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Foreword

The growing numbers of new families and the increasing population in the United States have created a pressing demand for additional housing that is conducive to healthful living. These demands are increased by the continuing loss of existing housing through deterioration resulting from age and poor maintenance

Large numbers of communities in the past few years have adopted housing codes and initiated code enforcement programs to prevent further deterioration of existing housing units. This growth in housing activities has caused a serious problem for communities in obtaining qualified personnel to provide the array of housing services needed, such as information, counseling, technical advice, inspections, and enforcement. As a result, many agencies throughout the country are conducting comprehensive housing inspection training courses. This publication has been designed to be an integral part of these training sessions.

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Chapter 1: Trends in Housing

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Members of countless communities throughout America are raising critical questions about the adequacy and effectiveness of local housing code enforcement programs. These critics feel deep concern over the fact that 1966 found "some four million urban families living in homes of such disrepair as to violate decent housing standards.'' For this reason, they insist everything possible be done to guarantee that present and future inspection efforts lead to rapid and adequate upgrading of the substandard but salvageable housing in each community and that the neighborhoods be made more desirable places in which to live.

In order to meet these demands effectively, inspectors of housing and their supervisors should first acquaint themselves with the origin of public concern about housing problems; the past, present, and new approaches to housing code administration; the expanded role of the inspection function in the neighborhood improvement effort; and the general nature of their role and responsibilities.

I. The History of Housing

The first public policies on housing in this country were established during the Colonial period. Many of the early settlers built houses with wooden chimneys and thatched roofs which were the causes of frequent fires. Consequently, several of the colonies passed regulations prohibiting these. One of the first was the Plymouth Colony, which in 1626 passed a law stipulating that new houses should not be thatched but roofed with either board or pale and the like. In 1648 wooden or plastered chimneys were prohibited on new houses in New Amsterdam, and chimneys on existing houses were decreed to be inspected regularly. In Charlestown in 1740, following a disastrous fire. the general assembly passed an act that declared that all buildings should be of brick or stone, that all "tall'' wooded houses must be pulled down by 1745, and that the use of wood was to be confined to window frames. shutters, and to exterior work. This law was obviously unenforceable because, as we learn from other publications during that period, more Charlestown houses were made of timber than of brick.

Social control over housing was exerted in other ways. Early settlers in Pennsylvania frequently dug caves out of the banks of the Delaware River and used these as primitive-type dwellings. Some of these shelters were still in use as late as 1687 when the Provincial Council ordered inhabitants to provide for themselves other habitations, in order to have the said caves or houses destroyed. In some New England communities, around the turn of the 18th century, standards were raised considerably higher by local ordinances. In East Greenwich, it had been the custom to build houses 14 feet square with posts 9 feet high; in 1727 the town voted that houses shall be built 18 feet square with posts 15 feet high with chimneys of stone or brick as before.

During the early days of this country, basic sanitation was very poor, primarily because outdoor privies served as the general means of sewage disposal. The principal problems created by the use of these privies involved their nearness to the streets and their easy accessibility to hogs and goats. In 1652, Boston prohibited the building of privies within 12 feet of the street. The Dutch of New Amsterdam in 1657 prohibited the throwing of rubbish and filth into the streets or canal and required the householders to

keep the streets clean and orderly.

After the early Colonial period we pass into an era of very rapid metropolitan growth along the eastern seashore. This growth was due largely to the immigration of people from Europe. Frequently these immigrants arrived without money or jobs and were forced to move in with friends or relatives. This led to severe overcrowding. Most of the information available pertains to New York City, because the situation there was worse than that in any other city in the country. It received the majority of the immigrants, many of whom were unable to move beyond the city. The most serious housing problems began in New York about] 840 when the first tenements were built. These provided such substandard housing and such unhealthy, crowded living conditions that a social reform movement was imminent in New York.

During the early part of the 19th century, the only housing control authority was that vested in the fire wardens, whose objective was to prevent fires, and the health wardens, who were charged with the enforcement of general sanitation. In 1867, with the passing of the Tenement Housing Act, New York City began to face the problem of substandard housing. This law represented the first comprehensive legislation of its kind in this country. The principal features of the act are summarized as follows: for every room occupied for sleeping in a tenement or lodging house, if it does not communicate directly with the external air, a ventilating or transom window to the neighboring room or hall; a proper fire escape on every tenement or lodging house; the roof to be kept in repair and the stairs to have bannisters; water closets or privies - at least one to every twenty occupants for all such houses; after July 1, 1867, permits for occupancy of every cellar not previously occupied as a dwelling; cleansing of every lodging house to the satisfaction of the Board of Health, which is to have access at any time; reporting of all cases of infectious disease to the Board by the owner or his agent; inspection and, if necessary, disinfection of such houses; and vacation of buildings found to be out of repair. There were also regulations governing distances between buildings, heights of rooms, and dimensions of windows. The terms "tenement house," "lodging house," and "cellar" were defined.

Although this act had some beneficial influences on overcrowding, sewage disposal, lighting, and ventilation, it did not correct the evils of crowding on lots and did not provide for adequate ventilation for inner rooms. In 1879, a second tenement act, amending the first, was passed adding restrictions on the amount of lot coverage and providing for a window opening of at least 12 square feet in every room. Several attempts in 1882, 1884, and 1895 were made to amend this original act and provide for occupancy standards, but they were relatively unenforceable. While these numerous acts remedied only slightly the serious problems of the tenements, they did show the city's acknowledgment of the problems.' This public acknowledgment, however, was seldom shared by the owners of the tenements, or, in some cases, by the courts. The most famous case, in 1892, involved Trinity Church, at that time one of the largest owners of tenements in New York City. In the case, the City of New York accused Trinity Church of violating provisions of the Act of 1882 by failing to provide running water on every floor of its buildings. A district court levied a fine of $200 against the Church. which in turn appealed to the Court of Common Pleas to have the law set aside as unconstitutional. Incredibly the court agreed unanimously to uphold the landlord's position. stating there is no evidence nor can the court judicially know that the presence and distribution of water on the several floors will conduce to the health of the occupants . . . there is no necessity for legislative compulsion on a landlord to distribute water through the stories of his building; since if tenants require it, self-interest and the rivalry of competition are sufficient to secure it . . . now, if it be competent for the legislature to impose an expense upon a landlord in order that tenants be furnished with water in their rooms instead of in the yard or basement, at what point must this police power pause? . . . a conclusion contrary to the present decision would involve the essential principle of that species of socialism under the regime of which the individual disappears and is absorbed by a collective being called the 'state',a principle utterly repugnant to the spirit of our political system and necessarily fatal to our form of liberty. Fortunately, 3 years later, the city health department was granted an appeal from the court order, and eventually the constitutionality of the law was upheld.

Jacob A. Riis, Lawrence Veiller, and others did much during this period to champion the cause of better living conditions. Their efforts resulted in the Tenement House Act of 1901, a milestone in housing and an extremely comprehensive document for its time. It began with concise definitions of certain terms that were to become important in court actions. It contained provisions for protection from fire, requiring that every tenement erected thereafter, and exceeding 60 feet in height, should be fireproof. In addition, there were specific provisions regarding fire escapes on both new and existing houses. More light and ventilation were required; coverage was restricted to not more than 70 percent on interior lots and 90 percent on corner lots. There were special provisions governing rear yards, inner courts, and buildings on the same lot with the tenement house. At least one window of specified dimensions was required for every room, including the bathroom. Minimum size of rooms was specified as were certain characteristics for public halls. Significantly included were provisions concerning planning for the individual apartments in order to assure privacy. One of the most important provisions of the Tenement Act was the requirement for running water and water closets in each apartment in new tenement houses. Special attention was given to basements and cellars, the law requiring not only that they be damp proof but also that permits be obtained before they were occupied. One novel section of this act

prohibited the use of any part of the building as a house of prostitution.

The basic principles and methodology established in the Tenement Act of 1901 still underlie much of the housing efforts in New York City today. Philadelphia, a city that can be compared with New York from the standpoint of age. was fortunate to have farsighted leaders in its early stage of development. Since 1909, with the establishment of the Philadelphia Housing Association, the city has had almost continual inspection and improvement.

Although Chicago is approximately two centuries younger than New York, it enacted housing legislation as early as 1889 and health legislation as early as 1881. Regulations on ventilation, light, drainage, and plumbing of dwellings were put into effect in 1896. Many of the structures, however, were built of wood, were dilapidated. and constituted serious fire hazards.

Before 1892, all government involvement in housing was at a local level. In 1892, however, the Federal Government passed a resolution authorizing investigation of slum conditions in cities containing 200,000 or more inhabitants. At that time these included the cities of Baltimore, Boston, Brooklyn, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Milwaukee, New Orleans, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco, and Washington. Much controversy surrounded the involvement of the Federal Government in housing. The Commissioner of Labor was forced to write an extensive legal opinion concerning the constitutionality of expenditures by the Federal Government in this area. The result was that Congress appropriated only $20,000 to cover the expenses of this project. The lack of funds limited actual investigations to Baltimore, Chicago, New York, and Philadelphia and did not cover housing conditions in toto within these cities. Facts obtained from the investigation were very broad, covering items such as the number of saloons per number of inhabitants, number of arrests, distribution of males and females, proportion of foreign-born inhabitants, degree of illiteracy, kinds of occupations of the residents, conditions of their health, their earnings, and the number of voters.

The 20th century started off rather poorly in the area of housing. No significant housing legislation was passed until 1929 when the New York State legislature passed its Multiple Dwelling Law. This law continued the Tenement Act of New York City but replaced many provisions of the 1901 law with less strict requirements. Other cities and states followed New York State's example and permitted less strict requirements in their codes. This decreased what little emphasis there was in enforcement of building laws so that during the 1920's the cities had worked themselves into a very poor state of housing. Conditions in America declined to such a state by the 30's that President Franklin D. Roosevelt's shocking report to the people was "that one-third of the nation is ill-fed, ill-housed, and ill-clothed." With this the Federal Government launched itself extensively into the field of housing. The first Federal housing law was passed in 1934. One of the purposes of this act was to create a sounder mortgage system through the provision of a permanent system of government insurance for residential mortgages. The Federal Housing Administration was created to carry out the objectives of this act.

Many other Federal laws followed: the Veterans Administration becoming involved in guaranteeing of loans, the Home Loan Bank Board, Federal National Mortgage Association, Communities Facilities Administration, Public Housing Administration, and the Public Works Administration. With the U.S. Housing Act of 1937, the Federal Government entered the area of slum clearance and urban renewal, requiring one slum dwelling to be eliminated for every new unit built under the Housing Administration program. It was not until the passage of the Housing Act of 1949 that the Federal Government entered into slum clearance on a comprehensive basis.

The many responsibilities in housing administered by various agencies within the Federal Government proved to be unwieldy. Hence, in 1966 the Department of Housing and Urban Development was created to have prime responsibilities for the Federal Government's involvement in the field of housing.

II. Trends in Housing Inspection

Historically, local provisions for the inspection of housing have been completely inadequate. Usually the function has been split among two or more agencies, and the pertinent code sections have been spread among several local ordinances.

Following the work of C. E. A. Winslow, minimum code standards were made available and resulted in the passing of housing codes. This consolidation of housing requirements resulted in the field of housing inspection. Originally much of the work was devoted to complaint and referral inspections.

A Complaint and Referral Inspections

In most communities the housing inspectors are expected to center their efforts primarily on complaint and referral inspections. This approach satisfies the persons making the complaints and referrals and helps improve some of the municipality's substandard housing. However, it does little to bring about general improvements in any section of the community and actually constitutes an inefficient way of using the available inspection manpower because the men have to spend so much time traveling from one area to another.

Many supervisors and inspectors realize this unsystematic method not only wastes time but also is an ineffective way of upgrading housing and curbing blight. First, on complaint inspections the inspectors are usually instructed to confine their investigations to the dwelling unit specifically involved unless the general conditions are so bad that an inspection of the entire building is deemed necessary. This means most complaint inspections are piecemeal and do not ordinarily bring entire dwellings up to code standards. Second, even though numerous complaints are unwarranted, inspectors are often given so many to check each day that they do not have time to inspect other obviously substandard houses in the vicinity of those complained about. Consequently, these "rotten apples" are left to spoil the block, while the house that has been improved stands alone.

Too often inspection agencies have found they did not have enough facts on hand about the extent and distribution of the substandard housing in their communities. Thus, they were unable to convince their superiors and the public about the inadequacy of complaint inspections as the major method of uncovering violations and checking residential blight in neighborhoods. It is the consensus of housing officials that area inspections are the most effective way of doing both.2 Fortunately, in the 1960's, as one city after another began developing the comprehensive community renewal plans provided for in the Housing Act of 1959, this information finally started to become available. It verified the need for systematic inspections on a neighborhood basis. Congress further emphasized the importance of this new approach by including Section 301 in the Housing Act of 1964. This required all cities engaged in urban renewal to have comprehensive area inspection programs in operation by March 1967, and thereafter, in order to remain eligible for national renewal funds.

B **Neighborhood Inspection Technique**

The area or neighborhood inspection technique is a more recent type of inspection and one which begins to face up to the problems of saving neighborhoods from urban blight. While this is a step forward, it is merely one of several steps required if urban blight and its associated human suffering are to be minimized or controlled.

Throughout this manual the terms "area" or "neighborhood" are used interchangeably and refer to a readily identifiable portion of a community. Whether this consists of so many blocks, an entire neighborhood, or a section thereof, it should be of such size as to permit the local code enforcement team to inspect and systematically effect minimum housing standards within a manageable time.

This means that area inspection programs involve systematic cellar-to-roof, house-to-house, block-to-block inspections of all properties within the specific area and include all the follow-up work required to bring the substandard housing up to code standards within a reasonable period. By putting major emphasis on this type effort instead of on the complaint-oriented approach, blight is checked and an overall upgrading of residential sections is achieved in one portion of a community after another. Thus, systematic area inspection is both a longer lasting and a much more effective method of improving housing and stabilizing property values than the traditional complaint method.

Usually a municipality combines its area work with some complaint and referral inspections. This is not objectionable so long as major emphasis is given to the area programs, and the inspectors move through the various sections of town systematically. Only in this way can a community's housing inspection program contribute adequately to the municipal efforts to upgrade all substandard housing and stem the deterioration of individual homes and neighborhoods. A percentage of the inspection force should, however, be primarily assigned to complaint and referral work so that prompt action can be taken on all cases in which the problems are too severe to await action in connection with the area inspections.

While the area-wide or neighborhood inspections will correct violations of the housing code, this is all they will accomplish. Once these neighborhoods are brought up to standard, inspectors will move on to other neighborhoods but be forced to return at a later time and repeat the process.

If a neighborhood has declined to the extent that there is a large amount of housing violations, then it is obvious that something or someone or both have caused the neighborhood to deteriorate. Any effort that does not also eliminate the cause for deterioration can only be a token effort and frequently a wasted effort. Unless a housing program evaluates the total neighborhood for both housing violations and for environmental stresses within the neighborhood that may have caused the deterioration of the housing, then the inspectional effort has not been complete.

