be noted, however, that the purpose of the particular report or data base under review may not have been intended to provide the information being sought by this investigation.

A.1. Descriptive Data on Residential Accident Types, Buffalo Organization for Social and Technological Innovation (BOSTI)[1]

The data base was set up "for an etiological and human factors analysis of important home accidents, and for the subsequent development of preventive performance specifications, based on a conceptualization of the accident as a system" (p. 1). Furthermore, the study collected "epidemiological data on residential accidents from at least 30 states, covering all types of housing..." (p. 1) and grouped the accidents into two types:

- "Group A", including accidents in which a housing element or service was the actual agent of injury or accident, and,
- "Group B", including accidents whose agents were products which were deemed beyond the control of the housing industry. These particular accidents are of interest, because "the housing design context in which these products are used may contribute to the occurrence of the accident, and that the factors that generate their use may be modified in such a way as to prevent the accident" (p. 3).

The data presented related the particular accidents to the cause of each accident. Little is given to indicate what underlying hazard sources were involved. Also, the statistical significance of the data is limited. The data collected do not appear to represent a base that can be easily extended to represent the national picture. Certain

[1] Increasing Residential Safety Through Performance Design—Phase 1, Buffalo Organization for Social and Technological Innovation, Inc., August 3, 1971.

assumptions are made in the selection of data included in the base which make it difficult to make inference concerning a number of products and circumstances under consideration in this report. The accidents that are excluded from the BOSTI base, and that may be important for this study, are excluded: (p. 170).

> "1) because their prevention is already being dealt with on a larger scale by other organizations as in the case of fire or explosion,
> 2) because they are not generated directly by human activity in the use of a living space as in the case of accidents caused by natural disasters, (and,)
> 3) because intervention by residential design is not possible, as in the case of children's toys or home furnishings..."

While these data did give some indications concerning the accident-cause relationship for certain accident circumstances, they were of little use for our purposes.

A.2. In-Depth Investigatory Reports (IDIR's)[2]

The IDIR's are accident reports collected, by product category, either by CPSC field investigators as follow-ups to reports from the National Electronic Injury Surveillance System or by private contractors who use a number of additional sources for descriptions of accident occurrence. They contain brief narratives and some quantitative information giving insight into accident patterns and sequences. The number of IDIR's available for a given product category varies widely and does not reflect a set percentage of all accidents reported or occurring with each product. The reports, however, do serve at least as examples of the accident situations that can be expected to occur.

The information presented bears most directly on the causes of accidents. While the hazard sources are, once again, not directly indicated, one can derive an indication of feasible ranges of hazard sources involved with given accidents.

In an attempt to discover how effectively hazard sources might be established from the IDIR's, 58 reports were read representing 9 of the product categories under study (Since we are solely interested in the value of the IDIR as a tool for establishing hazard sources, breakdowns for each product are not given). The reports read do not represent the total number of the nine categories. They were selected at random to serve as examples.

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[2]Bureau of Epidemiology, U.S. Consumer Product Safety Commission

A list of possible hazard sources involving products installed in homes was constructed before the reports were read. (Note that this list is not the same as that formally presented in the text. It serves merely as a breakdown for the purpose of example.) The list follows:

(1) Defective materials
(2) Improper materials
(3) Faulty design in manufacture or construction
(4) Inferior installation
(5) Inferior construction
(6) Inadequate maintenance
(7) Misuse prior to accident sequence
(8) Misuse during accident sequence by injured consumer
(9) Misuse during accident sequence by bystander
(10) Inadequate information about product's use and/or maintenance
(11) Cannot establish with degree of confidence

Table A.2.1. summarizes the results of the survey. The results are dependent on the reader's interpretation of each report and may vary from reader to reader. Multiple hazard sources in Table A.2.1. indicate that more than one hazard source may have contributed to an accident. The hazard sources which most often contributed to an accident were in order of frequency, misuse during accident sequence by injured consumer, inadequate maintenance, and improper materials.

Table A.2.1.
Summary of Accident Causing Hazard Sources

Hazard Source	Number of Accidents (Single Hazard Source)	Number of Accidents (Multiple Hazard Sources)
1	0	1
2	5	6
3	1	3
4	1	4
5	0	0
6	5	9
7	2	2
8	16	16
9	1	3
10	1	1
11	3	0

A high degree of confidence cannot be placed in the estimates of hazard source contribution. Much more detailed information on each case and its history would have to be obtained to be able to better establish the contributing hazard source(s).

Summaries of the IDIR's associated with given products are also available. The summaries present condensed information, for every accident occurring with a product, under the following categories: case number; sex of victim; age of victim; date of accident; pattern of the accident; accident sequence; disposition of the victim; specific injury sustained; and, the product (and its make, if known). Occassionally, further analyses and narratives are included. Several of these summaries were compared with several of the corresponding IDIR's used in the above survey. We felt that, in most cases, we could make as good an estimate of the involved hazard source(s) with the summaries as we were able to with the full reports. For the purpose of estimating some very general trends in hazard source involvement, the summaries are a more time-efficient vehicle. The same problems with lack of more detailed information are, however, heightened.

A.3. National Electronic Injury Surveillance System (NEISS) Summary Matrices[3]

Summary matrices for FY73 for all 44 individual products (representing the 12 product categories) were obtained. The matrices include information on: date of the accident; age and sex of the victim; disposition of the victim; type of injury and the body part injured.

These data do not give any indication of the accident situation, and thus do not contribute significantly to the determination of hazard sources. The data base, however, is the most statistically significant and reliable one available for information on accidents occurring in the home.

A.4. Flammable Fabrics Accidents Case and Testing System (FFACTS)[4]

The data included in the FFACTS is very similar to those available from the CPSC. The extent of information available lies somewhere between that available from the NEISS reports and that available from the IDIR's. The products of interest to this study would generally be listed as "ignition sources".

A.5. National Center for Health Statistics Data[5]

The information available from the National Center for Health Statistics includes statistics on accidents in the United States covering types of

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[3]Bureau of Epidemiology, U.S. Consumer Product Safety Commission.

[4]Fire Technology Division, Institute for Applied Technology, National Bureau of Standards.

[5]U.S. Department of Health, Education and Welfare, Public Health Service, Types of Injuries Incidence and Associated Disability, United States July 1965-June 1967, October 1969.

injuries, number and types of persons injured, disability days due to injury, itc. The data are useful as support material, but they are neither broken down by product nor presented in a manner which gives an indication of the accident pattern, sequence, hazard sources involved, and so on.

A.6. U.S. Department of the Interior, and National Oceanographic and Atmospheric Administration Accident Reporting Systems

While these systems do present consistent reports on accidents involving Interior and NOAA employees, the accidents are all occupational. Of the reports surveyed, very few of them involved products installed in homes. The displays available give information, by accident, on items covering the injured party, the product, and the circumstances of the accident.

A.7. Household Safety Study[6]

This study of home accidents was conducted by mailing questionnaires to selected people requesting information on the latest accidents in their households. The reports available give information on the product involved, the date of the accident, the age and sex of the victim, very short edited phrases giving the skeleton of the accident sequence, and an estimate from the person reporting the accident on how the accident may have been prevented. Due to the structure of the survey, the statistical validity and the accuracy of the reporting is limited. The information presented was of little use for our purposes.

A.8. Home Department Data, National Safety Council

The information available from the National Safety Council does not give breakdowns by products. The data are of a gross nature (e.g., total number of accidents involving burns from ranges) and do not give the history or sequence of the individual accidents. They are thus not detailed enough to indicate estimations of hazard source involvement.

A.9. A Design Guide for Home Safety[7]

This report lists causes of accidents for the product categories involved in this study. These causes, however, are almost entirely related to physical characteristics of the faulty product-environment system. They do not indicate what, or who, caused the faults. The report does offer constructive recommendations for design of homes promoting accident reduction.

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[6]Market Facts, Inc., Chicago, Illinois, June 1971.

[7]Teledyne Brown Engineering, prepared for HUD, PB-211709, January 1972.

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APPENDIX B.
INSTITUTIONAL GROUPS INFLUENCING THE SAFETY OF RESIDENCES

The safety aspects of the products installed in residences is determined by the acts of the many individuals and institutional groups listed in Tables 2.4.1. and 2.4.2. This appendix discusses the activities of what might be considered the most important groups relative to the regulation of the building and related industries and its bearing on those products under study. Discussion will concentrate on the present activities of the various institutional groups under the existing regulatory system without speculating on what part, either passive or active, these groups could take to decrease injuries when faced with a particular CPSC initiative. The information developed for the institutional groups was used in sections (4) of this report, which discusses the implementation of alternative countermeasures. The institutional groups to be discussed include the housing construction industry, trade and professional associations, model building code organizations, standard making organizations, Federal Government agencies, state government agencies and local government building departments. This information is used to indicate how alternative CPSC implementation approaches parallel activities presently being carried out in some fashion by existing institutional groups. Particular attention will be directed to describing activities which could be directly affecting consumer product safety or could be used to aid the implementation of CPSC product safety rules or education programs.

B.1. Housing Construction Industry

The construction industry includes general building contractors, special trade contractors (plumbing, heating, air conditioning, painting, paper hanging, decorating, electrical work, masonry and other stonework, plastering and lathing, terrazzo, tile, marble, mosaic work, carpentering, floor laying and floor work, roofing and sheet metal work, concrete work, structural steel erection, glass and glazing work, excavating and foundation work, and installing building equipment) and operative builders.[1] Housing construction firms in the United States consist of a combination of many small firms and a relatively few large firms in terms of both dollars expended and numbers of construction workers employed. In fact, in 1967, of the 795,000 total construction firms, 436,000 were run without a payroll by working partners or proprietors.[2] The median construction firm had total annual receipts of between $10,000 and $25,000. Of those firms having a payroll, the median firm had receipts between $50,000 and $100,000.

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[1]Builders primarily engaged in construction for sale on their own account rather than as contractors.

[2]U.S. Bureau of Census, Statistical Abstract of the United States: 1973 (94th edition), Washington, D.C. 1973, p. 677. The statistics do not differentiate the type of building taking place and the statistics used in this discussion include buildings of all types regardless of use.