What then are these "environmental stresses"? Environmental stresses are the elements within a neighborhood that influence the physical, mental, and emotional well-being of the occupants. They include items such as noise, glare, excessive land covering, nonresidential land uses, and extensive traffic problems. If a housing program is to be complete, these stresses must be identified and assessed. Then efforts must be made in conjunction with other departments within the city to program capital improvement budgets to alleviate or minimize these stresses.

These two types of inspection are the field involvement of the housing inspector. He must inspect not only the houses for violations but also the neighborhoods for environmental stresses. This will provide him with knowledge of physical conditions within the neighborhood. As mentioned previously, however, this is not the whole problem in most neighborhoods. Generally, the very difficult problem of the human element is involved. Many buildings and neighborhoods deteriorate because of apathy on the part of the neighborhood inhabitants. Efforts must be made to motivate the slum dweller to work towards a better living environment. Experience by the Public Health Service (PHS) in motivational training has shown it to be very effective in raising the living standards of neighborhood populations.

In summary then, a housing inspection effort should be made up of three parts: First, a neighborhood or area-wide housing inspection procedure; second, a neighborhood analysis procedure to identify, assess, and eventually control environmental stresses; and third, a program of motivational training for slum dwellers to raise the living standards of the neighborhood .

III. Role of Health Agencies in Housing

Up until the end of World War II, most local housing hygiene programs were carried on by the health departments. After WW II! health agencies began to drift away from the field of housing hygiene. This gap was filled by a variety of other city agencies including building departments, police departments, fire departments. and more recently created departments of licenses and inspections. Regardless which department administers the housing code, the health department, if it is to live up to its responsibilities of protecting the public health, must have an involvement in housing. A general statement of PHS policy is that the basic responsibility of health agencies with regard to housing is to see to it that local and state governments take action to ensure that all occupied housing meets minimum public health standards. This basic responsibility falls upon federal, state. and local health agencies alike.

Several kinds of governmental action are required. These include: (I) adoption of minimum health standards in housing, (2) conduct of a program to achieve and maintain these standards, (3) periodic evaluation of the standards to ensure their current adequacy, and (4) monitoring of the standards enforcement effort to guarantee that public health values are provided. Health agencies, in order to meet their responsibilities, must accept the role of either stimulating or carrying out these four required kinds of governmental action.

In communities that have neither standards nor program, the health agency has the responsibility of initiating both by stimulating the required governmental action. Stimulation may be direct, through elected or appointed officials, or indirect, by generating public support that will trigger official action.

IV. Summary

Several basic thoughts are contained in this chapter.

A Housing is an old, well-established but often overlooked topic within this country. Indications are, however, that the broad field of housing will receive much more attention from the policy makers throughout the country within the coming years.

B No single agency can eliminate urban blight. A concentrated effort of all city departments, private concerns, and political bodies

must be focused on small sections (neighborhoods) to minimize or control urban blight and its associated human sufferings.

C A housing effort cannot be successful if it is merely an inspection of houses for code compliance. There must also be a united effort to eliminate environmental stresses within the neighborhood and instill motivation in slum dwellers to desire and work towards improving their environment.

REFERENCES

- President Lyndon B. Johnson's "Demonstration Cities" message to Congress, January 26, 1966.
- "Enforcement of Housing Codes," Harvard Law Review, Vol. 78. No. 4, Feb. 1965, p. 807.

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Chapter 2: The Housing Code

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Any housing code, regardless of who promulgates it, is basically an environmental health protection code. The hygiene of housing, correspondingly, is the area of environmental health that deals with man's most intimate living environment-his home and his neighborhood. Into the fabric of housing hygiene is woven a wide variety of health, safety, economic, social, and political factors.

Early housing codes primarily considered protecting only man's physical health; hence, they were enforced only in slum areas. More recently the realization has been made that if urban blight and its associated human suffering are to be controlled, the housing codes must consider both physical and mental health and must be administered uniformly throughout the community.

In preparing or revising the housing code, local officials must maintain a level of standards that will not merely be "minimal." These standards should maintain a living environment that contributes positively to healthful individual and family living. The fact that a small portion of housing fails to meet a desirable standard is hardly a legitimate reason for retrogressive modification or abolition of a standard. A housing code is merely a means to an end. The end is the eventual elimination of all substandard conditions within the home and neighborhood. This end cannot be reached if the community adopts an inadequate housing code. The adoption of a housing ordinance that establishes low standards for existing housing serves only to legalize and perpetuate an unhealthy living environment. Wherever local conditions are such that immediate enforcement of some standards within the code would cause undue hardship upon some individuals, it is better to provide a time interval for compliance than to eliminate an otherwise satisfactory standard.

I. Definitions

The following definitions of terms have been excerpted from "APHA - CDC Recommended Housing Maintenance and Occupancy Ordinance" and will be used throughout this manual. [1]

1. **Accessory Building or Structure** shall mean a detached building or structure in a secondary or subordinate capacity from the main or principal building or structure on the same Premises.
2. **Appropriate Authority** shall mean that person within the governmental structure of the corporate unit who is charged with the administration of the appropriate code.
3. **Approved** shall mean approved by the local or state authority having such administrative authority.
4. **Ashes** shall mean the residue from the burning of combustible materials.

5. **Attic** shall mean any story situated wholly or partly within the roof, and so designed, arranged or built as to be used for business, storage, or habitation.
6. **Basement** shall mean the lowest story of a building, below the main floor and wholly or partially lower than the surface of the ground.
7. **Building** shall mean a fixed construction with walls foundation and roof. such as a house, factory, or garage.
8. **Bulk Container** shall mean any metal garbage, rubbish, or refuse container having a capacity of two (2) cubic yards or greater and which is equipped with fittings for hydraulic or mechanical emptying, unloading or removal.
9. **Cellar** shall mean a room or group of rooms totally below the ground level and usually under a building.
10. **Central Heating System** shall mean a single system supplying heat to one (1) or more dwelling unit(s) or more than one (I) rooming unit.
11. **Chimney** shall mean a vertical masonry shaft of reinforced concrete, or other approved noncombustible, heat-resisting material enclosing one (I) or more flues, for the purpose of removing products of combustion from solid, liquid, or gaseous fuel.
12. **Dilapidated** shall mean no longer adequate for the purpose or use for which it was originally intended.
13. **Dormitory** shall mean a building or a group of rooms in a building used for institutional living and sleeping purposes by four (4) or more persons.
14. **Dwelling** shall mean any enclosed space wholly or partly used or intended to be used for living, sleeping, cooking, and eating; provided that temporary housing as hereinafter defined shall not be classified as a dwelling. Industrialized housing and modular construction which conform to nationally accepted industry standards and used or intended for use for living, sleeping, cooking, and eating purposes shall be classified as dwellings.
15. **Dwelling Unit** shall mean a room or group of rooms located within a dwelling forming a single habitable unit with facilities used or intended to be used by a single family for living, sleeping, cooking, and eating purposes.
16. **Egress** shall mean an arrangement of exit facilities to assure a safe means of exit from buildings.
17. **Extermination** shall mean the control and elimination of insects, rodents, or other pests by eliminating their harborage places; by removing or making inaccessible materials that may serve as their food; by poisoning, spraying, fumigating, trapping, or by any other recognized and legal pest elimination methods approved by the local or state authority having such administrative authority.
18. **Fair Market Value** shall mean a price at which both buyers and sellers are willing to do business.
19. **Family** shall mean one or more individuals living together and sharing common living. sleeping, cooking, and eating facilities (See also Household).
20. **Flush Water Closet** shall mean a toilet bowl which is Rushed with water which has been supplied under pressure and equipped with a water sealed trap above the floor level.
21. **Garbage** shall mean the animal and vegetable waste resulting from the handling, preparation, cooking, serving, and nonconsumption of food.
22. **Grade** shall mean the finished ground level adjacent to a required window.
23. **Guest** shall mean an individual who shares a dwelling unit in a non-permanent status for not more than thirty (30) days.
24. **Habitable Room** shall mean a room or enclosed floor space used or intended to be used for living, sleeping, cooking, or eating purposes, excluding bathrooms, water closet compartments, laundries, furnace rooms, pantries, kitchenettes and utility rooms of less than fifty (50) square feet of floor space, foyers, or communicating corridors, stairways, closets, storage spaces and workshops, hobby and recreation areas.
25. **Health Officer** shall mean the legally designated health authority of the (Name of Corporate Unit) or his authorized representative. (If the legally designated health authority has a title other than "Health Officer" the title of this authority should be substituted for "Health Officer" in this section and all other sections of this ordinance.)
26. **Heated Water** shall mean water heated to a temperature of not less than 120 F at the outlet.
27. **Heating Device** shall mean all furnaces, unit heaters, domestic incinerators, cooking and heating stoves and ranges, and other similar devices.
28. **Household** shall mean one or more individuals living together in a single dwelling unit and sharing common living, sleeping, cooking, and eating facilities (See also Family).
29. **Infestation** shall mean the presence within or around a dwelling of any insects, rodents, or other pests.
30. **Kitchen** shall mean any room used for the storage and preparation of foods and containing the following equipment: sink or other device for dishwashing, stove or other device for cooking, refrigerator or other device for cool storage of food, cabinets or shelves for storage of equipment and utensils, and counter or table for food preparation.
31. **Kitchenette** shall mean a small kitchen or an alcove containing cooking facilities.
32. **Lead-based Paint** shall mean any paint containing more lead than the level established by the U.S. Consumer Product Safety Commission as being the "safe" level of lead in residential paint and paint products.

33. **Meaning of Certain Words** Whenever the words "dwelling," "dwelling unit," "rooming units," "premises," and "structure" are used in the ordinance they shall be construed as though they were followed by the words "or any part thereof." Words used in the singular include the plural, and the plural the singular, the masculine gender includes the feminine and the feminine the masculine.
34. **Multiple Dwelling** shall mean any dwelling containing more than two dwelling units.
35. **Occupant** shall mean any individual, over one (1) year of age, living, sleeping, cooking, or eating in or having possession of a dwelling unit or a rooming unit; except that in dwelling units a guest shall not be considered an occupant.
36. **Operator** shall mean any person who has charge, care, control, or management of a building, or part thereof, in which dwelling units or rooming units are let.
37. **Ordinary Summer Conditions** shall mean a temperature 10?F below the highest recorded temperature in the locality for prior ten (10) year period.
38. **Ordinary Winter Conditions** shall mean a temperature 15?F above the lowest recorded temperature in the locality for prior ten (10) year period.
39. **Owner** shall mean any person who alone or jointly or severally with others:
    (a) shall have legal title to any premises, dwelling or dwelling unit, with or without accompanying actual possession thereof, or
    (b) shall have charge, care, or control of any premises, dwelling or dwelling unit, as owner or agent of the owner, or as executor, administrator, trustee or guardian of the estate of the owner.
40. **Permissible** Occupancy shall mean the maximum number of individuals permitted to reside in a dwelling unit, rooming unit. or dormitory.
41. **Person** shall mean and include any individual, firm, corporation, association, partnership, cooperative, or governmental agency.
42. **Plumbing** shall mean and include all of the following supplied facilities and equipment: gas pipes, gas burning equipment, water pipes, garbage disposal units, waste pipes, water closets, sinks, installed dishwashers, lavatories, bathtubs, shower baths, installed clothes washing machines, catch basins, drains, vents, and any other similar supplied fixtures, and the installation thereof, together with all connections to water, sewer, or gas lines.
43. **Premises** shall mean a platted lot or part thereof or unplatted lot or parcel of land or plot of land, either occupied or unoccupied by any dwelling or non dwelling structure, and includes any such building, accessory structure. or other structure thereon.
44. **Privacy** shall mean the existence of conditions which will permit an individual or individuals to carry out an activity commenced without interruption or interference, either by sight or sound by unwanted individuals.
45. **Properly Connected** shall mean connected in accordance with all applicable code and ordinances of this (Name of Corporate Unit) as from time to time enforced; provided, however, that the application of this definition shall not require the alteration or replacement of any connection in good working order and not constituting a hazard to life or health.
46. **Rat Harborage** shall mean any conditions or place where rats can liven nest, or seek shelter.
47. **Ratproofing** shall mean a form of construction which will prevent the ingress or egress of rats to or from a given space or building, or from gaining access to food, water, or harborage. It consists of the closing and keeping closed of every opening in foundations, basements, cellars, exterior and interior walls, ground or first floors, roofs, sidewalk gratings, sidewalk openings, and other places that may be reached and entered by rats by climbing, burrowing or other methods, by the use of materials impervious to rat gnawing and other methods approved by the (Appropriate Authority).
48. **Refuse** shall mean all putrescible and nonputrescible solids (except body wastes) including garbage, rubbish ashes, and dead animals.
49. **Refuse Container** shall mean a watertight container that is constructed of metal, or other durable material impervious to rodents, that is capable of being serviced without creating insanitary conditions, or such other containers as have been approved by the (Appropriate Authority). Openings into the container such as covers and doors shall be tight fitting.
50. **Rooming House** shall mean any dwelling other than a hotel or motel or that part of any dwelling, containing one (1) or more rooming units, or one (1) or more dormitory rooms and in which persons either individually or as families are housed with or without meals being provided.
51. **Rooming Unit** shall mean any room or group of rooms forming a single habitable unit used or intended to be used for living and sleeping, but not for cooking purposes.
52. **Rubbish** shall mean nonputrescible solid wastes (excluding ashes) consisting of either:
    (a) combustible wastes such as paper, cardboard, plastic containers, yard clippings, and wood; or
    (b) noncombustible wastes such as cans, glass, and crockery.
53. **Safety** shall mean the condition of being reasonably free from danger and hazards which may cause accidents or disease.
54. **Space Heater** shall mean a self-contained heating appliance of either the convection type or the radiant type and intended primarily to heat only a limited space or area such as one room or two adjoining rooms.

55. **Supplied** shall mean paid for, furnished by, provided by, or under the control of the owner, operator, or agent.
56. **Temporary Housing** shall mean any tent, trailer, mobile home or any other structure used for human shelter which is designed to be transportable and which is not attached to the ground, to another structure, or to any utility system on the same premises for more than thirty (30) consecutive days.
57. **Toxic Substance** shall mean any chemical product applied on the surface of or incorporated into any structural or decorative material which constitutes a potential hazard to human health at acute or chronic exposure levels.
58. **Variance** shall mean a difference between that which is required or specified and that which is permitted .

II. Background of Housing Codes in the United States

To assist municipalities with the development of legislation necessary to regulate the quality of housing, the Committee on the Hygiene of Housing, American Public Health Association, prepared and in 1952, published a proposed housing ordinance. This provided a prototype on which such legislation might be based and has served as the basis for countless housing codes enacted in the United States since that time. Some municipalities enacted it without change. Others made revision by omitting some portions, modifying others, and sometimes adding new provisions.

In the ensuing years this ordinance was revised in 1969 and 1971.

In 1975, the American Public Health Association and the Public Health Service's Center for Disease Control jointly undertook the job of rewriting and updating this model ordinance. The new document, entitled "APHA- CDC Recommended Housing Maintenance and Occupancy Ordinance," is the most recent model ordinance available. This new ordinance is one of several model ordinances available to communities to consider when they are interested in adopting a housing code.

One must keep in mind when considering the adoption of any model code that the code is, as stated, merely a model. The community should read and consider each element within the model code to determine its applicability to that community. As previously stated, however, a housing code is merely a means to an end. The end is the eventual elimination of all substandard conditions within the home and the neighborhood. This end cannot be reached if the community adopts an inadequate housing code.

III. Objectives of a Housing Code

The Housing Act of 1949 gave new impetus to existing local, state, and Federal housing programs directed towards the elimination of poor housing and the production of sound and decent housing. In passing this legislation, Congress defined a new national objective by declaring that the general welfare and security of the nation and the health and living standards of its people .. . require a decent home and a suitable living environment for every American family. This mandate generated an awareness that the quality of housing and residential environment has an enormous influence upon the physical and mental health and the social well-being of each individual and, in turn, upon the economic, political, and social conditions in every community. Consequently, public agencies, units of government, professional organizations, and others sought ways to ensure that the quality of housing and the residential environment did not depreciate or deteriorate.

It soon became apparent that a new type of legislation was needed, namely, ordinances that regulate the supplied facilities and the maintenance and occupancy of dwellings and dwelling units, or as they are more commonly called, "housing codes." The objective of a housing code is to establish minimum standards essential to make dwellings safe, sanitary, and fit for human habitation by governing the condition and maintenance, the supplied utilities and facilities, and the occupancy.

IV. Limitations

A housing code is limited in its effectiveness by several factors. First, if the housing code does not contain ***standards that adequately protect the health and well being of the individuals,*** it cannot be effective. The best trained soldier, if armed only with a pea shooter, can accomplish little positive action in a battle. Similarly, the best trained housing inspector, if not armed with an adequate housing code, can accomplish little good in the battle against urban blight.

A second factor affecting the quality of the housing administration effort is the ***budget of the housing group***. If the housing effort is directed, because of limitations of funds and personnel, to the fire-fighting efforts of complaint answering, then the

community can expect to lose the battle against urban blight. It is only through a systematic enforcement effort by an adequately sized staff of properly trained inspectors that the battle can be won.

A third factor that can affect the housing effort is the ***attitude of the political bodies within the area.*** A properly administered housing program will require the upgrading of substandard housing throughout the community. Frequently, this results in political pressures being exerted to prevent the enforcement of the code in certain areas of the city. If the housing effort is backed properly by all political elements, blight can be controlled and eventually eliminated within the community. If, however, the housing program is not permitted to choke out the spreading influence of substandard conditions urban blight will spread like a cancer. engulfing greater and greater portions of the city. Similarly, an effort directed only at the most serious blocks in the city will merely upgrade those blocks while the blight spreads elsewhere. If a cancer is to be controlled, it must be cut out in its entirety. If urban blight is to be controlled, it also must be cut out in its entirety.

A fourth element that limits the ability of a housing program is ***whether or not the housing program is supported fully by the other departments within the city.*** Regardless of which city agency administers the housing program, the other city agencies must support the activities of the housing program. In addition, great effort should be expended to obtain the support and cooperation of the community as a whole towards the housing effort. This can be accomplished through public awareness and public information programs. These two programs should never be undersold. They can provide considerable support or considerable resistance to the efforts of the program.

A fifth limitation to an effective housing program is an ***inadequately or improperly trained inspectional staff.*** The housing inspector should have considerable training and considerable capabilities if the effort is to accomplish much good. He should have a basic knowledge and general understanding of the principles involved in many related areas. He should have the capability of evaluating whether a serious or a minor problem exists in matters ranging from a structural stability of a building to the health and sanitary aspects relating to the structure. A housing inspector cannot be expected to accomplish his job properly unless he is given sufficient training so as to prepare him to be able to make basic judgments regarding the severity of problems. Since the housing inspector is a generalized inspector, it is not intended that he should become an expert in all areas such as building, electrical, or health inspection. It is merely intended that he should be able to distinguish whether a problem warrants immediate referral to another department or whether it can be handled through routine channels.

A sixth item that frequently restricts the effectiveness of a housing administration effort ***is the fact that many housing groups fail to do a complete job of evaluation of the housing problems.*** In many cases, the inspectional effort is restricted to merely evaluating what conditions exist with little or no thought given to why these conditions exist. If a housing effort is to be successful, it must consider why the homes deteriorated. Was it because of environmental stresses within the neighbor hood that need to be eliminated or was it because of apathy developed on the part of the occupants? In either case, if the causative agent is not removed, then the inspector faces an annual problem of maintaining the quality of that residence. It is only by eliminating the causes of deterioration that the quality of the neighborhood can be maintained. These, then, are a few of the principal limitations that affect the quality of a housing administration effort.

V. Content

What then are the general items that should be included in a housing code? Although all comprehensive housing codes or ordinances contain a number of common elements, the provisions of any two or more communities on the same element or elements will usually vary to some extent. This is true whether the codes be national or state models, those of a northern, eastern, southern, or western municipality, or even of two or more communities within the same state or region. These variations stem from differences in local policies, preferences, and to a lesser extent, needs. They are also influenced by the standards set by the related provisions of the diverse building, electrical, and plumbing codes in use in the municipality.

Within any housing code there are generally five major sections. These sections are listed and discussed in more detail both in the following pages and to a degree in the Legal Aspects chapter of this manual. The five major features are:

A Definitions of terms used in the code.

B Administrative provisions showing who is authorized to administer the code and the basic methods and procedures that must be followed in implementing and enforcing the sections of the code. The administrative sections deal with items such as what are reasonable hours of inspections; when service of violation notices is and is not required; how to notify

either the absentee owner when he can or cannot be contacted in person or through a legally responsible agent, or the resident-owner or tenant; how to process and conduct hearings; what rules to follow in processing dwellings alleged to be unfit for human habitation; how to occupy or use dwellings finally declared fit.

C Substantive provisions specifying the various types of health. building, electrical, heating, plumbing, maintenance, occupancy, and use conditions that constitute violations of the housing code. These provisions can also be and often are grouped into three main categories, namely, (I) minimum facilities and equipment for dwelling units, (2) adequate maintenance of dwellings and dwelling units as well as their facilities and equipment, and (3) the occupancy conditions of dwellings and dwelling units.

D Court and penalty sections outlining the basis for court action and the penalty or penalties to which the alleged violator will be subjected if he is proved guilty of violating one or more provisions of the code.

E Enabling, conflict, and unconstitutionality clauses providing for the date a new or amended code will take effect, prevalence of more stringent provision when there is a conflict of two codes, severability of any part of the ordinance that might be found unconstitutional and retention of all other parts in full course and effect. In any city following the format of the "APHA - CDC Recommended Housing Maintenance and Occupancy Ordinance," the Health Officer or other supervisor in charge of housing inspections will also adopt appropriate housing rules and regulations from time to time to clarify or further refine the provisions of the ordinance. This has been done, for example, by the Commissioners of Health in Baltimore, Maryland and Milwaukee, Wisconsin, and by the District of Columbia's Department of Licenses and Inspections. In contrast, some municipalities such as Fort Worth, Texas; St. Louis, Missouri; and Chicago, Illinois, have tended to make their housing codes broader in the first place and subsequently have relied more on amendments to their ordinances rather than on numerous rules and regulations. Either method has its advantages, and so local practice will often help determine which is used.

Where the rules and regulations method is used, care should be taken that the department is not overburdened with a number of minor rules and regulations. Similarly, a basic housing ordinance that encompasses all rules and regulations might have difficulty because any amendments to it require action by the political element of the community. Some housing groups, in attempting to obtain amendments to the ordinance, have had the entire ordinance thrown out by the political bodies.

VI. Administrative Elements of a Housing Code

The administrative procedures and powers of the housing inspection agency, its supervisors, and staff, which are outlined in a housing code are similar to its other provisions in that all are based upon the police power of the state to legislate for public health and safety. In addition, the administrative provisions, and to a lesser extent, the court and penalty provisions, outline how the police power is to be exercised in administering and enforcing the code.

Generally, the administrative elements deal with the procedures to follow for ensuring that the constitutional doctrines of reasonableness, equal protection under the laws, and due process of law are observed. They must also guard against violation of its prohibitions against unlawful search and seizure, impairment of obligations of contract, and unlawful delegation of authority. These factors encompass items of great importance to housing inspection supervisors such as the inspector's right of entry, reasonable hours of inspection, proper service, and the validity of the provisions of the housing codes they administer. All are described and discussed generally, in light of United States Supreme Court and state supreme court tests and decisions, in the publication entitled, "The Constitutionality of Housing Code."2 This publication is a clear and excellent source of information about the constitutional administration of housing codes.

A Determination of Legal Owner of Record

In some communities the importance of ascertaining the legal owner of record is not fully understood by the housing inspection supervisors and inspectors. Consequently, they lose cases in court because they have not taken action against the proper party. This problem often arises in connection with "land contract of sale" properties, where the legal deed never passes to the purchaser until he has paid for the property completely. In these cases, the person who is selling the property is the rightful owner and the action should be taken against him.

The method of obtaining the name and address of the legal owner of a property in violation varies from place to place. Ordinarily a check of the city tax records will suffice unless there is reason to believe these are not up to date on the property in question. In the latter case, a further check of county or parish records will turn up the legal owner if state law requires him to register his deed there. If it does not, the advice of the municipal law department should be sought about the next steps to follow.

B Due Process Requirements

Every notice, complaint. summons, or other type of legal paper concerning alleged housing code violations in a given dwelling or dwelling unit must be legally sewed on the proper party. This might be the owner, his agent, or the tenant, as required by the code, in order to be valid and to prevent harassment of innocent parties. It is quite customary to require that the notice(s) to correct existing violations and any subsequent notices or letters to the violator be served by certified or registered mail with return receipt requested. The receipt serves as proof of service if the case has to be taken to court.

Due process requirement also calls for clarity and specificity with respect to the alleged violations, both in the violation notices and the court complaint-summons. For this reason, special care must be taken to be complete and accurate in testing the violations and charges. To illustrate, rather than direct the violator "to repair all windows where needed" he should be told exactly which windows and what repairs are involved. Unless he is so advised, his attorney has a built-in defense against the city's case.

The chief limitation on the due process requirement, with respect to service of notices, lies in cases involving immediate threats to health and safety. In these instances, the inspection agency or its representative may, without notice or hearing, issue an order citing the existence of the emergency and requiring such action to be taken as is deemed necessary to meet the emergency.

C Hearings and the Condemnation Power

The purpose of a hearing is to give the alleged violator an opportunity to be heard, if he wishes, before further action is taken by the housing inspection agency. These hearings may be very informal, involving meetings between a representative of the agency and the person ordered to take corrective action. They may also be formal hearings at which the agency head presides and the city and the defendant both are entitled to and usually are represented by counsel and expert witnesses. Each type will be discussed below.

?Informal Hearings- A violation notice may raise questions in the mind of the violator or may be served on him at a time when personal hardships or other factors prevent him from meeting the terms of the notice. Therefore, many housing codes afford him an opportunity to have a hearing at which he may discuss his questions or problems and seek additional time or some modification of the order. Administered in a firm but understanding manner, these hearings serve as invaluable aids in relieving needless fears of those involved, in showing how the inspection program is. designed to help them, and in winning their voluntary compliance.

Formal Hearings - These are quasi-judicial hearings - even though the prevailing court rules of evidence do not control-from which an appeal may be taken to court. All witnesses must therefore be sworn, and a stenographic record of the proceedings must be made.
The formal hearing is used chiefly as the basis for determining whether a dwelling is or is not fit for human habitation, occupancy, or use. In the event it is proved "unfit," the building is condemned as such and the owner is given a designated amount of time either to rehabilitate it completely or to demolish it. Where local funds are available or the new Federal demolition grant program is in effect, if the owner fails to obey the order within the time specified, the municipality may demolish his building and put a lien against the property to cover demolition costs.
This type of "condemnation" hearing is a very effective means of stimulating prompt and appropriate corrective action when it is administered fairly and firmly. This is particularly true if the community funds are available for demolition action when the owner proves reluctant or unwilling to obey the order.
In some places, such as Oakland, California, the housing inspection agency is permitted only to order unfit buildings repaired or vacated until they are repaired. In others, such as Jersey City, New Jersey, the local ordinance also empowers the housing inspection agency to order these buildings demolished by the city if the owners fail to repair or demolish.

D Special Features for Coping with Common Problems

Limitation of Occupancy Notification -This technique was pioneered by Wilmington, Delaware. It makes it mandatory for property owners in the community to obtain legal notice from the housing inspection agency of the maximum number of persons that may occupy each of their dwelling or rooming units. It also requires these owners to have a residence, place of business, or an agent for their properties within the community. The agent should be empowered to take remedial action on any of the properties found in violation. In addition, if the property is sold, the new owner must obtain a new Limitation of Occupancy Notification. The fee charged is nominal.

Request Inspections-California and Pennsylvania are among the states that permit their municipalities to offer a request inspection service. In return for a fee, the housing inspector will inspect a property for violations of the housing code before its sale so that the buyer can learn its condition in advance. Some communities require owners to notify prospective purchasers of any outstanding notice of violations they have against their property before the sale. If they fail to do so and their properties are in violation, the code holds them liable to civil action by the purchaser and quasi-criminal action by the inspection agency as housing code violators.

Tickets for Minor Offenses-Denver, Colorado, has used this method of token fines to prod minor violators and first offenders into correcting without the city resorting to court action. There are mixed views about this technique because it is so akin to formal police action. The inspection agency's primary function is to achieve compliance rather than to punish a criminal for a crime that cannot be "corrected" once the damage has been done. Nevertheless, if the action stimulates compliance and reduces the amount of court action needed to achieve it, the ticket technique will undoubtedly spread.

E Other Administrative Aids: Forms and Form Letters

There is tremendous diversity in these aids, yet many small communities have little information about them. The reason for this is that no one in the nation has developed a "housing inspection library" of standard forms and letters.

Before describing a fairly typical set of forms and form letters, it should be stressed that inspectional forms to be used for legal notices must (a) satisfy legal standards of the code, (b) be meaningful to the owner and sufficiently explicit about the extent and location of particular defects, (c) be adaptable to statistical compilation for the governing body reports, and (d) be written in a manner that will facilitate clerical and other administrative usage.

The Daily Report Form-This form gives the inspection agency an accurate basis for reporting, evaluating, and. if necessary, improving the productivity and performance of its inspectors.

Complaint Form-This form helps in obtaining full information from the complainant and thus makes the relative seriousness of the problem clear and reduces the number of crank complaints.

No Entry Notice-This advises occupant or owner that inspector was there and notifies him he must call and make an appointment or face legal action.

Inspection Report Form - This is the most important form in the agency. It comes in countless varieties ranging from manual, to key punch, to "automated" and from almost complete write-in to almost complete check-off types. If it is designed properly, it will (a) ensure more productivity and more thoroughness by the inspectors, (b) reduce the time spent in writing reports, (c) locate all violations correctly, and (d) reduce time required for typing violation notices. Forms may vary widely in sophistication from a very simple form to those whose components are identified by number for use in processing the case by automation. Some forms are a combined inspection report and notice form in triplicate so that the first page can be used as the notice of violation, the second as the office record, and the third as the guide for reinspection. A covering form letter notifies the violator of the time allowed to correct the conditions listed in the report-notice.