There are 16,137 firms with annual receipts exceeding one million dollars, with an average of 3.4 million dollars per firm. Firms with total receipts exceeding one million dollars (which include subcontract payments for construction work) represent only 2% of construction firms, yet they account for 54% of the total receipts. Table B.1.1 indicates, for construction firms with a payroll, an average of only 8 workers per firm, with special trades contractors averaging 6.3 and operative builders having an average of 3.7 workers. Average net receipts for all types of construction firms after deduction payments to subcontractors is $189,000. The regulation of an industry as diffuse as the construction industry presents quite a challenge. Many factors must be considered when addressing the operations of the construction industry which ultimately affect the safety aspects of residences being constructed.

Market competition and the economics of operation introduce many practices and factors which may influence safety. The factors which influence a builder's selection of materials and design include the type of structure, as well as its intended market. Residential construction types include high-rises, mid-rises, garden type structures, detached houses, row or townhouses, etc. Market considerations include competition and the structures intended use—whether for rental, condominiums or single resident owner—and the degree of luxury required. The practice of engaging an independent architect to design, supervise construction, and certify to the owner that a building has been completed according to plan for an agreed upon percentage of total cost, has decreased in practice over time. The present day arrangement is one of owner-developers hiring architects and engineers for a salary in hopes of cutting the costs of construction. One of the by-products of this practice is that the architect has lost his ability to control deviations from his plans which could result in code violations. This is true, since, in most instances, he does not supervise construction, nor can he overrule an owner-developer.

Another practice which has potential for allowing unsafe conditions and code violations is the practice of piecework payment. Piecework involves paying tradesmen by the job, although technically (perhaps by union rule) they may be getting paid by the hour. The advantage to the subcontractor or developer is to afford him a fixed-cost operation. If a tradesman experiences difficulties causing delay, he will be working in effect at a lower hourly rate, thus encouraging him to rush the job with the possibility of making mistakes or using improper practices. The subcontractor system widely used in the United States tends to encourage such practices, since the economics of construction dictate a quick turnover from one job to another. Furthermore, subcontractors are tempted, when qualified tradesmen are not available, to hire rovers for the sake of meeting construction deadlines. These conditions make the inspection and enforcement function of the local building code enforcement agency

Table B.1.1.

Average Receipts and Numbers of Construction Workers for the Construction Industry[3]

	Establishments With Payroll	Average Total Receipts Per Firm (Thousands)	Average Net[4] Receipts Per Firm (Thousands)	Average Construction Workers Per Firm
Construction Industries Total	368,711	$260	$189	8.0
Building Construction	324,189	$201	$151	6.7
General Building Contractors	95,049	$352	$185	7.9
Special Trade Contractors	215,903	$146	$135	6.3
Operative Builders	13,237	$360	$168	3.7

[3]Statistics derived from the Statistical Abstracts of the United States: 1973 p. 677.

[4]Construction receipts less payments for construction work subcontracted to others.

extremely important for the protection of the people who will occupy these structures. The fact that there are 800,000 construction firms operating in the United States makes this task difficult. Of course the local building and zoning codes provide guidelines and constraints within which most builders will remain. In the following sections we will discuss the degree of consideration given by local building codes to the safety of the products installed in homes.

Recent efforts by the home construction industry reflect an awareness of the need, or at least an awareness that the public perceives a need, for increased quality control and protection for the home buyer. The home building industry is introducing a national home owners warranty program modeled after a similar program now operating in England. The warranty covers: first year faulty workmanship and defective materials; during the first two years plumbing, heating, cooling, and electrical systems and their installation, exclusive of defects covered by any manufacturer's warranty; and for ten years, major construction defects. The program is being implemented through the National Association of Home Builders (NAHB) and will be administered by a council established by the NAHB. The council will use fees (0.2% per house) to obtain insurance coverage for claims paid to home owners during the third through tenth years of warranty coverage with the builder responsible the initial two years. The program is intended to provide a mechanism to decide disputes between builder and buyer through the council and finally through binding arbitration. The council will establish standards of construction, such as those of FHA, VA, and local building codes, for housing under warranty and inspect homes to insure the standards are being met.

B.2. Trade Associations

The system for determining those specifications required of products used in the building industry has evolved over time as the need to establish guidelines for manufacturers, designers, builders, and code officials became apparent. Organizations and institutions have grown with the support of various sections of the building industry as well as various government agencies to guide the development and acceptance of innovations in construction methods and materials. Among those institutions having an interest in such requirements are trade associations, which consist of a group of business firms joined for the promotion of their common interests. There are more than 150 such associations and technical groups producing standards to which the building industry is asked to conform.[5] One of the model building codes (the Basic Building Code) references over 400 standards for the various aspects of construction.

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[5]Building the American City, Report of the National (Douglas) Commission on Urban Problems to the Congress and to the President of the United States, U.S. Government Printing Office, Washington, D.C., 1968, p. 263.

Except in the larger cities the basic industries (steel, lumber, cement and gypsum) do not become involved in local building regulations.[6] Their trade associations, however, are a major force for change in the model building codes. The engineers assigned by trade associations to work with the model code associations are concerned with keeping the codes up to date for their products and, if possible, gaining a better competitive position for their industry. When they are threatened, trade associations will fight changes. Following an intensive campaign, proponents of plastic pipe had achieved its adoption in the Building Officials Conference of America (BOCA) Basic Building Code of 1970. The Cast Iron Soil Pipe Institute realizing the potential harm to their position as a result of such a change brought suit against BOCA to prevent their publication of the approved changes allowing plastic pipe. The Illinois Supreme Court finally acted to dismiss the case.

In view of obvious opposing interests, the trade associations have formed an organization to deal with model code publishing groups. This organization know as the Building Industry Association Representatives (BIAR) attempts to represent the common interests of their trade associations. The representatives of BIAR discuss code change policies and procedures and other needs and recommendations with the model code groups.

B.3. Professional Associations

In addition to the trade associations which represent almost every product or material used in construction, there are professional societies which also influence the actions of the model code associations. The ultimate design and material specifications for buildings and systems is determined within the constraints of the building code system by the membership of the following associations: The American Institute of Architects, American Society of Civil Engineers, National Society of Professional Engineers, American Society of Heating, Refrigeration and Air Conditioning Engineers, The Society of Mechanical Engineers, American Institute of Electrical Engineers. The talents of the membership of these associations are employed to design and construct housing and associated equipment and make the decisions which result in "safe" or not so safe" places for people to live. These professionals, rather than the building code officials, can, if given the proper incentives and information, make changes to reduce accidents in the home.

Members of these professional societies are often active on various committees producing standards for the building industry. Often a society may be assigned as secretariat for a particular standard for which they have expressed strong interests and shown initiative.

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[6]Richard L. Sanderson, Codes and Code Administration: An Introduction to Building Regulations in the United States, Building Officials Conference of America, Inc., Chicago, 1969, pp. 33-34.

B.4. Model Building-Related Code Groups

The Basic Building Code (BBC), developed by the Building Officials Conference of America, Inc., states regulations which:[7]

> "...control all matters concerning the construction, alteration, addition, repair, removal, demolition, use, location, occupancy and maintenance of all buildings and structures...; except as such matters are otherwise provided for in the local municipal chapter, or other ordinances or structures, or in the rules and regulations authorized for promulgation under the provisions of the Basic Code."

This is the general scope which all of the model building codes are designed to cover. The codes are of a voluntary nature such that localities may choose to adopt all, or portions, of them. In the area of safety, they are theoretically designed[8]

> "...to safeguard life or limb, health, and public welfare and the protection of property as it relates to these safeguards by regulating and controlling the design, construction, prefabrication, equipment or appliance installation, quality of materials, use and occupancy location and repair of detached...dwellings."

When operating effectively in this capacity, the model codes would seem to be promising avenues for effective ranges in safety-related building code aspects.

Most localities and states have adopted, completely or in some altered form, one of the five national model building codes. The associations, and their codes are:

- Building Officials Conference of America (BOCA)—Basic Building Code (BBC)
- American Insurance Association (AIA)—National Building Code (NBC)
- Southern Building Code Congress (SBCC)—Southern Standard Building Code (SSBC)
- International Conference of Building Officials (ICBO)—Uniform Building Code (UBC)

With the cooperation of all four of the above—One and Two Family Dwelling Code.

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[7]The BOCA Basic Building Code/1970, Building Officials Conference of America, Chicago, 1970, p. 1.

[8]One and Two Family Dwelling Code, 1971 Edition, Preface, Opening Paragraph.

The four separate organizations are located at the four corners of the nation—one on each coast and the other two in the nation's north and south. Sanderson (BOCA) reports that the local acceptance of the codes tends to be very regional. However, there is a certain amount of competition among the organizations in getting their codes more nationally accepted. With the trend seeming to be toward state promulgation of building codes, this competition may intensify. As an example of this competition, a conversation[9] with an official of the American Insurance Association revealed that, in some areas of the nation, they are losing ground to BOCA, mainly because BOCA offers an architectural plan and equipment endorsement service in cooperation with the Underwriters' Laboratories. Product approval or certification programs for about one-half of the codes and standards generating groups are carried on by private agencies.[10] A handbook, Building Codes: Product Approvals[11] has been written on the subject of product approvals applicable to the construction industry.

The influence that the model code associations exert over the localities is due in large part to the inability of most localities to develop their own codes. Only the larger municipalities have the staff available for such a task. As a result, most localities use the prepared and readily-available model codes. Also, such services as BOCA offers (as mentioned above) may attract low-staffed departments.

The comparison of the various model codes offers some interesting points about their relative and absolute value in the consideration of home safety. A study[12] done in 1970 by Teledyne Brown Engineering for the Department of Housing and Urban Development (HUD) analyzes certain safety aspects of a number of products for the following building codes: BBC, SSBC, UBC, NBC, and the Federal Housing Administration's Minimum Property Standards (MPS). Teledyne Brown's intent for HUD was to show the relative quality of the MPS. Two types of specifications are analyzed for the MPS: safety specifications (SS) and prescription specifications (PS). The analysis attempted to show the relative and absolute quality of the codes in relation to accident causal factors (e.g., slippery treads for stairs, or glass thickness for glass doors) defined by Teledyne Brown. The analysis determined for each of the products considered (stairways, glass doors, windows, doors other than glass and hot water systems) whether code language was adequate, adequate-deficient, deficient, or omitted requirements which could reduce accident occurrences for products. Figure B.4.1. was derived from the Teledyne

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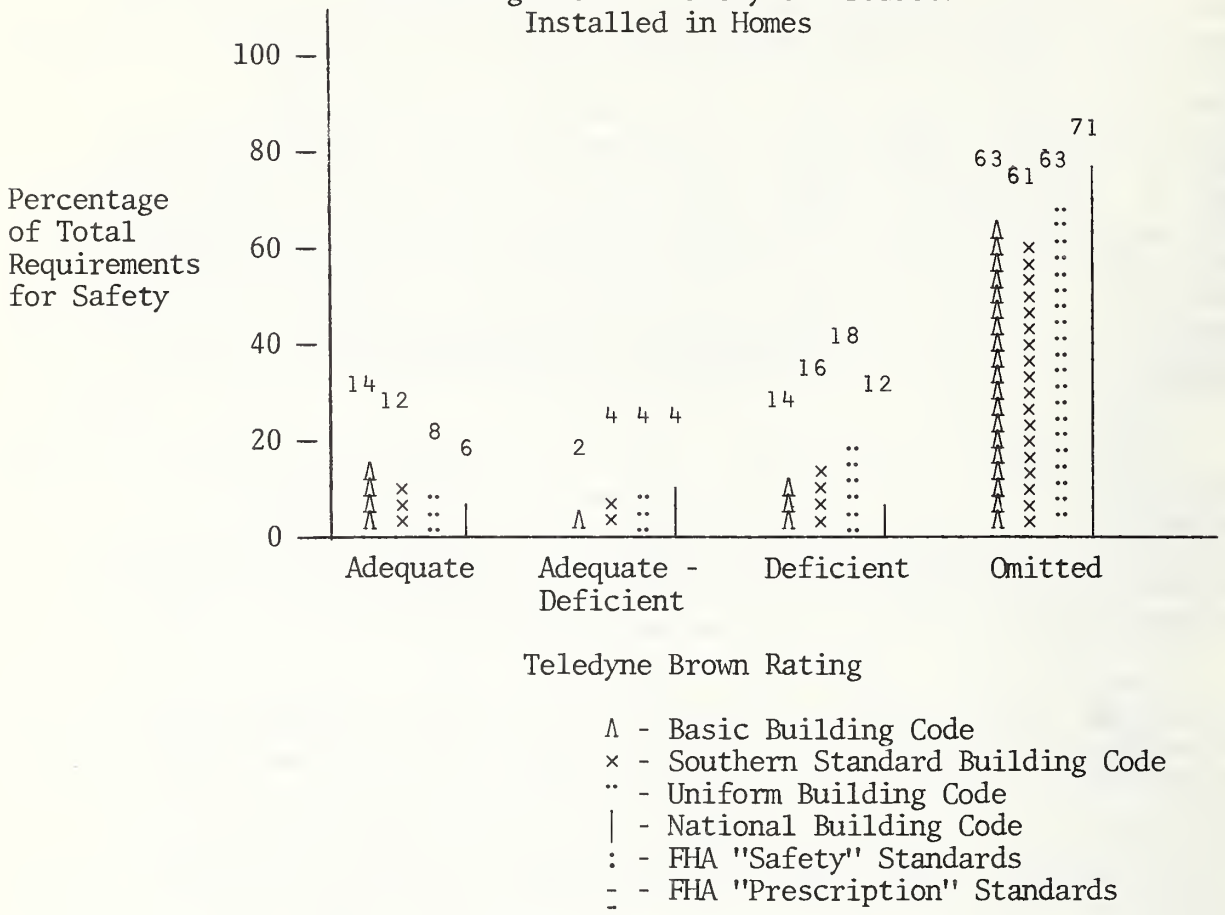
[9]Telephone conversation with Mr. Watson, January 16, 1974.

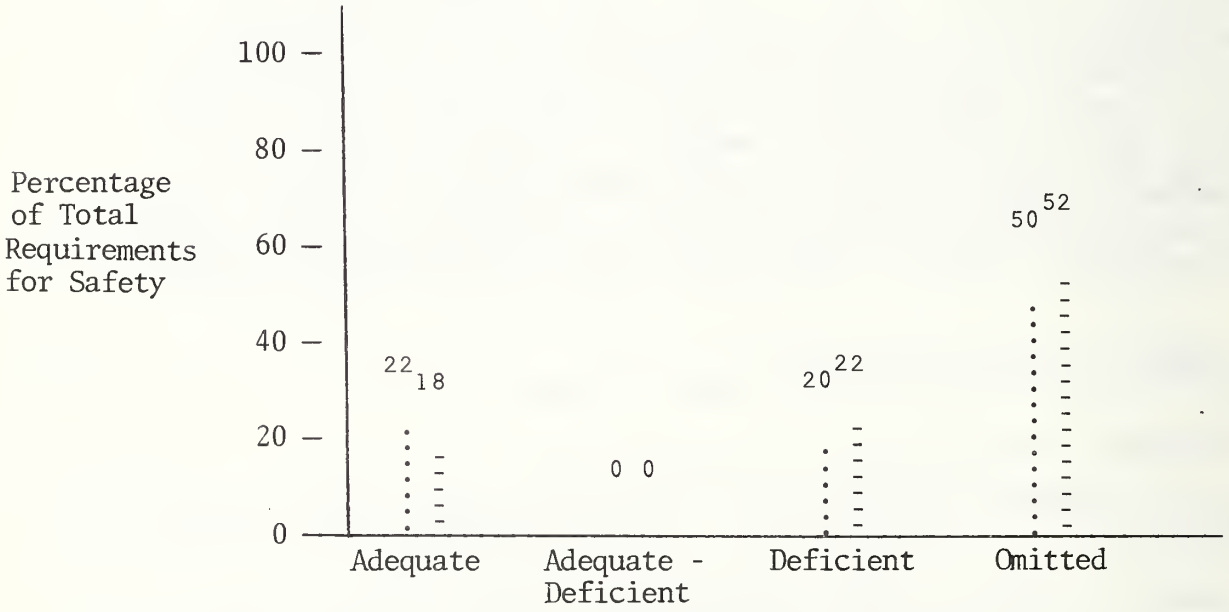
[10]Building the American City, op. cit., p. 263

[11]William Demarest, Building Codes: Product Approvals, Ludlow Bookman, New Haven, 1964.

[12]Shuford, R. H., Jr., Editor, Summary Report, Phase I Study: Home Accident Causes and Recommended Remedial Measures, Teledyne Brown Engineering, Jan. 1970.

Figure B.4.1
Comparison of Building Codes for Requirements
Affecting Product Safety of Products
Installed in Homes





Brown analysis and portrays the percentage of the defined requirements falling within the four categories established for the evaluation. It is recognized that some of the requirements are more crucial from the standpoint of safety than others. However, for the purpose of obtaining a gross measure of the relative quality of the codes,the various requirements for the products evaluated have been combined.

There are some basic conclusions that can be drawn from this work. Under the analytical framework defined by Teledyne Brown, the HUD MPS's appear to include a higher percentage of adequate specifications then do the other four codes. Furthermore, the MPS's have a lower percentage of omissions. Within the four model codes, the percentages in each category from adequate to omitted are fairly close. In an absolute sense, however, none of the five codes appear to consider safety to a large degree. The average of the four model codes for adequate specifications is only 10%; the corresponding value for the MPS's is 20%. The model codes have only 3.5% in the adequate--deficient range; the MPS's have 21% deficient. The model codes and the MPS's have, correspondingly, 59.5% and 51% omitted. The remaining 8% and 9%, respectively, are in the "Not Applicable" area. While the methods used by Teledyne Brown are but one possible set for such an analysis, their results do indicate significant lack of safety consideration in the specifications of the five building codes by 1970.

One other important type of model codes is the model housing code. This code differs from the model building code in that it is primarily related to the occupancy requirements of buildings and their maintenance after they have been constructed and occupied. One example of such a code, the Southern Standard Housing Code[13], 1973 Edition, states that it is designed to help secure "public safety, health, and general welfare--through structural strength, stability, sanitation, adequate light and ventilation, and safety to life and property from fire and other hazards incident to the construction, alteration, repair, removal, demolition, use and occupancy of dwellings, apartment houses, rooming houses or building, structures or premises used as such."

Since, in the near future, the large proportion of occupied housing units in this country will not have been built under regulations altered to increase their safety aspects, the housing code, as a vehicle for requiring the alteration of existing sturcture, may be important to the CPSC. While the methods of enforcement of the housing code are more complicated and often more difficult than the enforcement of building codes on the construction site through inspection, the promulgated codes are associated with some type of enforcement mechanism in the localities adopting them.

Two other associations, (and their respective regulations) cover only certain segments of building, but are of wide enough acceptance to deserve mention. They are the codes and code groups for electrical work and plumbing. The National Fire Protection Association (NFPA)

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[13]Southern Building Code Congress, pg. 1.

produces as one of its codes the National Electric Code (NEC), which is the major code used by virtually all localities for the regulation of electrical installations and operations. Also, the American Society for Mechanical Engineers (ASME) produces the National Plumbing Code, which has enjoyed fairly wide acceptance. Furthermore, all of the major model building code associations promulgate[14] the use of the NEC and the NPC to all of their subscribers. As such, these two codes are major influences on these two building specialities.

Capital stock insurance companies comprise the membership of the American Insurance Association (AIA), whose major interest is to reduce the loss from fire or other damage to the structures. While this interest is in common with that of the CPSC, it only covers the major accidents, ones in which the structure itself is damaged, and does not necessarily emphasize the safety of the inhabitants from occurrences not resulting in property loss. The NFPA's membership is broader than that of the AIA. Sanderson states that:[15]

> "It is comprised of some two hundred organization members, mostly trade associations and insurance rating bureaus, and twenty one thousand associate members. The latter includes architects, builders, merchants, manufacturers, engineers, fire marshals, fire chiefs, firemen, electricians, credit men, insurance executives,field men, agents, brokers, chambers of commerce, public libraries and many other organizations, individuals, firms and corporations."