Violation Notice-This is the legal notice to the owner or tenant that the specified housing code violations in his property or dwelling unit exist and must be corrected within the indicated amount of time. It may be in the form of a letter that includes the list of alleged violations or has a copy of these attached. It may be a standard notice form, or it may be a combined report-notice. Regardless of the type used, each should make the location and nature of all violations clear and specify the exact section of the code that covers each one. The notice must advise the violator of his right to a hearing. It should also indicate that he has a right to be represented by counsel and that failure to obtain counsel will not be accepted as grounds for postponing a hearing or court case.

Hearing Forms-These should include a form letter notifying violator of date and time set for his hearing, a standard summary sheet on which the supervisor can record the facts presented at an informal hearing, and a hearing-decision letter for notifying all concerned of the hearing results. The latter should include the names of the violator, inspector, law

department, and any other city official or agency that may be involved in the case.

Reinspection Form Letters or Notices-These have the same characteristics as the Violation Notice previously referred to except that they cover the follow-up orders given to the violator who has failed to comply with the original notice within the time specified. Some agencies may use two or three types of these form letters to accommodate different degrees of response by the violator. Whether one or several are used, standardization of these will expedite the processing of cases.

?Court Complaint and Summons Forms-These forms advise the alleged violator of the charges against him and summon him to appear in court at the specified time and place. It is essential that the housing inspection agency work closely with the municipal law department in the preparation of these forms so that each is done in exact accord with the rules of court procedure in the state and community.

Court Action Record Form-This is not a very prevalent form, but it should be, for it provides an accurate running record of the inspection agency's court actions and their results.

If a housing inspection agency does not include all of these forms and form letters in its basic kit, it should move to introduce the needed additions. Although it will take some time to arrive at the best forms to meet local needs, once they are put into use they will result in marked savings of time.

VII. Substantive Provisions of a Housing Code

A discussion of the substantive provisions of a housing code will be divided into three main categories. Discussions follow on each of these categories.

A Minimum Facilities and Equipment for Dwelling Units

What are the minimum facilities and equipment that should be required for a dwelling unit? Keep in mind during this discussion that a dwelling unit must have provisions for preparing at least one regularly cooked meal per day within the unit. Minimum equipment should include a kitchen sink in good working condition and properly connected to the water supply system approved by the appropriate authority. It should provide, at all times, an adequate amount of heated and unheated running water under pressure and should be connected to a sewer system approved by the appropriate authority. Cabinets or shelves, or both, for the storage of eating, drinking, and cooking utensils and food should be provided. These surfaces should be of sound construction and made of material that is -easily cleanable and that will not impart a toxic or deleterious effect to the food. In addition, a stove and refrigerator should be provided. Within every dwelling there should be a nonhabitable room that affords privacy and is equipped with a flush water closet in good working condition. Within the vicinity of the flush water closet a lavatory sink should be provided. In no case should a kitchen sink be permitted to substitute as a lavatory sink. In addition, within each dwelling unit there should be provided, within a room that affords privacy, either a bathtub or shower or both, in good working condition. As mentioned in the discussion of the kitchen sink, both the lavatory basin and the bathtub or shower or both should be equipped with an adequate amount of heated and unheated water under pressure. Each should be connected to an approved sewer system. Obviously, within each dwelling unit two or more means of egress should be provided to safe and open space at ground level. Provisions should be incorporated within the housing code to meet the safety requirements of the state and community involved. The housing code should spell out minimum standards for lighting and ventilation within each room in the structure. In addition, minimum thermal standards should be provided. Although most codes merely provide the requirement of a given temperature at a given height above floor level, the community should give consideration to the use of "effective temperatures." The effective temperature is a means of incorporating not only absolute temperature in degrees but also humidity and air movement. This mechanism gives a better indication of the comfort index of the room.

B Adequate Maintenance of Dwellings and Dwelling Units and of Their Facilities and Equipment

The code should spell out provisions that no person shall occupy or let for occupancy any dwelling or dwelling units that do not comply with stated requirements. Generally, these requirements specify that the structure be in sound condition and good repair regarding foundation, roof, exterior walls, doors, window space and window condition; that it be damp-free, watertight and reasonably weather tight; that all structural surfaces be sound and in good repair. These provisions basically state that any necessary repairs should be made before the unit is relet to new occupants. For detailed information regarding these items, see Section VII of the 1975 "APHA-CDC Recommended Housing Maintenance and Occupancy Ordinance."

C The Occupancy Conditions of Dwellings and Dwelling Units

Occupancy provisions- -set maximum density standards within dwelling units. Generally, they require a given quantity of square footage of space for sleeping area. Requirements in this section restrict the number of basic families permitted within any one dwelling unit. They state, in addition, the minimum ceiling heights, and closet space.

The housing code is the basic tool of the housing inspector. This code spells out what he may and may not do. It sets the requirements he will enforce and provides him with his basis for action. A housing effort can be no better than the code allows.

REFERENCES

- APHA CDC Recommended Housing Maintenance and Occupancy Ordinance. DHEW Publication No (CDC) 75-8299. Atlanta, 1975.
- Constitutionality of Housing Codes. 2nd Edition 1964, National Association of Housing and Renewal Officials. Washington, D.C.

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Centers for Disease Control and Prevention
National Center for Environmental Health

Chapter 3: Health and Sanitary Elements of A Housing Inspection

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I. Background Factors

Benjamin Franklin said "Sir I respectfully submit that we can give advice but we cannot give conduct."

In dealing with public we must give to our fullest capacity. Sometimes what we believe are frustrations peculiar to inspectors of housing are actually the same frustrations experienced by inspectors in many other fields. In fielding with the public, it is our duty to perform officially, teach where possible, and use the big stick only when necessary. Our manner must be forth-right and that of a tutored professional. A housing inspector is the key person in a local housing hygiene program since he is the local representative dealing with the grass roots problems. Unless the inspector is a sanitarian, he is not prepared or expected to function as a sanitarian. There must, however, be a rapport between the housing inspector and the sanitarian to achieve the united action that will result in the achievement of greater health, safety, and welfare of the community. This is brought about by joint and supporting actions of the housing inspector brings him into contact with health problems more ofter than the work of the average sanitarian does. If both parties wish to do their respective jobs well, then they should develop an arrangement of mutual support and assistance.

II. Major Health and Sanitary Factors

A comprehensive housing ordinance or code includes minimum requirements for adequate heat, light, ventilation, sanitation, space, and occupancy. Various studies have provided evidence of the relaitionship between unsanitary conditions, overcrowding, inadequate heat, light, and ventilation and health problems such as the tranmission of various diseases and infections. Studies to evaluate the effects of conditions within man's living environment upon his mental health and emotional stability are being undertaken by the U.S. Public Health Service. Within all comprehensive housing ordinances, there are appropriate standards for the important health and sanitation factors.

A Heat

Minumum inside heating temperatures vary little throughout the country except for the marked difference between the localities with very mild or very cold climates. Some state and local housing codes have set 70?F as the minimum standard. They vary, however, on the outside temperature that must prevail before the inside statdard of 70?F must be met. The 1975 "APHA-CDC Recommended Housing Maintenance and Occupancy Ordinance," for example, required it to be maintained under *ordianry minimum winter conditions*. Of necessity, therefore, you must be guided by your local code for quantitative standards. If there are no quantitative standards in your local code, Table No. 1 in Chapter 26 of the "American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE), Handbook of Fundamentals", gives minimum design temperatures for different areas of the country under winter conditions. The publication is readily available from most public libraries.

The "APHA-CDC Recommended Housing Maintenance and Occupancy Ordinance" states that a temperature of at least 68?F at a

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distance of 36 inches above the floor level should exist. ASHRAE states that the temperature should be measured at the breathing line 5 feet above the floor or at the seating level 30 inches above the floor in a location where the temperature-sensing device is not exposed to a condition of abnormal heat gain or heat loss. Local code requirements should, however, prevail. If the local code does not give a specific statement, any of the previously mentioned methods may be used, but every housing inspector in the community should measure the temperature the same way.

B Thermal Environment

One of the basic requirements in healthful housing is maintenence of a thermal environment that will avoid undue heat loss from the human body. Heat loss results in lowered resistance, particularly to respitory tract infections, and to some extent all other infections.

Room temperatures vary considerably from floor to ceiling. Since hot air rises, the coolest temperature will be found near the floor and the warmest near the ceiling. The temperature of 70?F maintained near the ceiling might be far from adequate for protection required. Therefore, as mentioned earlier, the 1975 APHA-CDC Recommended Ordinance specifies that temperature measurements for the determination of compliance with requirements be made at a level approximately 36 inches from the floor. This ensures that children, even the younger children who are most active, are in an area where the temperature is sufficiently warm to give them the protection they need. It also assures the less active adults a location in an area where the temperatures are at a desirable level.

C Natural Light

Most municipalities require at least one window or skylight facing directly to the outdoors for every habitable room. They are also in general agreement that this window area or skylight area be 10% of the total floor area of the room. Note here that a window located less than 3 feet from an outside wall or other structure that extends above the ceiling level of the room is not deemed to face directly to the outdoors. A window that faces directly into a completely enclosed court is counted as facing directly to the outdoors as long as the court is greater than 3 feet in its least dimensions.

Daylight should be used as fully as possible in all buildings no matter how adequate other forms of light may be. Satisfactory natural illumination depends upon the intensity of daylight or sky brightness and the amount, distribution, and quality of this light in a room. Natural light is particularly important in low-income housing where artificial lighting will be held to a minimum. Light is important in showing up dirt and thus leads to more cleanliness within the home. The bactericidal effect of light transmitted through glass is questionable. The bright, naturally lit room is, however, certainly more conductive to healthy mental attitudes than a dim. dark room lit only by artificial sources.

In different parts of the country different standards of window size are possible. For instance in a sunny climate, such as that found in the southwestern desert. a smaller window area would supply adequate illumination and may be desirable to prevent excessive glare in a room. In a climate in the northern part of the country. however 10% of the floor area should be a minimum for window area in consideration of the reduced amount of sunlight present. especially in the winter time.

The lighting requirements shall be deemed satisfactory if every habitable room has one window facing directly to the outdoors and the total window area in each habitable room is at least 10% of the floor area of that room. In computing window areas no deduction is made for sashes and trim used to hold the glass panes in place. If a skylight type of window on the ceiling of the habitable room serves as the only window in the room, the area of the horizontal projection of the skylight should also be at least 10% of the total floor area of the room. In a room with both a window and a skylight the total area of both should be at least 10% of the floor area.

D Artificial Light

It is a common requirement that every habitable room have two separate floor- or wall-type convenience outlets or else one such convenience outlet and one supplied ceiling-type electrical light fixture. It is also required that public halls and stairways be sufficiently lighted at all times in such a manner as to allow safe travel back and forth. The 1975 APHA-CDC Recommended Ordinance states that every habitable room and nonhabitable room used for food preparation shall have two wall-type duplex electric convenience outlets or one such duplex convenience outlet and one supplied wall or ceiling-type electric light fixture. No

duplex outlet shall serve more than two fixtures or appliances.

Every water closet compartment, bathroom, kitchen or kitchenette, laundry room, furnace room, and public hall shall contain at least one supplied ceiling or wall-type electric light fixture. Convenient switches or equivalent devices for turning on one light for each room or passageway shall be located so as to permit the area ahead to be lighted.

Every public hall and stairway in a multiple dwelling shall be adequately lighted by natural or electric light or both at all times so as to provide in all parts at least 10 foot candles of light at the tread or floor level. If the structure contains not more than two dwelling units this light may be controlled by a switch and be turned on when needed instead of being turned on full time.

Electricity is as essential to the modern home as heating or ventilation. It has long replaced gas kerosene. and other utilities for lighting because it is more economical and, when properly used, safer. It has, probably more than any other single item, made practical the use of labor-saving devices for household tasks and thereby promoted the cleanliness of both the dwelling and the person.

Since the mid-1930's, electricity has been provided even to the most remote areas. Individual electrical generating units are available for use in places where industry or government has not provided electricity to the homeowner. Only the most backward and most primitive areas of this country are today without service of this utility. Certainly, all metropolitan areas have electricity, and there is no reason why this servant of mankind should not be available in the home.

The 1975 "APHA-CDC Recommended Housing Maintenance and Occupancy Ordinance" allows a dwelling that is located more than 300 feet from the nearest electrical source to be without this service; however, there are very few dwellings left in the populated areas of this country that do not have, within 300 feet, the lines of the local electric utility.

Although electricity is a valuable servant, it can also be a severe safety hazard. Among the most common faults in providing electrical service is the furnishing of inadequate outlets. This results in overloading of the lines, causing possible overheating of wires and fixtures and subsequent fire hazards. Improperly installed facilities and outlets furnish a fire hazard, as well as a safety hazard, particularly to small children.

When inadequate outlets are provided there is a tendency, particularly among the poorly educated, to connect many high-wattage items such as toasters, irons, televisions, and other similar items to a single outlet.

Kitchen, living rooms, and rooming units are most likely to contain several electrical appliances in addition to the lighting fixtures. This is not necessarily true in toilet rooms, laundry rooms, furnace rooms, and public hallways. It is very important therefore, that rooms most likely to have a large number of appliances be required to have an adequate number of outlets in order to prevent overloading of circuits and installation of amateurish and possibly hazardous extension wiring.

E Ventilation

The ordinance requirement for the total openable window area in every habitable room is 45 percent of the minimum window area except where an approved mechanical means of ventilation is installed.

Adequate ventilation is essential in meeting many of the fundamental needs in housing. Among these are the maintenance of a thermal environment that will permit adequate heat loss from the human body, provision of an atmosphere of reasonable chemical purity, and provision of possibilities for esthetic satisfaction in the home and its surroundings.

The factors controlling heat loss in the body are air temperature, mean radiant temperature of surrounding surfaces, relative humidity, and air movement. It is particularly important that cool, moving air be made available in sleeping rooms since the impact of cool air is of great value in promoting healthful sleep. Moreover, odors given off by the body exert a definitely harmful influence on appetite and therefore upon health. There can be no doubt that the well-ventilated home, like the well illuminated home, is more conducive to healthful mental attitudes than a poorly ventilated or poorly illuminated home.

Every bathroom and toilet room should comply with the housing ordinance's light and ventilation requirements for habitable

rooms except that windows or skylights should not be required if the ventilation system is adequate. Many codes state that mechanical means must provide at least two to six changes of air per hour.

As has been previously mentioned, light promotes cleanliness. This is particularly important in bathrooms and toilet rooms, where cleanliness is essential to sanitation and proper attitudes are essential to cleanliness. Ventilation is also necessary in these rooms because they are subject to a high concentration of body odors and humidity. Since these rooms are frequently located, for economical construction reasons, within the inner part of the structure and away from the exterior walls, windows and skylights are not always practical. The provision of artificial light sources and mechanical ventilation will, therefore, accomplish the basic purposes of light and ventilation requirements and at the same time meet practical standards of construction .