The methods for revision of model codes are basically the same for all groups. Changes are made on a voting approval basis, with all members involved in at least part of the process. For those areas which require either more expert advice or consolidation of effort due to the largeness of the organizations, preliminary judgments and suggestions are made by committees set up to study special topics for review. As an example, consider the diverse membership of the NFPA. Their own staff does much of the research and development, since they are the ones who are dealing with the issues on a day-to-day basis. Recommendations for changes in the national fire codes are made by them to the membership for approval, modification or rejection.

Building officials' organizations provide a very important service to construction industry trade associations--research and product approval programs. The most elaborate of the three is that of BOCA, who, as mentioned

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[14]With the exception of BOCA, which has developed its own mechanical code to replace the NPC.

[15]Sanderson, op. cit., pp. 37-38.

above, works with the Underwriter's Laboratories, Inc. to approve products. As Sanderson states.[16]

> "Since the model codes are performance codes which rely on nationally accepted standards for established materials and methods, it was necessary to establish a method whereby proprietary products not expressly covered by the codes or standards may be certified by an authoritative agency as acceptable under the performance requirements of the code. The building officials' organizations, when satisfied that a product is acceptable, issue a recommendation that local governments enforcing their model code accept the product. These recommendations are not binding on the users of the model codes but it is rare that they are not accepted."

The general procedures for proprietary product approval are the same for all three organizations, with only slight variations among them. The purpose is to allow manufacturers the easier avenue of approaching widely-accepted code organizations for product approval, rather than making them go to every locality in which they want to market their products. While these approvals are only recommendations to localities, these recommendations are generally followed.

There has been a trend in recent years towards coordination of codes for the major purposes of allowing the groups to reduce duplication of effort and of establishing a more coherent and homogeneous code system across the nation. Three organizations which have developed to establish such coordination are:

Model Code Standardization Council (MCSC)
ANSI Construction Technical Advisory Board (CTAB)
Council of American Building Officials (CABO)

As an example of the activities of these organizations, consider the MCSC. It was formed in 1949 as the Joint Committee on Building Codes and has representatives from NBS, HUD, ANSI, NFPA, AIA, UL, the American Institute of Architects, the American Society of Civil Engineers, the National Research Council of Canada, the Building Research Advisory Board, National Conference os States on Building Codes and Standards (NCSBCS), BOCA, ICBO, and SBCC. Subjects of discussion at MCSC include review of the most recent developments in codes, standards, construction methods and new products. In the NCSBSC January 1974 issue of "News," (page 2) guest editor James C. Spence gives the following description of recent MCSC activities:

> "One of the more significant actions taken by the MCSC at its last meeting was the formation of an MCSC standards Committee, with the objective of developing and maintaining a list of current standards for reference in building codes. The Committee has the responsibility of reviewing all new and revised national standards and making recommendations concerning their inclusion in a list of current

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[16]Sanderson, op. cit., p. 89.

standards for reference in codes. The Committee will also encourage the adoption by code organizations and other agencies of the standards listed by MCSC.

The work of the Standards Committee has progressed to the point where it has completed a listing of materials and specification standards, application standards, design criteria, and safety to life standards for building codes. Similar listings are also being assembled for plumbing and mechanical codes."

Coordination efforts like the ones run by the above organizations can contribute significantly to the standardization efforts across the nation.

B.5. Standards Organizations

The model building codes and organizations strongly depend on voluntary product standards, developed by a number of organizations, for guidance on structure, installation and performance recommendations for specific products. There are 39 organizations listed in Table B.5.1. which either develop or recognize voluntary product standards for products installed in residences. These organizations (Table B.5.2.) may be classified as government, trade and business associations, professional societies, nonaligned associations and testing-oriented laboratory. The National Bureau of Standards[17] has tabulated voluntary consumer product standards. Table B.5.3. organizes these standards by the 12 NEISS product categories being studied and indicates the number of standards promulgated by each organization, not all of which relate to product safety.

The only organization which has as a major purpose to recognize, and through their adoption, help promote, standards is the American National Standards Institute, Incorporated (ANSI). ANSI, besides being a coordinating agency for standards' adoption, also encourages standard development through well-established procedures. For the approval of standards made by other groups, ANSI uses its "existing standards" method whereby they review the standards for their quality. The "sectional committee" method is used in the case where a standard is requested. Here, ANSI acts as a coordinating agency to decide:[18]

"a. if there is a need for a requested standard

b. if there is an existing representative activity for developing the standard."

If a and b are answered in the affirmative, the existing group is encouraged to develop a standard and submit it to ANSI. If b is answered in the negative, ANSI encourages the formation of a sectional committee of representatives from groups considered to have expertise in the particular subject area. When approved by ANSI, the sectional committee becomes

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[17]Tabulation of Voluntary Standards and Certification Programs for Consumer Products, Chumus, TN-762.

[18]Sanderson, op. cit., p. 23.

Table B.5.1.

Organizations Which Develop Voluntary Standards for Products Installed in Residences

AAMA - Architectural Aluminum Manufacturers Association
ACI - American Concrete Institute
AHAM - Association of Home Appliance Manufacturers
AIA - American Institute of Architects
ANSI - American National Standards Institute, Inc.
ARI - Air-Conditioning and Refrigeration Institute
ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME - American Society of Mechanical Engineers
ASSE - American Society of Sanitary Engineers
ASTM - American Society for Testing and Materials
AVATI - Asphalt and Vinyl Asbestos Tile Institute
AWI - Architectural Woodwork Institute
BHMA - Builders Hardware Manufacturers Association
CEE - International Commission on Rules for the Approval of Electrical Equipment
CLFMI - Chain Link Fence Manufacturers Institute
DOC - U.S. Department of Commerce
FHDA - Fir and Hemlock Door Association
FSPT - Federation of Societies of Paint Technology
GTA - Glass Tempering Association
IAPMO - International Association of Plumbing and Mechanical Officials
IES - Illuminating Engineers Society
ISO - International Organization for Standardization
MFMA - Maple Flooring Manufacturers Association
NAAMM - National Association of Architectural Metal Manufacturers
NEMA - National Electrical Manufacturers Association
NCMA - National Concrete Masonry Association
NFPA - National Fire Protection Association
NOFMA - National Oak Flooring Manufacturers Association, Inc.
NPA - National Particleboard Association
NSF - National Sanitation Foundation
NSPI - National Swimming Pool Institute
NTMA - National Terrazzo and Mosaic Association, Inc.
NWMA - National Woodwork Manufacturers Association
SCRMA - Screen Manufacturers Association
SIGMA - Sealed Insulating Glass Manufacturers Association
STDI - Steel Door Institute
SWI - Steel Window Institute
UL - Underwriters' Laboratories, Inc.
WSFI - Wood and Synthetic Flooring Institute of America

Table B.5.2.

Classification of Voluntary
Product Standards Organizations

Classification	Organizations
Government	DOC
Trade and Business Associations	AAMA, ACI, AHAM, ARI, AVATI AWI, BHMA, CLFMI, FHDA, FSPT, GTA, IAPMO, MFMA, NAAMM, NEMA, NCMA, NOFMA, NPA, NSF, NSPI, NTMA, NWMA, SCRMA, SIGMA, STDI, SWI and WSFI
Professional Societies	AIA, AHRAE, ASME, ASSE, IES
"Nonaligned" Associations	NFPA, ANSI, ASTM, CEE and ISO
Testing-Oriented Laboratory	UL

Table B.5.3.

Standard Promulgation Organizations for Products Installed in Residences

Standards by NEISS Product Category	Standard Promulgating Organizations
Stairs...	
1801	ANSI*, AWI, NTMA, NAAMM
Doors...	
1805	NWMA, DOC(4)#, NAAMM(2)*, FHDA, UL, AAMA(4)**, STDI(2)
1827	FHDA, DOC, SCRMA
Architectural Glass	
0609	ANSI*, GTA*
1815	DOC(7), SIGMA, ANSI*, ASTM(4), AAMA(4), UL*, NFPA*, SWI
1823	AAMA*
1824	ANSI*, ASTM*, GTA*
1825	ANSI*, AAMA*, GTA*
1826	AAMA
1836	AAMA
Bathtubs...	
0611	ANSI(2), DOC(2), IAPMO
Space Heaters...	
0313	AHAM*, UL(4)****, NEMA*, CEE*, ARI*
0314	ANSI(3)*
0320	DOC
0323	UL(5)*****, ANSI*
0324	UL*, AHAM*
Swimming Pools...	
1231	NSPI*, UL*, NSF(6)*, NCMA
Floors...	
1807	ASTM(3), USC(3), NFMA, AVATI, ACI(2), NOFMA, NTMA, NPA, WSFI(5), ISO, ANSI(4)
Fences...	
1834	DOC(2), ASTM, CLFMI(2)
Furnaces...	
0310	ANSI(3)***
0311	UL(2)**
0318	UL*, ARI*
0328	ANSI(2)**
0329	UL(2)**
0335	UL*
Water Heaters	
0118	ANSI(2)**
0119	UL(2)**, ANSI*, CEE*
0120	UL*
0128	CEE*
Outside Structures...	
1810	NCMA

#Numbers in parentheses indicate the total number of standards by a given organization for a given product. If no number is indicated there is only one such standard.

*Each asterisk indicates a standard specified in the NBS publication as a "safety standard".

autonomous, though subject to ANSI procedures, and develops the standard. ANSI standard approval is based on a consensus of all members. In the case of sectional committee operation, a Standards Board of selected representatives from the field review the committee's recommendations. The Construction Standards Board reviews work on building materials and construction standards. Table B.5.4. lists the ANSI standards committees which deal with construction or with the products under study.

The board most pertinent to this project within ANSI is the Construction Technical Advisory Board (CTAB). CTAB is charged with "managing standards programs affecting the building industry, by coordinating voluntary material standards; minimizing duplication of effort, stimulating the standards activities of existing committees and organizations; keeping standards up to date; assuring protection and representation of public interests; determining the need for new standards; and seeking action by existing organizations competent to solve the need." As such, CTAB is the major ANSI committee dealing with building-related standards. CTAB's recognition is broadening to the extent that organizations like NCSBCS have sought membership on the Board.

The two largest and most diverse groups developing standards applicable to the products under consideration are the American Society for Testing and Materials (ASTM) and the Underwriters' Laboratories, Inc. (UL). ASTM develops and publishes specifications for standards and methods for testing materials and assemblies. Technical committees, while under the aegis of ASTM, nevertheless enjoy large autonomy. Many standards are approved on a tentative basis and implemented for a few years. The responsibility of monitoring the progress of the standard's application, and for making a final decision on approval, is given to the technical committee. The final decision on adoption is based on a concensus vote of the Society. The ASTM committees of interest to this project are: E32 on criteria for evaluating agencies concerned with engineering (systems) analysis, testing, and/or compliance assurance of manufactured building; E-6 on performance of building construction; E-36 on criteria for evaluation of testing and/or inspection agencies; and F-15 on consumer product safety.

Underwriters' Laboratories, Inc. (UL) was founded in 1894 by William H. Mervill to help insurance companies test products for electric and fire hazards. Over the years, UL has developed into an independent, self-supporting nonprofit safety test laboratory. Sponsorship and membership has been expanded to include representatives of government agencies, education, consumer interest groups, safety experts, public utilities, public safety bodies, and standardization groups. As stated in its Certificate of Incorporation, its objectives are: "By scientific investigation, study, experiments and tests, to determine the relation of various materials, devices, products, equipment, constructions, methods, and systems to hazards, appurtenant thereto or to the use thereof, affecting life and property, and to ascertain, define and publish standards, classifications and specifications for materials, devices, equipment, construction, methods, and systems affecting such hazards, and other information tending to reduce and prevent loss of life and property from such hazards." UL's various engineering activities are undertaken by six departments: Burglary Protection

Table B.5.4.

ANSI Standards Committees

A12 Safety Code for Floor and Wall Openings, Railings and Toeboards
Secretariat: National Safety Council

A55 Administrative Requirements for Building Codes
Secretariat: National League of Cities,
Building Officials Code Administrators
International

A65 Safety Standards for General Industrial Stairs
Secretariat: National Safety Council

C2 National Electrical Safety Code
Secretariat: NBS

C72 Electric Water Heaters - safety
Secretariat: National Sanitation Foundation,
Underwriters' Laboratories

Z21 Performance and Installation of Gas-Burning Appliances and Related Accessories
Secretariat: American Gas Association

Z26 Specifications and Methods of Test for Study Glazing Material
Secretariat: Society of Automotive Engineers

Z65 Building Areas-Methods of determining areas in buildings
Secretariat: Building Owners and Managers Assoc. International
Office of Education, U.S. Department of HEW

Z66 Prevention of Control of Hazards to Children
Scope: Specifications, tests and procedures to minimize home hazards to children which might result in physical injury or poisoning
Secretariat: American Academy of Pediatrics

Z91 Performance and Installation Standards for Oil Burners and Oil-Burning Appliances
Secretariat: National Oil Fuel Institute

Z97 Safety Requirements for Architectural Glazing Material
Secretariat: National Safety Council

Z223 National Fuel Gas Code: Development of safety code for gas piping systems on Consumer's premises and installation of gas utilization equipment and accessories ventilation and venting
Secretariat: American Gas Association, American Society of Mechanical Engineers, National Fire Protection Association

and Signaling; Casualty and Chemical Standards; Electrical; Fire Protection; Heating, Air-Conditioning and Refrigeration; and Marine.[19] Manufacturers and other organizations solicit UL for testing of products. Besides implementing detailed safety testing procedures, which include such aspects as efficiency checks on manufacturer's programs for instituting UL-approved methods, and testing individual products, UL publishes annual lists of manufacturers (updated bi-monthly) whose products UL approves, safety standards for devices, materials, methods and construction, and engages in numerous research projects.

B.6. Federal Government Agencies

There are nine Federal agencies (excluding CPSC) which in some way deal with building codes and related construction matters. These agencies can be divided into four categories:

(1) those that have direct control over the promulgation and enforcement of private housing construction codes;
(2) those that have direct control over the promulgation and enforcement of public housing construction codes;
(3) those that have been given responsibility over safety aspects in both private and public buildings; and
(4) those that only promulgate suggested codes, or conduct or contract for research in building code related areas.

Between the years 1960 and 1973, the percentage of the total new housing units represented by private ownership has remained high at from 97% to over 99%.[20] Federal construction codes impact on future starts will thus, to a large degree, be limited to those effected by agencies in category 1 above, those having an effect on private housing. FHA and VA are included here. They respectively "insure" and "guarantee" mortgage loans from banks to eligible home buyers. They also have minimum standards which are promulgated and enforced in all starts they aid. The FHA and the VA are the two Federal agencies which have the most direct control of any of the Federal agencies over the building codes followed in the localities. While they do not exercise the ability to change a local building code, they do have the leverage of being able to reject any home which is not built to specifications which are consistent with their requirements. The percentage of private starts aided by either organization, as compared to the total housing starts in the nation, has increased from 26 percent in 1960 to 33 percent in 1970,

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[19]Sanderson, op. cit., p. 229.

[20]Statistical Abstracts of the United States, 1973, U.S. Government Printing Office, Washington, D.C., p. 683. Percentages are taken from actual numbers of starts. Statistics are given for new housing units started by the type of funding program. Divisions are for privately-owned starts and under these, but not all-inclusive, mortgage insurance provided by the Federal Housing Administration (FHA), by the Veterans' Administration (VA), and publicly-owned starts. The types of private financing not covered by FHA or VA and the various types of publicly-owned starts are excluded.

and then dropped off to a 1973 percentage of 12 percent. While a future percentage is difficult to predict because of such variables as Federal policies, market situations, etc., these two agencies still have the largest degree of direct control over construction standards in the Federal Government.

Those agencies included in category 2 (promulgation of public housing codes) are the Department of Housing and Urban Development (HUD) and through them the FHA, the General Services Administration (GSA), the VA, and the Department of Defense (DOD). Though in 1973 they controlled less than one percent of total starts that were Federal public housing, they have developed and enforced their own minimum standards. The Building Research Advisory Board (BRAB), National Academy of Sciences is working with Federal agencies in compiling "Federal Construction Guide Specifications" which will be adopted and enforced by all Federal agencies involved with public building starts.

Category 3 (concern for safety aspects) includes the Occupational Safety and Health Administration (OSHA), the Department of Health, Education, and Welfare (HEW). OSHA does not effect private starts. However, HEW is concerned with health and welfare problems and has the mechanisms to affect certain health-related hazards. Finally, category 4 (promulgation of suggested codes) includes the National Science Foundation (NSF), which conducts and contracts for research into a number of building code aspects, and the National Bureau of Standards (NBS) which promulgates voluntary standards and conducts research for a number of products installed in homes.

The following discussion pertains to those Federal agencies with which the CPSC is most likely to work closely concerning the problems with products installed in the home. The discussion centers on two aspects of each agency's purview: the areas of building regulation in which the agency engages and the type and general extent of any enforcement operations.

B.6.1. VA

VA powers lie in two areas: first, as a "guarantor" of mortgages let to veterans, and, second, as a contractor for the building of facilities for its own operations (construction involves hospitals, support buildings, and some parking facilities). The first area is more crucial in the study of private dwellings. While rising interest rates have had dampening effect on VA loans, they potentially offer valuable service to building code regulation. Since all homes built and financed under a VA guarantee must meet certain minimum standards, as set by the VA, the inspection of construction by Federal inspectors for compliance to code is an aid to code enforcement at the local level. Although the VA-guaranteed housing starts and occupied housing units in recent years have represented small percentages of the totals for both categories (see Appendix C on new housing starts and occupied housing units), there are some masked effects that may increase the usefulness of the VA activity. The first of these is the fact that builders may decide to build many of their homes to meet the VA standards, with the anticipation that some (and they may not know which ones) of the homes may be financed through VA. Second, the

standards which the VA has chosen to adopt for its guaranteed homes are based on those set by the FHA. Finally, the standards that the VA sets for its guaranteed homes are likely to affect, in some way, the specifications which it approves for building constructed for its own use. The VA develops and reviews periodically the specifications it uses in letting contracts. Although VA-owned buildings do not directly affect what occurs in the private area, new developments may lead the VA to alter the standards it approves for guaranteed veteran housing. Also, manufacturers who make items for both public and private buildings may decide to make their products to meet the most stringent, or at least one uniform, set of standards for the purpose of being able to meet any standards to which their products may be subjected.

Concerning their own building programs, VA methods for processing and approving proposed specifications appear to be very similar to those used by internally-designed HUD projects. The choice of specifications is very project-specific and includes what is considered by the Federal contractor to be the best mix of approved standards and methods for that building.

The enforcement mechanisms used by the VA for both its guaranteed homes and its own property are similar. They inspect progress on-site during construction and after it is finished. However, since the VA always has the right to reject a home for guarantee, it does not keep as tight reigns on the work during conceptualization and construction of the building, as it does on its own property. The VA inspection activities involves regional centers for both areas of inspection. For its own buildings, the VA may choose, if the project is large enough, to commit full-time staff until completion.

B.6.2. FHA

The FHA offers mortgage insurance for residences which meet "minimum standards (which)...assure well planned, safe, and soundly constructed homes." (reference: preface to FHA Minimum Property Standards for Multifamily Housing). The standards are updated yearly. Current literature and past history are reviewed, and what is considered to be the best is incorporated, as is the practice of the VA. In the most recent revision, the FHA tried to make its standards more performance-oriented than in the past.

B.6.3. HUD

Between 1960 and 1973, the percentage of total NHS represented by publicly owned units remained low, dropping from 3% in 1960 to 1% by 1973. This appears to indicate a small impact on the housing market by those organizations controlling the public housing. While contracting for public housing jobs is usually done on a request-for-proposal basis, HUD has its own staff that reviews submitted proposals. In some cases, the staff may indicate certain minimum specifications to be met, either in the

initial proposals submitted or in future follow-up proposals requested from the more promising responses. Whatever the case may be, the final specifications decided on must meet the approval of the reviewing staff. In many cases the staff follows the specifications of the FHA. In those cases where HUD approves the specifications, there is a strong mechanism for affecting safety-oriented changes by working with HUD.