F Space and Occupancy

The maximum density of occupancy for any dwelling unit has been set by the APHA-CDC Ordinance at 150 square feet of total habitable room area for the first occupant and 100 square feet of floor space for every additional occupant, with the floor space calculated on the basis of total habitable room area. The ordinance further requires that the total number of persons allowed may not be more than twice the number of habitable rooms in the dwelling unit.

If more than one family plus two occupants unrelated to the families, not including guests or domestic employees, are to occupy a dwelling unit, a permit for a rooming house must be granted by the appropriate local authority.

The ceiling height of any habitable room is set at a minimum of 7 feet except in rooms under a sloping ceiling. In those instances at least one half of the floor area must have a minimum ceiling height of 7 feet. The floor area located under the portion of the room where the ceiling height is less than 5 feet may not be used in computing total floor area of the room when the maximum permissible ccupancy is being determined.

Space located up to 4 feet below the grade of the ground may not be used as a habitable room unless approved by the appropriate authority in writing.

In dwelling units of two or more rooms, each sleeping room must contain at least 70 square feet of floor space for the first occupant, and at least 50 square feet of floor space for each additional occupant .

Dwellings or dwelling units containing two or more sleeping rooms must have a room arrangement that permits access to the bathroom or water closet without passage through another sleeping room.

Other space requirements state that each dwelling unit shall have at least 4 square feet of floor-to-ceiling-height closet space for the personal effects of each permissible occupant. If this space is lacking, in whole or in part, an amount of square footage equal to the space deficiency shall be subtracted from the computed area of habitable room space used in determining permissible occupancy.

Overcrowding in housing is one of the greatest contributing factors in the transmission of diseases, particularly those of the respiratory tract. In addition, crowding violates one of the basic maxims of healthful housing-the need for privacy of the individual. Privacy in the home and privacy in the use of sleeping bath, and toilet rooms dictate that the user must be able to use these facilities without violating the privacy of another person or without having his privacy violated by another. Crowding makes proper cleansing and maintenance difficult and less likely to be done.

Rooms, to be considered habitable, must be of a size sufficient for use by normal-size people. Any room in which half the total floor area is usable only with difficulty, in which the ceiling is too low, or in which a person has problems moving around can hardly be considered habitable.

The use of below-grade space as habitable rooms in dwelling units is allowed basically to permit use of the so-called English Basement and Garden Apartment, which would otherwise meet the code requirements, since it conforms to the other provisions of the code for habitable rooms. Obviously, any room that is extremely damp, dark, and poorly ventilated would not be conducive to healthful occupancy by any human being.

G Sanitation in the Control of Arthropods and Rodents

The presence of vectors such as arthropods (flies, mosquitoes, fleas, cockroaches, lice, mites, ticks, and bedbugs) and rodents (rats and mice) in a house and its premises result from neglect of basic responsibilities for cleanliness. Rodents and arthropods are vectors of disease and cause injury to humans. In many cases, rats and mice, or insects and other arthropods may not necessarily pose an immediate disease threat. They are often present in such numbers or in such places as to limit the enjoyment and utilization of our environment. In this sense, they are pests disturbing the well-being of man and inspection and control programs are justified on this basis alone. Food, harborage, and water, which are life essentials for arthropods and rodents, occur frequently in and around all types of buildings whenever these vectors prevail. Their numbers increase rapidly as standards of cleanliness and maintenance decline. Substandard residential housing and commercial establishments produce and maintain greater and more widespread vector populations than well kept, clean residential and commercial areas. Lack of knowledge, carelessness, and indifference are usually the basic reasons for such conditions.

Although pesticides (insecticides and rodenticides) may produce temporary pest reduction, only permanent techniques such as sanitation and pest proofing bring about long-term control. Sanitation includes storage, collection, and disposal of refuse, together with premises maintenance and the proper storage of products and materials. It is important that all building, housing, and other related codes and ordinances include adequate provisions for control of pests and correction of conditions conducive to their proliferation. When a building, structure, or dwelling becomes infested, inspection and control measures are required. Inspection reports should list violations found and call for initial extermination and continued control. The causative conditions for the presence of pests must also be corrected by the responsible Persons.

The housing inspector should be able to identify correctly the various arthropods and rodents that infest a house and its premises. It is important to know the habits and characteristics of common household pests and be able to inform the public about the importance of their elimination and control .

1. **Domestic Rats and Mice**

   Rodent problems are common to most urban areas in the United States and most severe in areas of substandard housing and urban blight.

   Rats and mice are responsible for spread of a number of diseases, either directly, as by contamination of human food with their urine or feces, or indirectly by way of fleas and mites. The more common rodent-borne diseases are rat-bite fever, leptrospirosis, salmonellosis, trichinosis, murine typhus fever, and plague. Rickettsialpox is transmitted from the house mouse to man by the bite of the mouse mite. Rat bite, a public health problem, is associated with heavy urbanization, occurring primarily in lower economic areas exhibiting substandard housing, crowding, and poor sanitation. Rats consume or contaminate large quantities of food and feed, and destroy other property, as when they cause fires by gnawing the insulation from electric wires.

   The Norway rat is the most common rat found in the United States and is closely associated with man and buildings and is most dependent on him. This rat weighs 16 or more ounces, is heavy-set with blunt muzzle has small close set ears, and its tail is shorter than body and head combined. Its fur is coarse, generally reddish brown to grayish brown.

   The house mouse is the smallest of domestic rodents, weighing one half to three fourths in ounces, with small slender body, moderately large prominent ears, and semi-naked tail about as long as the body and head combined. Its fur is dusty gray.

   Control of rats and mice requires ***(a)*** sanitation to eliminate their food and harborage, ***(b)*** effective rodent proofing, and ***(c)*** efficient supplemental killing programs.

   Information about habits and characteristics of rodents and inspection and control techniques may be found in the following publications of the U.S. Department of Health, Education, and Welfare, Public Health Service, Center for Disease Control: "Control of Domestic Rats and Mice," "Biological Factors in Domestic Rodent Control," "Rodent-borne Disease Control Through Rodent Stoppage," "Urban Rat Surveys," and the "APHA-CDC Recommended Housing Maintenance and Occupancy Ordinance ."

2. **Arthropods**

The housing inspector should be able to identify correctly arthropods that are common household pests. It is also important for him to recognize these pests so that he can give the owner or occupant accurate instructions on appropriate control measures. Such household pests include:

a **Fleas**-Unlike most blood-sucking insects, fleas feed at frequent intervals. They do not remain on one host, but feed temporarily, and transfer to several other hosts which may be of entirely different species. The dog flea will feed on man as well as on dogs and cats. For this reason, and the fact that fleas insert their mouth parts to suck blood, they are particularly prone to transmit pathogenic organisms. The frequent biting is due to the fact that fleas are very easily disturbed while feeding and seldom complete a meal at one time. Some species of fleas are involved in the transmission of plague, endemic typhyus, salmonella typhimurium, and undulant fever. In addition, fleas are intermediate hosts of helminths such as dog tapeworm and dwarf tapeworm.

b **Fly** - The house fly and many of its relatives are common agents in the mechanical transmission of certain infections which are often grouped under the term, "fly-borne diseases." The mouth parts, the numerous body spines, and the sticky pads on the feet have been found to carry a large number of different pathogens causing human disease. Some of these pathogens may pass unaltered through the digestive tract and may remain viable in the feces Among the pathogens carried mechanically by the house fly are those causing typhoid fever, cholera, bacillary and amebic dysentery, tuberculosis, tetanus, and anthrax.

From the disease viewpoint, it should be emphasized that from feeding on excrement, sputum, open sores, or putrefying matter, the flies may quickly pass to food and milk, to mucous membranes or to uncontaminated wounds. It is these habits that make this fly and related forms such efficient mechanical vectors of disease.

When feeding, the fly frequently moistens substances with a "vomit drop" which is regurgitated from the crop. This vomit drop may be teeming with typhoid and cholera bacilli, or with organisms causing amebic or bacillary dysentery which are thus transferred to food and milk.

c **Bedbugs**-A heavily infested house has a distinctive odor. Some people are very sensitive to bedbug bites, while others are hardly aware of them. This insect has not been incriminated in the transmission of any communicable disease. Bedbugs may cause nervous disorders in sensitive people, and may contribute to the ill health of both children and adults. Although bedbugs will feed readily on poultry, mice, rats, and other animals, the preferred host is man.

d **Cockroach** - Cockroaches have become well adjusted to living with man. They harbor in the cracks and crevices provided by human building methods. They subsist on the bits of food man scatters where he lives or travels. Cockroaches have been reported nibbling on the eyelashes, fingernails, and toenails of sleeping children. They impart an unsavory odor and taste into food they infest. They carry the organisms causing enteric diseases (diarrhea, dysentery, typhoid, food poisoning) from sewers and garbage cans to the food of man and have been found naturally infected with many other pathogens.

(1) **American Cockroach** - This roach is capable of flights of a gliding nature. It is found in alleyways, yards, sewerage systems, and trees. It frequently enters buildings under doorways. It prefers warm resting places such as steam tunnels and basements during the winter months, and causes damage to book bindings, manuscripts, clothing, glossy paper with starch sizing, and labels from bottles. It is often trapped in vessels containing beer, syrup, or sweetened drinks. It is reddish to dark brown in color. The adults are about 1? to 2 inches long.

(2) **Australian Cockroach** - is reddish to dark brown with yellow markings and streaks. The adult is about 1 inch long. They are usually found in warm damp places in or out of doors.

(3) **Brown-Banded Cockroach** - is yellowish or reddish brown in color and the fertile eggs often show greenish through the walls. It is difficult to control because it does not confine its activities to the kitchen, bathroom, and pantry, but is found throughout the house.

(4) **German Cockroach** - is probably the most common cockroach found in restaurants. It is sometimes called the "croton bug." This pest enters the home with bottled drinks, potatoes, onions, other foods, and furniture.

e **Ticks**-All ticks are parasitic during some period of their lives. They are annoying pests, and in addition, they are transmitters of the causative agents of many diseases. Their bites are irritating, and often when they are removed forcibly, the mouth parts remain in the skin, resulting in infection causing ulceration or septicemia. Ticks are responsible for transmitting Rocky Mountain Spotted Fever

f **Mites** - As a group these arachnids are free living, but many are parasitic. The parasitic forms produce a mild to severe dermatitis, often followed by allergic reactions. Some mites are the etiological agents of mange and scabies of man and animals.

g **Lice** - Lice do not leave the host or host's clothing voluntarily but only when they are accidentally dislodged. They are mainly disseminated by physical contact with infested persons or their clothing. The bite of the head and body louse provokes rosy swellings and, coupled with the ensuing scratching, produces the characteristic scarring and bronzing of the skin referred to as "vagabond's disease."

Murine typhus can be transmitted from man to man by the body louse.

h **Mosquito** - Mosquitoes are known transmitters of encephalitis, malaria, dengue fever, yellow fever, and other diseases. Of all the insects that jeopardize the health of man, mosquitoes rank first. Not only do they transmit disease, but they occur in such numbers that they cause great annoyance. Pest mosquitoes affect the comfort and efficiency of man through severe annoyance, itching bites, loss of sleep, and nervousness.

i **Termites** - Termites are a key factor in the deterioration of housing in many parts of the United States as well as elsewhere in the world. Housing quality, one of the basic factors in public health, is often used as a general index of community health. For these reasons, public health workers should have a general knowledge of these pests.

Termites may be grouped into three types based upon the type of damage they do:

(1) wet wood termites damage living trees and are of relatively minor importance in most areas;

(2)dry wood termites establish colonies in cured wood and, while rare, may be a problem in museums and storage warehouses;

(3)subterranean termites attack wood from colonies established in the soil and are the ones of the greatest economic importance. These are very sensitive to moisture conditions; and, although they may feed on wood. they must leave it and return to the soil every few hours for moisture. Ordinarily they attack only wood that is in contact with the soil, but they can build cellulose tunnels through which they can climb to attack wood above ground level.

It is often difficult to assess the extent of termite damage or to ascertain that complete control has been achieved.

Information about these pests and inspection and control techniques may be found in the following U.S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control publications: "Introduction to Arthropods of Public Health Importance," "Sanitation in the Control of Insects and Rodents of Public Health Importance," "Household and Stored-food Insects of Public Health Importance and Their Control."

H. Childhood Lead Poisoning and Housing Inspection

Childhood lead poisoning is a disease of the environment-including the housing environment. The major lead source for children is lead contained in paint. In the past, paint containing significant amounts of lead was used extensively on interiors of dwelling units. Lead is still used in exterior paint in many sections of the country. As these dwelling units deteriorate and fall into disrepair, the leaded paint peels, flakes, and chips off of many painted surfaces. The paint is then accessible to small children who will chew and mouth non-food items such as window sills, door facings, and paint chips.

If a child is identified with undue lead absorption, the housing inspector's role in the prevention of lead poisoning is identifying the most probable lead hazard in that child's environment. This hazard is often leaded paint. The housing inspector must educate the occupants to this danger and ensure that appropriate hazard reduction occurs.

Childhood lead poisoning from ingestion of leaded paint is a disease whose eradication could be accomplished by removing its cause - leaded paint. There are, however, over 30 million dwelling units in the United States containing lead-based paint.

1 Determination of Lead in the Housing Environment

The method of choice for identification of lead paint hazards in the field is the portable x-ray fluorescence analyzer. These instruments have: gained wide acceptance for making quantitative measurements quickly and reliably on painted surfaces for lead content down to a level of 0.5 mg/cm2. While this level may be hazardous if ingested repeatedly, a lower level lead in paint is difficult to identify because of limits on instrument technology applicable to field use. Developmental work is being carried out which will allow quantitative measurement of levels below 0.5 mg/cm2.

As a supplement to x-ray fluorescent determinations, paint scrapings and loose chips may be collected for chemical analysis in the laboratory. In sample collection, it is important to obtain only paint for an accurate analysis.

Interpreting values obtained by x-ray fluorescence and wet chemistry on the same sample is difficult since the two methods are not directly comparable. The x-ray fluorescence instruments measure the total amount of lead present per unit area while the chemical test measures the amount of lead by weight of the sample tested. If even a small amount of underlying substrate is present in the sample, the chemical test will give false low values.

2 Initiating Action

Decisions concerning actions to be taken to control the sources of lead available to children must be in accordance with appropriate ordinances and codes. Highest priority should be given to eliminating paint hazards where children with undue lead absorption ***[Footnote #1]*** reside or frequently visit. The availability and condition of the painted surfaces, and the amount of lead contained in the paint are also primary reasons for action.

3 Hazard Abatement Techniques

Hazard abatement activities may vary with the condition of the dwelling. Sometimes complete renovation is necessary while in other circumstances the occupant may be able to minimize the hazard with simple methods. Wire brushing loose paints from the walls and sweeping up paint chips from the floor may be all that is necessary to prevent further accumulation of lead in a child with a low level of lead absorption.