HUD has also been capable of providing adjunct technical and financial assistance to communities who feel the need to improve their codes and standards for the construction and occupancy of housing and other buildings. To bring their building programs up to present standards, localities have been able to draw on the Urban Renewal Rehabilitation and the Code Enforcement programs for grants and consultation. Furthermore, home-owners have been able to seek financial assistance from the local authorities to conserve and improve existing housing. The Workable Program for Community Improvement mandates that properly enforced codes and standards meeting adequate health, safety and welfare standards must be in effect for a locality and its individual property owners to be able to use the plan. While the effect of these three plans in the future is unsure, they have offered examples, at least, of programs designed to help localities improve their housing situation with Federal help.

HUD (including FHA) and VA influence building regulation by exerting a kind of "secondary control" over the entire building industry. The vehicle is the encouragement, be it direct or implicit through agency actions, of manufacturers and builders to conduct all of their work in a uniform manner which will allow their products to meet the requirements of any existing reasonable codes or standards. One example would be the designing of a type of stairway which is used in both private homes and HUD-sponsored projects according to the specification which HUD has stated. These specifications would be considered by the manufacturer to be the most stringent ones that his product is likely to meet. There are a number of other Federal agencies which, though they do not have the power to mandate codes or standards for private dwellings, do exercise some kind of similar "secondary control" over the building environment.

B.6.4. GSA

One of GSA's duties is to contract for and oversee the construction of virtually all Federally-used buildings (with the exception of DOD). While all of these are "public" buildings, and while almost none of them are residences, GSA utilizes their own series of specifications and standards in developing requests for proposals, negotiating with bidders at different stages of the contracting process, overseeing the actual construction, and maintaining the buildings, once they are completed. GSA purchases large amounts of material from private firms which must meet GSA specifications and which may also be used in private homes. Also, the large amounts of purchasing by GSA encourages builders to buy materials which meet GSA specification and which may also be used in private home construction. Furthermore, the GSA attitude on various specifications may affect the attitudes of other agencies who are reviewing building codes and standards.

B.6.5. DOD

The Department of Defense contracts for large numbers of housing units used by members of the armed services as well as DOD employees. A conversation with Rear Admiral Kenneth Sears,[21] Director of Construction Administration, provided a summary of DOD policy on housing construction. DOD contracts for the building of housing for installations in the United States only when suitable housing is not available in the local communities. The Department will survey the housing situation in the area and make a determination of what types, if any, of housing are needed.

Since DOD contracts for more housing units than does GSA they will be in some way involved with the purchase of many more building products which may also be used in private homes.

B.6.6. OSHA

OSHA has been charged with protecting the safety and health of employees in this nation. As such, they are primarily concerned with job-related accidents. It is conceivable, however, that a number of the accidents with which they deal will involve products installed in homes. Examples of such products are stairs, floors, doors, furnaces, and architectural glass. The influence of OSHA on standard setting groups may be of direct consequence to at least a few of these products. OSHA's expanding data base may also provide insights into the safety aspects of these products.

B.6.7. HEW

Many jurisdictions have health agencies which play significant roles in developing and enforcing certain aspects of housing codes and standards, especially for sanitary conditions. Their work covers mainly aspects of occupancy and use of housing. The Public Health Service of HEW provides technical assistance in housing quality improvement, code administration, and the training of state and (on an ad hoc basis) local agencies. The Bureau of Radiological Health has developed expertise in a number of areas related to safety in the home. Their study of the hazards associated with microwave ovens is one example of this.

Of further importance is the historical background and departmental development of HEW in the general area of safety. A part of CPSC had its start in the Bureau of Product Safety. Some of the programs now being used by CPSC (e.g., the NEISS data base) began there. Also, other parts of HEW, like the National Institutes of Health, which have provided research assistance on questions of effects of safety problems on humans, have in the past coordinated their efforts with the agencies charged with running specific safety-related work. The technical knowledge of such agencies will be of use of the CPSC.

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[21] Telephone conservation, April 5, 1974.

B.6.7. NSF

One of the major functions of the NSF is to award grants to universities and other research groups for the investigation of special-interest projects. One illustration is the Research Applied to National Needs program. Much of its work is developmental and of an investigatory nature for the purpose of unearthing new and fruitful areas of future research. Much of it is in support of efforts that are currently on-going in other Federal agencies: One of these areas is consumer product safety.

B.6.8. NBS

NBS is one of the major standards promulgating organizations in the Federal Government. In the Institute for Applied Technology, and with the help of the Center for Building Technology (CBT) and the interested industry groups, NBS has promulgated standards for a number of products of interest to this study. Appendix D discusses some of the major aspects of these standards. CBT, besides conducting research on all aspects of building technology, is also involved in a number of panels and organizations which are involved with the development and promulgation of codes and standards. One example, which will be discussed further in another section, is the CBT involvement in the National Conference of States on Building Codes and Standards as its secretariat.

Through the Office of Engineering Standards Services at NBS, the Department of Commerce has promulgated a number of voluntary product standards for products installed in the home. (The products covered by NBS-approved standards are listed in Appendix D.) All of these standards have installation specifications and procedures for labeling and identification, and, in the case of products which perform a function in and of themselves, i.e., without the necessary presence of and use by a consumer, performance specifications. None of the standards, however, has maintenance specifications.

B.6.9. BRAB

The Building Research Advisory Board of the National Academy of Sciences is in the process of compiling a set of Federal construction guide specifications which, when completed, will be used by all major Federal agencies involved in the promulgation or use of building codes and standards. The purpose of this effort is to establish a uniform set of regulations which can be more easily and consistently used by all involved agencies. It will also help establish a more nearly uniform consensus of what regulations the Federal Government approves of and uses. Since most of the involved agencies are working on buildings that are designed for public work or recreational use, the codes will be slanted along these lines rather than to the private home sector.

B.6.10. NIBS

Although not a Federal agency, the Housing Development Act of 1974 created the National Institute of Building Sciences. The Institute's responsibilities relate to development and promulgation of performance criteria, standards and test methods for adoption by building regulatory jurisdictions with due consideration of consumer problems.

B.7. State Jurisdiction

Code enforcement has traditionally been a function of local government in the United States. Field and Ventre,[22] however, report a trend toward increased activity by state governments to exercise their power to regulate construction. State codes are often based upon the national model codes but differ in their potential consequences for local control. States can impose limits upon the code powers of local jurisdictions ranging from mandatory minimum standards to mandatory use of a state code. State building codes have taken four major forms: model codes that may be adopted by political subdivisions; compulsory statewide codes; mandatory codes that exclude buildings to be used for certain occupancies (such as one and two family dwellings); and codes that apply only to construction of state owned buildings or those financed by public funds. At least 20 states[23] have passed one of the forms of state codes and the first compulsory statewide code was passed by Connecticut in 1970. The majority of states having codes (about 80%) have established minimum codes allowing more rigid standards to be set by localities. A few (North Carolina, for example) have set minimum-maximum state codes limiting local codes to variations within a specified range.

States have asserted themselves in the areas of industrialized housing where laws allow for inspection and certification of housing units and mobile homes in factories. These two construction activities are multiregional and therefore demand immunity from the local code variations. A builder must continue to meet local requirements for zoning and the affixing of the unit to the site but may be relieved from seeking local approval on the unit as he markets in different municipalities.

States have also attempted to control the firms and/or the tradesmen which work on new construction and home improvements. This control is exercised chiefly through the process of licensing. Since complaints by building officials or consumers against a firm can affect a firm's ability to renew a license, licensing can provide an indirect control over workmanship and business practices.

The National Conference of States on Building Codes and Standards (NCSBCS) is primarily comprised of state government employees with building regulation responsibilities. Its purpose is to provide a forum for the discussion of mutual problems and to promote uniformity throughout the states in building codes and in their enforcement. Voting membership consists of a delegate selected to represent each state. The NBS Center for Building Technology serves as secretariat for the Conference and provides technical research assistance in the field of performance criteria and their measurement methods. Representatives of NCSBCS, the model building code groups, HUD, DOC, and pertinent trade associations have cooperated to draft three Model State Laws for building regulation. The suggested legislation distributed by the Council of State Governments includes a manufactured building act, a mobile home act and a state building code act.

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[22] Charles Field and Francis Ventre, "Local Regulation of Building Codes: Agencies, Codes, and Politics", 1971 Municipal Yearbook, p. 143.

[23] As of 1971.

Like their counterparts in the other inspection functions of state government, state building code officials are located in a variety of departments depending upon the particular state. The NCSBCS Management and Regulatory Procedures Committee recently attempted to formulate a suggested organization for state and local jurisdictions. The Committee solicited from the 15 states, which had statewide building regulatory organizations, their organization charts and salary schedules. Responses were received from six of these states.[24] The Committee found "a great disparity in the various states' organization, and in the responsibilities other than buildings assigned the state organization." The state delegates to the NCSBCS also demonstrate the diversity in organization among the states coming from such departments as Department of Planning (Arkansas), Department of Housing and Community Development (California), Public Works Department (Connecticut), Labor and Industrial Relations (Hawaii), State Fire Marshall (Louisiana), Department of General Services (Maryland), Department of Labor and Industries (Washington). State governments exercise, for the most part, indirect control over construction, leaving inspection, and, in most instances, code requirements up to local governments.

B.8. Local Government Building Code Regulation

A survey conducted in 1967 for the Douglas Commission[25] found from surveying almost 18,000 units of local government that 46.4% had a building code. The survey found, for the 4,067 municipalities and townships with populations exceeding 5,000, 80.5% had a building code. With respect to electrical and plumbing work the National Electrical Code was adopted by 78.1% of these (4,067) governments having a building code and the National Plumbing Code was used by 43.9% with the remainder either not having a plumbing code or using the BOCA, Western, or some other plumbing code. In addition, the Douglas Commission survey found that for the governmental units over 5,000 in population 52.5% (42% of all governmental units) "substantially incorporated" a national model code. Other local codes were originally based upon such a model (482 jurisdictions), or were based upon a state model code (589 jurisdictions) or were not related to any model (383 jurisdictions), or the relationship was not reported (105 jurisdictions).