If the lead hazard requires major action, two alternative approaches are available. The leaded paint can be removed or a protective barrier can be placed over the leaded paint.

a Paint Removal

There are several methods of paint removal in current use:

These include:
(1) Chemical paint removers
(2) Sanding and scraping
(3) Heating to soften
(4) Combination of above

When using any of the above-procedures, care must be exercised to ensure that workmen use approved protective equipment and/or adequate ventilation to prevent inhaling lead dust or vapors. Children and other household members must also be

protected or removed from exposure. Toxic lead fumes occurring when paint is overheated are especially dangerous. Proper attention must be given to disposal of leaded paint removed from the dwelling.

b **Principles of Shielding**

The basic principle of shielding is to isolate leaded surfaces so that a child cannot get to those surfaces. There are seven characteristics of an ideal shielding material:

1. Scrape-proof and puncture-proof by a child.
2. vermin-proof.
3. relatively fire resistant or have a high ignition temperature.
4. not release toxic or noxious gases or vapors at high temperatures or upon ignition.
5. not place any appreciable additional load or stress on the existing structure of the building.
6. easy to install with reasonable installation costs (materials and labor).
7. have a low maintenance cost.

Flat Surface Covering Materials

Five different flat surface covering materials have been used in shielding leaded surfaces. These materials include the following:

1. gypsum board-this material creates a new wall in front of the old; the installation is relatively expensive and requires the use of skilled labor.
2. fiberglas wall covering materials - this material requires removal of all loose paint and plaster before application; some patching of wall surface may be necessary; material comes in thin sheets of approximately 40 inches in width; an adhesive compound is needed.
3. paper wall covering materials - usually made of heavy kraft paper which is easy to paint over.
4. vinyl coat sheeting - must be applied with a special adhesive; is the least combustible of the plastic materials which may be used for this purpose, but upon ignition emits hydrochloric acid fumes and vapors.
5. plywood and hardwood-this material is nailed directly to the wall studs; is relatively easy to install.

Liquid Covering Materials

Some of the above listed materials can be applied only to flat surfaces. In order to find a material which will provide a shield over both flat and curved surfaces, several liquid covering materials have been used, but to date only a limited degree of success has been obtained. The two liquid covering materials which have some use as a shield of leaded surfaces are as follows:

(1) urethane-based paint - this material requires the removal of all loose paint and plaster before application; repeated applications may be needed; new surface may peel if old base paint is not removed; should be considered only as a temporary or short-term method, e.g., may be ideal in building scheduled for demolition within a few years.

(2) pigmented masonry conditioner-this material requires the prior removal of all flaking, peeling, and scaling paint: material has a tung oil base which permits penetration into the base wall material and provides effective shielding; several coats are needed to obtain sufficient bonding of the surface material.

I Sanitation: Water Supply and Temperature

Some housing codes specify only that dwelling units have hot and cold water supply at all times. Other codes, however, specify a minimum rate of flow for hot and cold water of 1 gallon per minute from each fixture. The temperature generally requested and accepted for hot water is a minimum of 120?F at the outlet.

J Sanitation: Septic Tanks

There are 17 million people in the United States who use septic tanks as a means of sewage disposal. It is important, therefore, for an inspector of housing to have a basic understanding of their construction and use.

Before a septic tank can be installed it must be determined that there is a correct location for a disposal field. The best guide to future performance is carefully prepared soil maps together with the experience with each soil in a region. In the absence of such maps percolation tests provide some guidance.

The conventional septic tank sewage and disposal system consists of two main parts-a septic tank and an absorption field or seepage pit. The tank settles, stores, and digests the solids (sludge and scum). As sewage enters the tank, the heavier solids settle to the bottom and become sludge, and the lighter particles, including grease, rise to the top of the liquid and remain as scum. The organic matter contained in both sludge and scum is decomposed by action of anaerobic bacteria (the type of bacteria that thrive in absence of air). These bacteria gain their life-processing oxygen by reducing complex organic substances. Gases are vented to atmosphere, and liquids are discharged to the disposal field.

Digestive action by the bacteria takes time, and so the tank must be of sufficient capacity to store solids for the required time. As raw sewage enters the tank, an equal amount of liquid effluent is discharged so that the liquid level remains fairly constant. The tank inlet has a baffle to divert the incoming sewage downward. An outlet baffle or pipe fitting retains solids but allows discharge of liquid to the absorption or disposal field. Recommended retention period of the liquid ranges from 8 to 48 hours. In normal operation, scum and sludge must be removed from the tank by mechanical means.

Public Health Service research has shown that two or more solids retention compartment tanks are more efficient than one. Rectangular compartment tanks are as good as any, and change in tank shapes to oval, or others offers no special advantages. The flow from the septic tank goes into the absorption field to allow liquid to be dissipated in the soil.

K Sanitation: Drainage

The dangers of puddles and pools of stagnant water can be great depending on the location, the depth, and amount of the stagnant water. Stagnant water, whether it be on the ground or in receptacles such as cans, bottles, or rubber tires, can be a major health hazard in any area of the country. Mosquitoes use these pools as breeding grounds. Female mosquitoes lay their eggs in water, and the eggs hatch into a larval stage. The larvae later change to a pupal stage and remain in the water-filled container until they change into adult mosquitoes and begin the fourth stage of their life cycle. It is in this fourth or adult stage that mosquitoes can carry diseases to man. The elimination of ponds, puddles, and other sources of stagnant water is the best way of eliminating mosquito hazards. If the pond or pool is large enough, it can also be a safety hazard for small children who may stumble into the water and drown.

Poor drainage may create another hazard if electricity is nearby. The obvious danger of being electrocuted exists when water and electricity are both present. The inspector should always look for evidence of water near the main fuse box in the house and for broken or frayed electrical wires in the kitchen, bathroom, water closet compartment, or laundry room.

Excessive dampness caused by puddles and other small bodies of stagnant water or leaking plumbing fixtures can cause structural damage to a house. The water itself can cause rotting of main structural members or can offer the campground needed by subterranean termites for their attack on wooden structures.

L Sanitation: Rubbish and Garbage Storage

Every occupant of a dwelling must maintain the part of the dwelling unit that he occupies and controls. **The storage and disposal of rubbish and garbage in a safe and sanitary manner is considered the responsibility of the occupant** insofar as the garbage and trash is generated in his portion of the structure. **It is the owner's responsibility to see that arrangements are made by the tenant for the adequate removal of this refuse**.

In a structure containing three or more dwelling units it is also the owner's responsibility to supply containers for the storage of refuse and to make provisions for its safe and sanitary removal as often as is necessary to maintain a sanitary structure.

In the case of a single- or two-family dwelling, it shall be the responsibility of the occupant to furnish facilities or containers. This does not preclude any agreement, whether written or oral, between owner and occupant for other types of disposal practices; however, any other type of disposal practice must be safe and sanitary. As previously stated, avoiding the attraction of insects and rodents is essential to the public health. Refuse furnishes food and harboring places for rodents and tends to attract them to areas where they have not previously been present. The same is true of insects. The requirement that the proper facilities for the storage of rubbish be provided is to fix responsibility for maintenance and use of these facilities with a particular party whether it be the owner or the occupant of the dwelling. In the case of single-family or two-family dwellings, it is possible for the appropriate department to fix the responsibility for improper use and maintenance of rubbish storage facilities. Such is not the case, however, for multiple-family dwellings, and the responsibility for this use is therefore placed on the owner or operator.

M Sanitation: Kitchen Facilities

All kitchens or kitchenettes should contain a kitchen sink, cabinets or shelves (or both), a stove, and a refrigerator. Without these items the unit is not a dwelling unit but a rooming unit. If one of these items is missing, the health of the occupants is in jeopardy because of poor food sanitation. The kitchen sink should be an approved type and not a hand-washing sink. It should be large enough to hold a reasonably sized dish or pot. The sink should be connected to the hot- and cold-water systems. It is preferable, but not mandatory, to have a mixing faucet for safety reasons. The drain should be connected to the waste line and should include a trap. If the local plumbing code calls for a grease trap, it should be installed.

The purpose of a kitchen sink is the correct washing of dishes used in preparing-and consuming meals. The diseases that can be caused by improperly washed dishes include food poisoning by salmonellae, shigellae, and staphylococci.

All kitchens should be supplied with adequate cabinets or shelves for the storage of eating, drinking, and cooking equipment. These may also be used to store foodstuffs that do not require refrigeration. It is important that newly cleaned eating and cooking equipment be stored on a clean surface so that contamination does not occur.

A stove or similar device for cooking food is necessary for maintaining adequate nutrition of-the inhabitants. A diet of only cold food soon becomes boring and of doubtful nutritional value. Additionally, some foods need to be cooked to provide safety from parasites and pathogens. A refrigerator or similar device for storing food is also required in all kitchens. The refrigerator should be capable of storing food at temperatures between 32?F and 45?F under ordinary maximum summer conditions. An ice box would not meet the requirements, because it cannot keep the temperature below 45?F at all times during the summer. A freezer compartment is not necessary in this refrigerator, but it is always desirable because of the large amount of frozen foods now on the market. The purpose of a refrigerator is to protect the occupants of a dwelling unit from illness caused by improperly stored food. An economic factor is also involved since it is more expensive to buy food for one meal at a time.

III. Inspection Procedures

A Although inspection procedures vary from city to city, there are several common items that the inspector can and should check. These include:

1. Rodents - Rats and mice are habitually nocturnal and secretive and are rarely seen during the day except when infestations are heavy. Therefore, it is necessary to interpret signs of their activities properly in order to plan control work. These signs are found in secluded places, such as along walls, under piles of rubbish, and behind or under boxes, boards, and thick vegetation. From the rodent signs, one can tell the species present, and whether a rodent infestation is current or old, heavy or light. The following are the most common rat signs: droppings, runways, rubmarks, burrows, gnawing, and tracks.

2. Roaches- An experienced inspector can frequently detect roaches by their oily odor and by the obvious smell of commercial repellants used by home-owners. Roaches are more commonly found in the kitchen and in the bathroom. Check drawers and cabinets and, also, check trash cans and open garbage bags; usually they are very active in and near the food sources.

3. Bedbugs-In touring a house, notice bed linens and blankets and be alert to urine odor. Blood spots on the linen are typical signs of bedbug activity. Bedbugs have a distinctive odor. If children are at home when you call, casually observe the younger ones for bites on face and arms.

4. In general, look for rubbish, garbage, and food leavings in or on sinks or strewn on floors. Observe any domestic animal beds or droppings.

5. Lifting, peeling, or flaking paint should be ordered removed, and the place should be repainted with lead-free paint to prevent possible lead poisoning to children.

6. Cracked and broken floor covering provides a nest for household pests. It should be ordered removed, the floor should be cleaned, and new covering put down. Kitchen and bathroom floor coverings should be impervious to water.

7. Cracks around bathtubs, in toilets, or in sinks are also unsanitary.

8. Back siphonage possibilities should be checked thoroughly. Make sure there is a proper air gap between the spill rim of basin, sink, or tub and the lowest point of the faucet.

9. Make sure kitchens are equipped with approved garbage containers with tight-fitting lids.

10. Refuse storage facilities should include enough containers to hold all garbage and rubbish that normally accumulates between collection days. A good refuse container should be rust resistant, water-tight, tightly covered, easy to clean, easily handled by one man, of rat-anddamage-resistant construction (heavy duty), and constructed with a recessed bottom.

11. Keep alert for evidence of coal gas, sewer gas, and escaping cooking gas.

12. Order all unvented home space heaters removed in your presence.

13. Check legality of any community kitchens you may find, since they are often a source of disease.

14. Check all windows for proper screening, where required, during the period called for in your code.

B The inspector will also find that there are other items he should check, and that, when these conditions are found, they should be referred to the appropriate local authority. These include:

1. Reports by occupant of bites by rodents, roaches, or bedbugs.

2. Broken sewage disposal lines, also referred to as sanitary waste-water lines.

3. Stopped-up toilets.

4. Accumulation of weeds, garbage, or trash on premises.

5. Any obvious rashes or sores on occupants.

Although he is empowered to and should order corrective action on most, if not all, of these problems, he should also refer these sources or evidences of disease to the health agency.

C Appropriate Tools

The inspector should always carry a flashlight, thermometer, and a measuring tape. Moreover, when infestation is present, it

would also be well for him to carry repellant so that he does not transport pests. Other equipment will be carried according to local department requirements.

D Reminder

In carrying out the health and sanitary aspects of housing inspections, the inspectors must keep in mind that responsibility is there for them to assume. They cannot do "just their jobs." They must do the "extra" that puts them above an automaton and raises them to the class of dedicated, trained guardians of public health, safety, and welfare.

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[1] *Additional information on undue lead absorption, see CDC Statement. Increased Lead Absorption and Lead Poisoning in Young Children." March 1975.* Return to Paragraph

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Chapter 4: Building Aspects of a Housing Inspection

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The principle function of a house is to furnish protection from the elements. In its current stage, however, our civilization requires that a home provide not only shelter but also privacy, safety, and reasonable protection of our physical and mental health. A living facility that fails to offer these essentials through adequately designed and properly maintained interiors and exteriors cannot be termed "healthful housing."

I. Background Factors

In this chapter, a building will be considered in terms of its major components: heating, plumbing, and electrical systems. Each of these items will be examined in detail in future chapters. Attention will be given in this chapter to the portions of a building not visible upon completion of the ceiling, roof, and interior and exterior walls in order to give the reader an understanding of generally accepted construction practices. Emphasis, however, will be placed upon the visible interior and exterior parts of a completed dwelling that have a bearing on the soundness, state of repair, and safety of the dwelling both during intended use and in the event of a fire. These are some of the elements that the housing inspector must examine when making a thorough housing inspection.

II. Housing Construction Terminology

(Key to Component Parts Numbered in Figure 4-1)

Figure 4-1. Housing Construction Terminology

A Fireplace

1. **Chimney** - A vertical masonry shaft of reinforced concrete or other approved noncombustible, heat resisting material enclosing one or more flues. It removes the products of combustion from solid, liquid, or gaseous fuel.

2. **Flue Liner** - The flue is the hole in the chimney. The liner, usually of terra cotta, protects the brick from harmful smoke gases.

3. **Chimney Cap** - This top is generally of concrete. It protects the brick from weather.

4. **Chimney Flashing** - Sheet-metal flashing provides a tight joint between chimney and roof.

5. **Firebrick** - An ordinary brick cannot withstand the heat of direct fire, and so special firebrick is used to line the fireplace.
6. **Ash Dump** - A trap door to let the ashes drop to a pit below, from where they may be easily removed.
7. **Cleanout Door** - The door to the ash pit or the bottom of a chimney through which the chimney can be cleaned.
8. **Chimney Breast** - The inside face or front of a fireplace chimney.
9. **Hearth** - The floor of a fireplace that extends into the room for safety purposes.