Model code groups meet on an annual basis to revise their codes to keep them up to date with the changing technology. The survey found,

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[24]Report of the Management and Regulatory Procedures Committee to the 6th Annual Meeting of the National Conference of States on Building Codes and Standards, May, 1973, p. 1.

[25]Allen D. Manvel, Local Land and Building Regulation Research Report No. 6, National (Douglas) Commission on Urban Problems, 1968.

when assessing the local governments' record for keeping up with such code revisions, that:

- Only two-thirds of the "building code governments" (only one-half of all governments, including those without codes) base their codes on the model code to begin with.
- Of these "model code governments" only 58% had provided for procedures to consider changes on an annual basis.
- Only 28% had adopted as much as 90% of the recommended changes during the previous three years.
- Of all governments having a building construction code of any kind, 45% had not made comprehensive revisions in the four year period preceeding the survey.
- Finally, only about 15% of all municipalities and townships above 5,000 residents had an up-to-date version of a national model code with the remainder either not based upon a model code or failing to keep the model code up to date.

A survey conducted in 1970 by the International City Management Association (ICMA) of local building departments confirmed many of the findings of the 1967 survey.[26] The ICMA survey also ascertained for the 919 cities reporting the basis for their present code. The model code based cities consisted of 73.5% (12.2% AIA, 31.3% ICBO, 14.9% SSBC and 15.1% BOCA), state or county codes accounted for 13.5%, 10.8% were locally drafted codes and the remaining 2.2% of the sample reported no code in effect.[27] The report also indicated for the 140 cities (15%) changing their code between 1964 and 1970, a 40% increase for the model code group, a decline of 80% for the locally-drafted code cities and a dramatic gain for cities adopting state codes from two in 1964 to 34 cities in 1970.

Both the Douglas Commission and the ICMA surveys selected an identical set of 14 construction technology advances, all but one of which had been accepted by either the model building code organizations, the National Electrical Code or the National Plumbing Code. Based on information collected from the local jurisdictions, Ventre[28] came to the conclusion that:

> "there appears to be a marked tendency for local building codes based on advisory model codes to be more technologically

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[26]Francis T. Ventre, "Maintaining Technological Currency in the Local Building Code: Patterns of Communication and Influence", Urban Data Service International City Management Association, Washington, D.C., April 1971, Vol. 3, No. 4

[27]The Survey was administered to all U.S. cities over 10,000 population and a few under 10,000 accounting for the high rate of cities having a code when compared to the 1967 survey which included many jurisdictions between 5,000 and 10,000 population.

[28]Ventre, op. cit., p. 6.

current. On the whole, model code cities prohibited fewer of the 14 construction advances than did state/county or local code cities. But considering that all items except one are accepted by all of the model building codes or pertinent model mechanical codes, the substantial deviation from perfect scores underlines the purely advisory and voluntary nature of the model code."

When the code types were compared in terms of population served rather than the number of jurisdictions, only a slight technical advantage for local codes based on model codes was noted:

> "if the proportion of cities served by technically current codes is the measure of code effectiveness, then model codes are clearly superior; if, in contrast, the proportion of people served by technically current codes is the measure of code effectiveness, than any of the three (model state/county or local) code types can be shown to deliver 'better' service."

There are two basic functions for a code enforcement agency--examination and inspection. The examination function involves those activities which are designed to determine the possibility of compliance prior to construction, while inspection involves activities which will disclose violations following construction. The examination function is concerned with the testing of tradesman (plumbers, electricians, air conditioning and refrigeration contractors, television repairmen, boiler operators, etc.) and issuing them licenses, and the examination of plans (for buildings, structures, alteration, plumbing, wiring, etc.) and the issuing of permits for these activities. Inspection involves the determination of initial compliance and continuing compliance.

Enforcement of building codes may be accomplished through the use of "stop work orders." Jurisdictions vary in the authority given to inspectors but where the authority exists to halt construction for violations a potentially powerful tool is present for code enforcement. The contractors are sensitive to delays in schedule which can cause considerable economic losses.

Other enforcement mechanisms usually provided only in cases of danger to the community are the power to perform work on a structure, such as backfill of dangerous excavations, and the assessment of the owner/builder for city expenses. Where these choices are not available to a local building code agency, it must take court action to gain compliance with code for noncomplying builders.

Housing codes differ from building codes in that housing codes are primarily related to the occupancy requirements of buildings and their maintenance after they have been constructed. Housing codes offer a mechanism for influencing the safety aspects of older buildings which could not be influenced by modification of existing building codes. Particular influence over rental properties can be obtained through housing codes. Housing codes are even more difficult to enforce than building codes. If the administrative process fails to gain compliance, then court action is sought; however, judicial permissiveness, as reflected

in low or nominal fines, and no jail sentences may reduce the deterrent effect of the threat of court action. Typically a defendant will plead guilty and engage in repairs prior to sentencing. Thus the court will be less likely to treat them harshly.[29] After referencing many studies on low cost housing which indicated a failure to enforce housing codes at the local level, Schoor[30] addressed the questions: "Why is it so difficult to enforce codes? Why do they not work effectively?" Some of his answers were:

(1) codes are antiquated and unclear;
(2) penalties embodied in the law are slight. Owners find it cheaper to pay occasional fines than to make repairs;
(3) municipal enforcement staffs are likely to be undermanned;
(4) political interests may not support enforcement efforts;
(5) resident owners may not have the resources to make improvements; and,
(6) tenants may resist enforcement because it means rent rises or that some must move.

Schorr further observes that:

"One cannot review the problem of code enforcement and the solutions that are proposed without concluding that they are superficial, if grave, symptoms of a deeper maladjustment. The hard fact is that profit-making incentives run counter--so far as the maintenance of housing is concerned--to the best interests of the poor. Tax laws and condemnation procedures combine with the peculiarly vulnerable situation of those who are poor to pay the most profit for the worst housing. When enforcement is pitted day by day against the businessman's incentive to make profit, enforcement is bound to be in trouble."

Factors identified that operate in this fashion are the municipal property tax, the capital gains tax, the basis for calculating value in condemnation, and the depreciation allowance.

The extent to which injuries can be attributed to poor maintenance as opposed to original design will affect which type of codes now in effect should be the major concern to reduce injuries. Sanderson[31] describes building codes and housing codes as follows:

"The typical building code regulates the construction, alteration, maintenance, repair, and demolition of buildings and structures.

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[29] Building the American City, op. cit., p. 28.

[30] Alvin L. Schorr, Slums and Social Insecurity, U.S. Government Printing Office, Washington, D.C. 1966, p. 89.

[31] Sanderson, op. cit., p. 14.

> It may or may not regulate the installation maintenance of mechanical systems and equipment within or appurtenant to buildings and structures. Many experts look upon the entire complex of regulatory codes, including electrical, plumbing, heating, boilers, pressure vessels, air pollution, air conditioning, refrigeration, elevators, and flammable liquids as integral parts of the comprehensive building code... Housing codes are basically maintenance codes which also regulate the environmental factors of residential buildings and, in the case of rental property, the facilities which must be supplied by the landlord. Housing codes are frequently a chapter in the building codes of major cities, but there is a trend to separate the housing code from the building code."

The Douglas Commission compared housing codes of four model code groups, nine state housing codes and 16 city or county housing codes for their content. The evaluation considered dwelling unit occupancy provisions; sleeping room occupancy provisions; required facilities for bathrooms, and ventilation. The results from the examination of the standards indicated[32]

> "that there are wide variations among them; that they are often in conflict, that the variations are so great that by definition they could not be based on scientific or objective standards, that many provisions are couched in subjective language 'adequate,' 'in safe condition,' or 'in good repair,' that many of the objective standards are based on a combination of tradition, rule of thumb, or personal experience, and that they differ in emphasis from structure to health, depending upon the code adopted."

[32]Building the American City, op. cit., p. 277.

APPENDIX C.
HOUSING PROJECTIONS

One mechanism through which countermeasures can be applied is to require that housing units to be occupied in the near future meet certain safety requirements. This requirement would affect the construction of new housing units started (NHS) and the renovation of presently unoccupied housing units intended for future occupancy. We have considered data for NHS's and occupied housing units (OHU) in an attempt to project the impact of this type of mechanism on future countermeasure effectiveness. Effectiveness may be, to some extent, tied to the percentage of total housing units covered by the regulations at a given time. We have estimated the future number of NHS's and OHU's for 1980, 1985 and 1990, and the corresponding percentages of total which would be covered by regulations adopted in 1975.

The general trend appears to be that, while predictions are very difficult to make and rely on, countermeasures implemented in 1975 may influence a significant percentage of the housing units occupied in the future.

As shown on Table C.1., the number of NHS's since 1960 has increased significantly. The number, however, appears to fluctuate from year to year, with an upward trend from 1960 indicated, but not assured, for the future. The variables influencing the NHS's include National, State and local policies, National and regional economics, availability and price of materials, and so on. The wide variety and unpredictability of the contributing variables make accurate future predictions on the number of NHS's difficult. Too many of the variables can change their characteristics to make NHS projections reliable when accuracy is demanded. NHS projections seem reasonable to use at best to obtain a range of possible outcomes.

The NHS's, however, do offer some information:

- The NHS's for the time period considered have been dominated heavily by privately-owned starts. The publicly-owned starts represent roughly less than 10% of the total throughout the period.

The privately-owned dwelling unit has thus been the dominant element in new units started.

- Of the privately-owned starts, a significant percentage (varying from 12% to 33%) has been intended to be financed through the FHA or the VA. Thus, while the total FHA and VA financing has not dominated the new starts, it does represent a significant percentage of the total NHS's.

Table C.1.