B Roof

10. **Ridge** - The top intersection of two opposite adjoining roof surfaces.
11. **Ridge Board** - The board that follows along under the ridge.
12. **Roof Rafters** - The structural members that support the roof.
13. **Collar Beam** - Really not a beam at all. A tie that keeps the roof from spreading. Connects similar rafters on opposite side of roof.
14. **Roof Insulation** - An insulating material (usually rock wool or fiberglass) in a blanket form placed between the roof rafters for the purpose of keeping a house warm in the winter, cool in the summer.
15. **Roof Sheathing** - The boards that provide the base for the finished roof.
16. **Roofing** - The wood, asphalt, or asbestos shingles - or tile, slate or metal - that form the outer protection against the weather.
17. **Corner Bracing** - Diagonal strips to keep the frame square and plumb.
18. **Sheathing** - The first layer of outer wall covering nailed to the studs.
19. **Joist** - The structural members or beams that hold up the floor or ceiling, usually 2x10's or 2x12's spaced 16 inches apart.
20. **Bridging** - Cross bridging or solid. Members at the middle or third points of joist spans to brace one to the next and to prevent their twisting.
21. **Subflooring** - The rough boards that are laid over the joist. Usually laid diagonally.
22. **Flooring Paper** - A felt paper laid on the rough floor to stop air infiltration and, to some extent, noise.
23. **Finish Flooring** - Usually hardwood, of tongued and grooved strips.
24. **Building Paper** - Paper placed outside the sheathing, not as a vapor barrier, but to prevent water and air from leaking in. Building paper is also used as a tarred felt under shingles or siding to keep out moisture or wind.
25. **Beveled Siding** - Sometimes called clapboards, with a thick butt and a thin upper edge lapped to shed water.
26. **Wall Insulation** - A blanket of wool or reflective foil placed inside the walls.
27. **Metal Lath** - A mesh made from sheet metal onto which plaster is applied.

D Foundation and Basement

28. **Finished Grade Line** - The top of the ground at the foundation.

29. **Foundation Wall** - The wall of poured concrete (shown) or concrete blocks that rests on the footing and supports the remainder of the house .

30. **Termite Shield** - A metal baffle to prevent termites from entering the frame.

31. **Footing** - The concrete pad that carries the entire weight of the house upon the earth.

32. **Footing Drain Tile** - A pipe with cracks at the joints to allow underground water to drain in and away before it gets into the basement.

33. **Basement Floor Slab** - The 4 or 5-inch layer of concrete that forms the basement floor.

34. **Gravel Fill** - Placed under the slab to allow drainage and to guard against a damp floor.

35. **Girder** - A main beam upon which floor joists rest. Usually of steel, but also of wood.

36. **Backfill** - Earth, once dug out, that has been replaced and tamped down around the foundation.

37. **Areaway** - An open space to allow light and air to a window. Also called a light well.

38. **Area Wall** - The wall, of metal or concrete, that forms the open area.

E Windows and Doors

39. **Window** -An opening in a building for admitting light and air. It usually has a pane or panes of glass and is set in a frame or sash that is generally movable for opening and shutting.

40. **Window Frame** - The lining of the window opening.

41. **Window Sash** - The inner frame, usually movable, that holds the glass.

42. **Lintel** - The structural beam over a window or door opening.

43. **Window Casing** - The decorative strips surrounding a window opening on the inside.

F Stairs and Entry

44. **Entrance Canopy** - A roof extending over the entrance door.

45. **Furring** - Falsework or framework necessary to bring the outer surface to where we want it.

46. **Stair Tread** - The horizontal strip where we put our foot when we climb up or down the stairs.

47. **Stair Riser**-The vertical board connecting one tread to the next.

48. **Stair Stringer** - The sloping board that supports the ends of the steps.

49. **Newel** - The post that terminates the railing.

50. **Stair Rail** - The bar used for a handhold when we use the stairs.

51. **Balusters** - Vertical rods or spindles supporting a rail.

III. Structure

A Foundation

The word **foundation** is used to mean:

1. Construction below grade such as footings, cellar or basement walls.
2. The composition of the earth on which the building rests.
3. Special construction such as pilings and piers used to support the building.

The foundation bed may be composed of solid rock, sand, gravel, or unconsolidated sand or clay. Rock, sand, or gravel are the most reliable foundation materials. Unconsolidated sand and clay, though found in many sections of the country, are not as desirable. because they are subject to sliding and settling.

The footing (see Figure 4-2) distributes the weight of the building over a sufficient area of ground so as to ensure that the foundation walls will stand properly. Footings are usually constructed of a masonry-type material such as concrete; however, in the past wood and stone have been used. Some older houses have been constructed without footings.

Although it is usually difficult to determine the condition of a footing without excavating the foundation, a footing in a state of disrepair or lack of a footing will usually be indicated either by **large cracks or by settlement** in the foundation walls (see Figure 4-3).

Figure 4-2. Foundation Details

Figure 4-3. Foundation Cracks

Foundation wall cracks are usually diagonal, starting from the top, the bottom, or the end of the wall. Cracks that do not extend to at least one edge of the wall may not be caused by foundation problems. Such wall cracks may be due to other structural problems and should also be reported.

The foundation walls support the weight of the structure and transfer this weight to the footings. The foundation walls may be made of stone, brick, concrete, or concrete blocks and should be moisture proofed with either a membrane of water-proof material or a coating of portland cement mortar. The membrane may consist of plastic sheeting or a sandwich of standard roofing felt joined and covered with tar or asphalt. The purpose of water-proofing the foundation walls is to prevent water from penetrating the wall material and leaving the basement or cellar walls damp.

Holes in the foundation walls are a common finding in many old houses. These holes may be caused by missing bricks or blocks. Holes and cracks in a foundation wall are undesirable because they make a convenient entry for rats and other rodents and also indicate the possibility of further structural deterioration. These holes should not be confused with adequately installed vents in the foundation wall that permit ventilation and prevent moisture entrapment.

The basement or cellar floor should be made of concrete placed on at least 6 inches of gravel. The purpose of a concrete floor is to protect the basement or cellar from invasion by rodents or from flooding. The gravel distributes ground water movements under the concrete floor, reducing the possibility of the water's penetrating the floor. A waterproof membrane, such as plastic sheeting, should be laid before the concrete is placed for additional protection against flooding.

The basement or cellar floor should be gradually but uniformly sloped towards a drain or a series of drains from all directions. These drains permit the basement or cellar floor to be drained if it becomes flooded .

Evidence of ineffective waterproofing or moisture proofing will be indicated by water or moisture marks on the floor and walls.

Cellar doors, hatchways, and basement windows should be weathertight and rodent proof. A hatchway can be inspected by standing at the lower portion with the doors closed; if daylight can be seen, the door probably needs repair.

B Framing

Many different types of house-farming systems are found in various sections of the country; however, the majority of the members in each framing system are the same. They include:

1. **Foundation Sills:** (see Figure 4-4 and 4-5). The purpose of the sill is to provide support or a bearing surface for the outside walls of the building. The sill is the first part of the frame to be placed and rests directly on the foundation wall. It is bolted to the foundation wall by sill anchors. It is good practice to protect the sill against termites by extending the foundation wall to at least 18 inches above the ground and using a noncorroding metal shield continuously around the outside top of the foundation wall.

2. **Flooring Systems:** (see Figure 4-5). The flooring system is composed of a combination of girders, joists, sub-flooring, and finished flooring that may be made up of concrete, steel, or wood. Joists are laid perpendicular to the girders, at about 16 inches on centers, and are the members to which the sub-flooring is attached. When the subfloor is wood, it may be nailed at either right angles or diagonally to the joists.

   As shown in Figure 4-5, a girder is a member that in certain framing systems supports the joists and is usually a larger section than the joists it supports. Girders are found in framing systems where there are no interior bearing walls or where the span between bearing walls is greater than the joists are capable of spanning. The most common application of a girder is to support the first floor in residences. Often a board known as a ledger is applied to the side of a wood girder or beam to form a ledge for the joists to rest upon. The girder, in turn, is supported by wood posts or steel "lally columns" which extend from the cellar or basement floor to the girder.

3. **Studs:** (see Figure 4-4 and 4-5). Wall studs are almost always 2 by 4 inches; studs 2 by 6 inches are occasionally used to provide a wall thick enough to permit the passage of waste pipes. There are two types of walls or partitions: bearing and nonbearing. A bearing wall is constructed at right angles to and supports the joists. A nonbearing wall or partition acts as a screen or enclosure; hence, the headers in it are often parallel to the joists of the floor above.

   Figure 4-4. Wall Framing

   Figure 4-5. Floor Construction

   In general, studs like joists are spaced 16 inches on center. In light construction such as garages and summer cottages where plaster is omitted, or some other material is used for a wall finish wider spacing on studs is common.

   Openings for windows or doors must be framed in studs. This framing consists of horizontal members called "headers," and vertical members called "trimmers" (see Figure 4-l).

   Since the vertical spaces between studs can act as flues to transmit flames in the event of a fire, ''fire stops" are important in preventing or retarding fire from spreading through a building by way of air passages in walls, floors, and partitions. Fire stops are wood obstructions placed between studs or floor joists to prevent fire from spreading in these natural fluespaces.

4. **Interior Wall Finish:** Many types of materials are used for covering interior walls and ceilings, but the principal types are plaster and dry-wall construction. Plaster is a mixture, usually lime, sand, and water, applied in two or three coats to lath to form a hard-wall surface. Dry-wall finish is a material that requires little, if any, water for application. More specifically, dry-wall finish may be gypsum board, plywood, fiberboard, or wood in various sizes and forms.

Gypsum board is a sheet material composed of a gypsum filler faced with paper. Sheets are usually 4 feet wide and can be obtained in lengths up to 12 feet. In dry-wall construction, gypsum boards are fastened to the studs either vertically or horizontally and then painted. The edges along the length of the sheet are recessed to receive joint cement and tape.

A plaster finish requires a base upon which plaster can be spread. Wood lath at one time was the plaster base most commonly used, but today gypsum-board lath is more popular. It has paper faces with a gypsum filler. Such lath is 16 by 48 inches and 1/2 or 3/8 inches thick.

It is applied horizontally across the studs. Gypsum lath may be perforated to improve the bond and thus lengthen the time the plaster can remain intact when exposed to fire. The building codes in some cities require that gypsum lath be perforated. Expanded-metal lath may also be used as a plaster base. Expanded-metal lath consists of sheet metal slit and expanded to form openings to hold the plaster. Metal lath is usually 27 by 96 inches and is fastened to the studs.

Plaster is applied over the base to a minimum thickness of 1/2 inch. Because some drying may take place in wood-framing members after the house is completed, some shrinkage can be expected, which, in turn, may cause plaster cracks to develop around openings and in corners. Strips of lath imbedded in the plaster at these locations prevent cracks.

On the inside face of studs that form an exterior wall, vapor barriers are used to prevent condensation on the wall. The vapor barrier is an asphalted paper or metal foil through which moisture-laden air cannot travel.

5. **Stairways:** (see Figure 4-6). The general purpose of the standards for stairway dimensions is to ensure that there is adequate headroom, width, and uniformity riser and tread size of every step to accommodate the expected traffic on each stairway safely.

   Interior stairways should be not less than 44 inches in width. The width of a stairway may be reduced to 36 inches in one- and two-farnily dwellings. Stairs with closed risers should have maximum risers of 8? inches and a minimum tread of 9 inches plus 1 ?-inch nosing. Basement stairs are often constructed with open risers. These stairs should have maximum risers of 8? inches and minimum treads of 9 inches plus ?-inch nosing. The headroom in all parts of the stair enclosure should be no less than 80 inches.

   Exterior stairway dimensions should be the same as those called for in interior stairways, except that the headroom requirement does not apply.

   Figure 4-6. Stairway

6. **Windows:** The four general classifications of windows for residences are:

   a Double-hung sash window that moves up or down, balanced by weights hung on chains or ropes, or springs on each side.

   b Casement window sash is hinged at the side and can be hung so that it will swing outward or inward.

   c Awning window-usually has two or more glass panes that are hinged at the top and swing about a horizontal axis.

   d Sliding window - usually has two or more glass panes that slide past one another on a horizontal track.

The principal parts of a double-hung window (see Figure 4-7) are the lights, the top rail framing members, bars or muntins that separate the lights, stiles - side-framing members, bottom rail, sash weights, and sash cords or chains. (All rails are horizontal, all stiles vertical.) The casement window's principal parts include: top and bottom rails, muntins, butt hinges, and jamb. All types of windows should open freely and close securely.

The exterior sill is the bottom projection of a window. The drip cap is a separate piece of wood projecting over the top of the window and is a component of the window casing.

Figure 4-7. Window Details

Doors: There are many styles of doors both for exterior and interior use. Interior doors should offer a reasonable degree of privacy. Exterior doors must, in addition to offering privacy, protect the interior of the structure from the elements. The various parts of a door have the same definitions as the corresponding parts of a window.

The most common types of doors are:

a **Batten door:** This consists of boards nailed together in various ways. The simplest is two layers nailed to each other at right angles, usually with each layer at 4; degrees to the vertical.

Another type of batten door consists of vertical boards nailed at right angles to several (two to four) cross strips called ledgers, with diagonal bracing members nailed between ledgers. If vertical members corresponding to ledgers are added at the sides, the verticals are called frames.

Batten doors are often found in cellars and other places where appearance is not a factor and economy is desired.

b **Flush doors:** Solid flush doors are perfectly flat, usually on both sides, although occasionally they are made flush on one side and paneled on the other. Flush doors sometimes are solid planking, but they are commonly veneered and possess a core of small pieces of white pine or other wood. These pieces are glued together with staggered end joints. Along the sides, top, and bottom are glued 32-inch edge strips of the same wood, used to create a smooth surface that can be cut or planed. The front and back faces are then covered with a 1/8- to 1/4-inch layer of veneer.

Solid flush doors may be used on both the interior and exterior.

c **Hollow** - core doors: These, like solid flush doors, are perfectly flat, but unlike solid doors, the core consists mainly of a grid of crossed wooden slats or some other type of grid construction. Faces are 3-ply plywood instead of one or two plies of veneer, and the surface veneer may be any species of wood, usually hardwood. The edges of the core are solid wood and are made wide enough at the appropriate places to accommodate locks and butts. Doors of this kind are considerably lighter than solid flush doors.

Hollow-core doors are usually used as interior doors.

d **Paneled doors:** Most doors are paneled, with most panels consisting of solid wood or plywood, either "raised" or "flat," although exterior doors frequently have one or more panels of glass, in which case they are called "lights." One or more panels may be employed although the number seldom exceeds eight. Paneled doors may be used both on the interior or exterior.

In addition to the various types of wood doors, metal is often used as veneer or for the frame.

In general, the horizontal members are called rails and the vertical members are called stiles. Every door has a top and bottom rail, and some may have intermediate rails. There are always at least two stiles. one on each side of the door.

The frame of a doorway is the portion to which the door is hinged. It consists of two side jambs and a head jamb, with an integral or attached stop against which the door closes.

Exterior door frames are ordinarily of softwood plank, with side rabbitted to receive the door in the same way as casement windows. At the foot is a sill, made of hardwood to withstand the wear of traffic, and sloped down and out to shed water.

Interior door frames are similar to exterior, except that they are often set directly on the hardwood flooring without a sill.