New Housing Units Started (Thousands)[1]

Year:	1960	1965	1967	1968	1969	1970	1971	1972	1973
Total	1,296	1,510	1,322	1,545	1,500	1,469	2,085	2,379	2,054
By Type of Program:									
Privately Owned:	1,252	1,473	1,292	1,508	1,467	1,434	2,052	2,357	2 042
With FHA Aid	261	197	180	220	233	421	528	371[2]	161[2]
With VA Aid	75	49	52	56	51	61	94	104[2]	86[2]
Publicly Owned	44	37	30	38	33	35	32	22	12
FHA + VA Subtotal	336	246	232	276	284	487	622	475	247
Percent of Total Represented by (FHA + Va)	26%	16%	18%	18%	19%	33%	30%	20%	12%

[1]Unless otherwise noted statistics are taken from the 1973 Statistical Abstracts of the United States.

[2]Mr. McHugh, HUD (FHA).

- Of the two agencies, the FHA has dominated the financing of new starts. FHA financing has run approximately to 70% of the total for both FHA and VA. It thus appears that the FHA has the opportunity to be the more influencial agency.
- All categories of the breakdown were in a slow increase from 1960 to 1970. From 1969 to 1971, the FHA and VA financing both increased substantially and then dipped significantly in the next two years. The publicly-owned starts stayed fairly constant relative to the other categories during the entire period of the data. The total starts, and total privately-owned starts both showed a change, in a similar direction and more steep than that for FHA and VA financing, (and with a year's lag with respect to them).

The data for total NHS's are difficult to use for the purposes of projection. The information for the occupied housing units, however, appears to be more applicable to prediction.

The number of OHU's has increased significantly since 1900 (See Table C.2.). Overall ten-year periods show, the OHU's have shown positive percentage increases (ranging from 17% from '30-'40 to 27% from '00-'10, and averaging 22%). Given the dependence of the number of OHU's on many hard-to-predict variables including those listed above for NHS's, conclusive statements about the years 1980-90 should be carefully qualified.

If we assume a constant 20% increase (that showed in the last 1960-70 ten-year period) for 1970-80, 1980-85 and 1985-90, the total OHU's for 1980, 1985 and 1990 will be respectively, 76 million, 84 million and 91 million. If we further assume that countermeasures implemented in 1975 will affect the newly-occupied OHU's after 1975 the analysis leads to the following percentages affected:

By	Percent (Increase from 1975)
1980	8.7
1985	19.6
1990	30.5

Thus, by 1990, the countermeasures implemented may affect over 30% of the housing units occupied. This should be considered a lower bound since replacement housing (not considered by net change in OHU) would be subject to countermeasures.

A second method for predicting OHU's tied the number of OHU's to the projected resident U.S. population. It was assumed that the number of occupied housing units could accurately be described in a regression equation using the resident U.S. population as the single independent variable. When figures for the resident U.S. population and the OHU's were correlated for the eight census years from 1900 to 1970, inclusive, the following values for r and r^2 were obtained:

$$r = 0.997,$$
$$r^2 = 0.995$$

Table C.2.

Occupied Housing Units 1900 to 1970[3]
(Figures in Thousands Except Percent)

Year	Total	Owner Occupied		Renter Occupied		Percent Increase Over Preceding Census	
		Number	Percent	Number	Percent	Total Occupied Units	Total Population
1900	15,964	7,455	46.7	8,509	53.3	25.8	20.7
1910	20,256	9,301	45.9	10,954	54.1	26.9	21.0
1920	24,352	11,114	45.6	13,278	54.1	20.2	14.9
1930	29,905	14,280	47.8	15,624	52.2	22.8	16.1
1940	34,855	15,196	43.6	19,659	56.4	16.6	7.2
1950	42,826	23,560	55.0	19,266	45.0	22.9	14.5
1960	53,024	32,797	61.9	20,227	38.1	23.4	18.5
1970	63,417	39,862	62.9	23,555	37.1	19.6	13.3

[3]1971 Statistical Abstracts of the United States, p. 673.

It thus appears that the resident U.S. population may be used as a reasonable predictor of the OHU's, for a given census year. The 1971 Statistical Abstracts gives four values for population projections for each of the years 1975, 1980, 1985 and 1990. The regression equation is as follows:

$$Y = aX + b$$

where: X is the resident U.S. population projection, and,
Y is the resulting OHU projection, and
and: a and b are the constants for the regression equation,
a = 0.38 and b = 14,811.

Table C.3. relates the projected occupied housing units as a function of the Census Bureau's population projections.

Table C.3.

Occupied Housing Unit Projection as a Function of the U.S. Census Bureau's Resident Population Growth Rate Predictor (in thousands of units)

	1975	1980	1985	1990
High population growth	68,353	75,070	82,731	90,438
	67,767	73,406	79,796	86,276
	67,020	71,545	76,637	81,873
Low population growth	66,696	70,786	75,116	79,218

Table C.4. shows the high and low percentage increase figures from the year 1975 using the population projection method.

Table C.4.

Estimates of Occupied Housing Units Growth Over the Base Year 1975

Year	Percentage Increase	
	High Population Growth	Low Population Growth
1980	9.8	6.1
1985	21.0	12.6
1990	32.3	18.8

The year 1975 was used as a "base" year for the projections since it is assumed that a substantial number of countermeasures that the CPSC will implement concerning hazards with products installed in the home will not be begun until 1975. As such we seek an estimate of the impact on the number of occupied units any such actions might have by 1980, 1985 and 1990. It is clear from the tables that, even for the low estimates, the percentage increases representing over 10% of total around 1985, or ten years after countermeasures may be initiated. This means that it may take about that amount of time to see an impact on the total occupied units by actions taken on units that are being built. This gives some idea of the time it would take before the CPSC might expect to see measurable results from actions taken in units that were not occupied at the time of countermeasure implementation using implementation methods which do not attempt to influence "older" housing.

The projected net change in OHU's between 1975 and 1990 (90M-68M) for high population growth is about 22M units. This calls for a minimum average of 1.5M new housing starts per year over the 15 year period, not including allowance for replacement housing. It therefore appears, considering typical ranges of new housing starts (Table C.1.), that using the high population growth net change in OHU's and neglecting a component for replacement housing units provides a gross but conservative estimate of potential countermeasure impact.

APPENDIX D.
SUBJECT CONTENT OF VOLUNTARY PRODUCT STANDARDS[1]

Product, Date:	NEISS Product Category/ Product # Covered	Installation Specifications	Performance Test Specifications	Maintenance Specifications	Labelling or Identification Specified
Automatic Mechanical-Draft Oil Burners Designed for Domestic Installation, '56	38 / 0311	Stated	Stated	Not Stated	Stated
Standard Stock Light-Duty 1 3/8" and 1 3/4" Thick Flush-Type Interior Steel Doors and Frames, '66	3 / 1805	Stated	Not Stated	Not Stated	Stated
Hinged Interior Wood Door Units,'70	3 / 1805	Stated	Not Stated	Not Stated	Stated
Steel Bi-Fold Closet Door Units, Frames and Trim,'70	3 / 1805	Stated	Not Stated	Not Stated	Stated
Ponderosa Pine Doors, '58	3 / 1805	Stated	Not Stated	Not Stated	Stated
Hardwood Veneered Doors, '58	3 / 1805	Stated	Not Stated	Not Stated	Stated
Standard Stock Commercial 1 3/4" Thick Steel Doors and Frames, '62	3 / 1805	Stated	Not Stated	Not Stated	Stated

[1]Sophie J. Chumas, Tabulation of Voluntary Standards and Certification Programs for Consumer Products, NBS Technical Note 762, March, 1973.

APPENDIX D. (Continued)

Product, Date:	NEISS Product Category/ Product # Covered	Installation Specifications	Performance Test Specifications	Maintenance Specifications	Labelling or Identification Specified
Steel Chain Link Galvanized Fence Fabric, '62	33 / 1834	Stated	Not Stated	Not Stated	Stated
Steel Fence Posts - Field and Line Type, '51	33 / 1834	Stated	Not Stated	Not Stated	Stated
Aluminum Alloy Chain Link Fence, '65	33 / 1834	Stated	Not Stated	Not Stated	Stated
Mosaic - Parquet Hardwood Slat Flooring, '70	26 / 1807	Stated	Not Stated	Not Stated	Stated
Laminated Hardwood Block Flooring, '63	26 / 1807	Not Stated	Not Stated	Not Stated	Stated
N.W.M.A. Industry Standard for Wood Window Units, '69 (Suggested)	10 / 1815,26	Stated	Stated	Not Stated	Stated
Ponderosa Pine Windows, Sash, and Screens, '64	10 / 1815,26	Stated	Not Stated	Not Stated	Stated
Wood Double-Hung Window Units, '64	10 / 1815,26	Stated	Not Stated	Not Stated	Stated
Wood Awning Window Units, '64	10 / 1815,26	Stated	Not Stated	Not Stated	Stated

APPENDIX D. (Continued)

Product, Date:	NEISS Product Category/ Product # Covered	Installation Specifications	Performance Test Specifications	Maintenance Specifications	Labelling or Identification Specified
Wood Casement Window Units, '64	10 / 1815,26	Stated	Not Stated	Not Stated	Stated
Wood Horizontal-Sliding Window Units (All Sash), '64	10 / 1815,26	Stated	Not Stated	Not Stated	Stated
Wood Horizontal-Sliding Window Units (One, or more, operating Sash), '64	10 / 1815,26	Stated	Not Stated	Not Stated	Stated
Wood Single-Hung Window Units,'64	10 / 1815,26	Stated	Not Stated	Not Stated	Stated

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The Consumer Product Safety Commission's (CPSC) list of consumer products with high relative incidence of reported injuries includes many products which are integral parts of the consumer's residence, such as stairs, doors, architectural glass, furnaces and water heaters. The safety aspects of these products are influenced by on-site construction practices and design considerations which are regulated through local building codes. The problem is to identify operational methods the CPSC can employ in dealing with unreasonable hazards associated with component parts of residential units.

This report identifies, for products installed in homes, (1) the product history stages, (2) institutional groups, (3) hazard sources, and (4) countermeasures available to the CPSC. It structures relationships among these four elements for evaluating the impacts of alternative countermeasures. Current mechanisms for control of products installed in homes are presented and sixteen potential countermeasures are postulated.

17. KEY WORDS *(six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons)*

Building codes; Consumer Product Safety Act; product safety; residence-related products; residential safety; safety implementation approaches; safety standards.

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