Building codes throughout the country call for doors in various locations within the structure to be fire resistant. These doors are

often covered with metal or some other fire-resistant materials. and some are completely constructed of metal. Fire-resistant doors are usually located between a garage and a house, stairwells and hallways, all boiler rooms. The fire resistance rating required for various doors differs with local fire codes

C Roof Framing (see Figures 4-1,4-4,4-8, and 4-9)

Rafters serve the same purpose for the roof as joists do for floors, i.e., providing support for sheathing and roofing material. Rafters are usually spaced 20 inches on center.

1. Collar Beam: Collar beams are ties between rafters on opposite sides of the roof. If the attic is to be used for rooms, the collar beam may double as the ceiling joist.

2. Purlin: A purlin is the horizontal member that forms the support for the rafters at the intersection of the two slopes of a gambrel roof.

3. Ridge Board: A ridge board is a horizontal member against which the rafters rest at their upper ends; it forms a lateral tie to make them secure

4. Hip: Like a ridge except that it slopes. The intersection of two adjacent, rather than two opposite, roof planes.

5. Roof Boards: The manner in which roof boards are applied depends upon the type of roofing material. Roof boards may vary from tongue-and-groove lumber to plywood panels.

6. Dormer: The term dormer window is applied to all windows in the roof of a building, whatever their size and shape.

D Exterior Walls and Trim (see Figure 4-4 and 4-9) Exterior walls are enclosure walls whose purpose is to make the building weather-tight. In most one- to three-story buildings they also serve as bearing walls. These walls may be made of many different materials.

Frequently used framed exterior walls appear to be of brick construction. In this situation, the brick is only one course thick and is called a brick veneer. It supports nothing but itself and is kept from toppling by ties connected to the frame wall.

In frame construction the base material of the exterior walls is called "sheathing." The sheathing material may be square-edge, shiplap, or tongue-and-groove boards.

In recent construction there has been a strong trend toward the use of plywood or composition panels.

Sheathing, in addition to serving as a base course for the finished siding material, stiffens the frame to resist sway caused by wind. It is for this reason that sheathing has been applied diagonally on frame buildings.

The finished siding may be clapboard, shingles, aluminum, brick asphalt, wood, and so forth, or a combination thereof. Good aluminum siding has a backer board that serves as added insulation and affords rigidity to the siding. Projecting cornices are a decorative trim found at the top of the building's roofline. A parapet wall is that part of the masonry wall that extends up and beyond the roofline and is capped with a noncombustible material. It helps prevent spread of fire, provides a rest for fire department ladders, and helps prevent people on the roof from falling off.

Many types of siding, shingles, and other exterior coverings are applied over the sheathing. Wood siding, cedar, and other wood shingles or shakes, clapboard, common siding (called bevel siding), composition siding, asbestos, cement shingles, asbestos-cement siding, and the aforementioned aluminum siding are commonly used for exterior coverings. Clapboards and common siding differ only in the length of the pieces. Clapboards are 4 feet long while panel siding comes in lengths from 6 to 16 feet. Composition siding is made of felt and asphalt, which are often shaped to look like brick. Asbestos and cement shingles are rigid and produce a covering that is fire resistant. Cedar wood shingles are also manufactured with a backer board that gives insulation and fire-resistant qualities. Asbestos cement siding made of asbestos fiber and portland cement has good fire-resistant qualities and is a rigid covering.

E Roof Coverings (Flexible Material Class)

1. **Asphalt Shingle:** The principal damage to asphalt shingle roofs is caused by the action of strong winds on shingles nailed too high. Usually the shingles affected by winds are those in the four or five courses nearest the ridge and in the area extending about 5 feet down from the edge or rake of the roof.

2. **Asphalt Built-up Roofs:** These may be unsurfaced, the coating of bitumen being exposed directly to the weather, or they may be surfaced having slag or gravel imbedded in the bituminous coating. The use of surfacing material is desirable as a protection against wind damage and the elements. This type of roof should have enough pitch to drain water readily.

3. **Coal Tar Pitch Built-up Roofs:** This type roof must be surfaced with slag or gravel. Coal tar pitch built-up roof should always be used on deck pitched less than 34 inch per foot; that is, where water may collect and stand. This type roof should be inspected on completion, 6 months later, and then at least once a year, preferably in the fall. When the top coating of bitumen shows damage or has become badly weathered, it should be renewed (rigid material class).

4. **Slate Roofs:** The most common problem with slate roofs is the replacement of broken slates. Roofs of this type normally render long service with little or no repair.

5. **Tile Roofs:** Replacement of broken shingle tiles is the main maintenance problem. This is one of the most expensive roofing materials. It requires very little maintenance and gives long service.

6. **Copper Roofs:** Usually are of 16-ounce copper sheeting and applied to permanent structures. When properly installed, they require practically no maintenance or repair. Proper installation allows for expansion and contraction with changes in temperature.

7. **Galvanized Iron Roofs:** Maintenance is done principally by removing rust and keeping roof well painted. Leaks can be corrected by renailing, caulking, or replacing all or part of the sheet or sheets in disrepair.

8. **Wood Shingle Roofs:** The most important factors of this type roof are its pitch and exposure, the character of wood, kind of nails used, and preservative treatment given shingles. Creosote and coal tar preservative are satisfactory for both treated and untreated shingles.

9. **Flashing:** Valleys in roofs that are formed by the junction of two downward slopes may be finished, open, or closed. In a closed valley the slates, tiles, or shingles of one side meet those of the other. and the flashing below them may be comparatively narrow. In an open valley, the flashing, which may be made of zinc, copper, or aluminum, is laid in a continuous strip, extending 12 to 18 inches on each side of the valley, while the tiles or slates do not come within 4 to 6 inches of it.

   The ridges built up on a sloping roof where it runs down against a vertical projection, like a chimney or a skylight, should be weatherproofed with flashing.

   Metal flashings are generally used with slate, tile, metal, and wood shingles. Failure of roof flashing is usually due to exposed nails that have come loose. The loose nails allow the flashing to lift with leakage resulting.

10. **Gutters and Leaders:** Gutters and leaders should be of noncombustible materials. They should be securely fastened to the structure and spill into a storm sewer if the neighborhood is so provided. When there is no storm sewer, a concrete or stone block placed on the ground beneath the leader prevents water from eroding the lawn. This store block is called a splash block. Gutters will not become plugged if protected against clogging of leaves and twigs. Gutters should be checked every spring and fall and then cleaned out when necessary.

Figures 4-8 & 4-9 Cornice Construction.

IV. Discussion of Inspection Techniques

A serious building defect may often be observed during a housing inspector's routine examination. In many cases it is beyond the scope of the housing inspector's background to analyze the underlying causes and to recommend a course of action that will facilitate repair in an efficient and economical manner. In situations such as this, it is important that the inspector realize his limitations and refer the matter to the proper expert.

A prime example of a technically complex situation that a housing inspector might observe is a leaning, buckling, or bulging foundation or bearing wall. This problem may be the result of a number of hidden or interacting problems. For example, it may be the result of differential building settlement or failure of a structural beam or girder. It is beyond the scope of the housing inspector's responsibilities to discover the cause of the defect, but it is his responsibility to note the problem and refer it to the proper authority. In this case the proper authority would be a building inspector.

In the aforementioned situation where a bulging foundation wall was discovered, this would obviously constitute a violation of the housing ordinance and should be written up as such by the housing inspector. Since the housing inspector is generally not qualified to determine whether the house should be evacuated because it is in danger of imminent collapse, he should seek the advice of a building inspector.

A question that frequently arises is ***which violations should be referred to an expert?*** Needless to say, circumstances that obviously fall within the jurisdiction of another department should be referred to the department. The housing inspector should discuss with his supervisor any situation in which he feels inadequate to make a decision. In all cases the inspector should inform his supervisor before referring a problem to another agency or expert.

Another reason for referral to other departments is that when a remedial action is completed the other department will be in a better position to determine whether the job is satisfactory.

This principle of referral should be applied to every portion of the inspection, whether it deals with health, heating, plumbing, gas, or electrical as well as structural defects.

Certain structural items should be recognized as unsafe by the housing inspector. For example, a beam that has sagged or slanted may cause a portion of or an entire floor to sag or slope. Where a sagging or sloping floor is found, examine the ceiling of the room below or the basement for a broken or dropped girder or joist.

Doors and windows that are out of level will not close completely. It may be possible to see outside light through openings around window rails and door jambs. If an inspector detects such a situation, the condition of the supporting girders, girts, posts, and studs should be questioned, since this condition is evidence that some of these members may be termite infested or rotted and may be causing the outside wall to sag. Glass panes in doors and windows should be replaced if found to be broken or missing. Windows should also be checked for proper operation, and items such as broken sash cords or chains noted.

If the roof of the structure appears to be sagging, the inspector should make a special effort to examine the rafters, purlin, collar beams, and ridge boards if these members are exposed as in unfinished attics. The condition of the roof boards may be examined while he is in the attic. If light can be seen between these boards the roof is unsound. Evidence of a leaking roof will be indicated by loose plaster or peeling or stained paint and wall paper. Areas of the roof where flashing occurs, such as around the chimney, are frequent origins of roof leaks. It is essential that the leak be found and repaired, not only to prevent the entrance of moisture into the building, but also to prevent the loosening of the plaster, rotting of timbers, and extension of damage to the remainder of the house.

Gutters and rain leaders should be placed around the entire building to insure proper drainage of water. This will lessen the possibility of seepage of water through siding and window frames, and entrance of water into the cellar or basement. Lack of or leaking gutters may result in rotting of the siding or erosion of the exposed portion of the cellar or basement walls. This situation commonly exists where the mortar between bricks or concrete blocks in foundation walls is found to be heavily eroded. Gutters should be free from dirt and leaves.

The exterior siding should be in sound, weathertight condition. Peeled or worn paint on wood siding will expose the bare wood to

the elements and result in splitting and warping of siding. This condition will eventually lead to the entrance of rain water with resultant rotting of the sheathing and studs as well as inside dampness and falling plaster. Sound and painted siding will prevent major repairs and expenses in the future. This condition will often be particularly prevalent on the north face of the structure.

Roof and chimneys should be inspected for tilting, missing bricks, deterioration of flashing, and pointing of chimney bricks. In addition, roof covering should be checked for broken spots and missing shingles or tiles. Roof doors should be metal clad, self-closing, tight fitting, and unlockable. The roof should also be examined for weather-tightness and broken TV antennas.

Porches should be carefully examined for weakened treads, missing or cracked boards, holes, and holes covered with tin plates, railing rigidity, missing posts, handrail rigidity, condition of the columns that support the porch roof, and the condition of the porch roof itself. The open section beneath the porch should be inspected for broken lattice-work. Check under the porch for accumulation of dirt and debris that can offer a harborage for vermin and rodents.

Loose plaster and missing or peeling wallpaper or paint should be noted. Bugs and cockroaches eat the paste from the wallpaper while leaving behind loose paper.

The basic parts of a stairway that a housing inspector should be able to identify correctly are the following:

A Riser
B Tread
C Nosing
D Handrail
E Balustrade and Balusters, the Vertical Members that Support the Handrail, and
F The Soffit, Underpart of the Stairway.

In the examination of a stairway (be careful to turn the light on) initially check the underside, if visible, to see if it is intact. Then proceed slowly up the stairs placing full weight on each tread and checking for loose, wobbling, or uneven treads and risers. Regardless of the size of the treads or risers they should all be of uniform size. For all stairs that rise 3 or more feet, a handrail should be present and in a sound and rigid condition.

Any fireplace should conform to the requirements of the local code. An unused fireplace that has its opening covered with wallpaper or other material should have a solid seal behind the paper. Operable fireplaces should have a workable damper and a fire screen, and should be clean.

Garages and accessory structures should be inspected in the same manner as the main building.

Sidewalks and driveways, whether constructed of flagstone, concrete, or asphalt, should be checked for creaking, buckling, and other conditions dangerous to pedestrian travel.

Stone, brick, or concrete steps should be inspected for cracks, deterioration, and pointing.

Fences should be in a sound condition and painted. Fire escapes should be checked for paint condition, loose or broken treads and rails, proper operating condition, and proper connection to the house.

V. Noise as an Environmental Stress

People feel comfortable in an environment with a low-level, soothing, steady, unobtrusive level of sound, typical of the natural undisturbed environment. All of us have experienced the anguish that noise can cause, whether it be noise from a neighbor's television, the grinding of truck gears while asleep, the persistent whine of a fan motor, or the sound of children racing down the halls. These annoyances experienced in the home are producing public demands for noise control legislation.

Not only is noise disturbing, but studies also indicate that extreme noise can cause deafness and perhaps interfere with other bodily functions.

While few existing housing ordinances contain enforceable noise provisions, noise problems must be considered by the building inspector because they intimately affect and are affected by his decisions. As a housing inspector, you can help residents by suggesting corrective noise measures that can be taken; you can refer them to agencies, if needed, for corrective action; you can help them to understand that their noisy environment can place limitations on their behavior, capabilities, and satisfaction with their home.

Noise is unwanted sound. Noise can travel through air or through the building structure. The first stage of noise control is the control of sound at its source. If attempts to quiet the source are not completely successful, then other; more expensive corrective measures will be required.

Although a visual examination of a dwelling may detect some sources of noise leaks (see Figure 4-10) such as wide gaps or cracks at ceiling, floor, or adjoining wall edges, it is usually inadequate since it fails to detect sources of noise leaks hidden from the eye. A far more effective test is to be alert for the operation of some noisy device like a vacuum cleaner in a closed room and listen near the other side of the wall for any noise leakage. The ear is a reasonably good sensing device. If a noise leak is noticed, the partition may be surveyed at critical points with a bright flashlight while an observer looks for light leakage in a darkened room on the other side. Detection of any light leakage in the darkened room will signify a noise leak.

Figure 4-10 Transmission Of Airborne Noise

Noise carried as vibration by a building structure is called structure-borne noise. Detecting structure-borne noise caused by the operation of mechanical equipment is somewhat more difficult (see Figure 4-11). With noisy equipment in operation, the inspector can sometimes locate noise leaks or structure-borne noise paths by conducting similar hearing tests along with pressing the ear against various room surfaces or using fingertips to sense the vibration of these surfaces.

A Airborne Noise

The sources of airborne noise that cause the most frequent disturbances in the home are audio instruments such as televisions. radios. phonographs, or pianos; adults and children speaking loudly, singing, crying and shouting; household appliances such as garbage disposals, dishwashers, vacuum cleaners, clothes washers, and dryers; plumbing noises such as pipes knocking, toilets flushing, and water running.

The disturbing influences of airborne noise are generally limited to the areas near the noise source. For example, a phonograph may cause annoyance in rooms of a neighbor's apartment adjacent to the phonograph but rarely in rooms farther removed unless doors or passageways are left open. Sound absorption materials such as carpeting, acoustical tile, drapery, and upholstered furniture in the intervening rooms may often provide a significant reduction in the disturbing noise before it reaches rooms where quiet is desired.

Under no conditions should sound-absorptive materials be used on the surfaces of walls and ceilings for the sole purpose of preventing the transmission of sound as structure-borne noise. To do so would be a complete waste of effort. To illustrate, imagine the noise conducted by a wall constructed solely of drapery or acoustical tile attached to studs. The noise level in the room would be reduced, but sound produced in the room would pass through the wall to adjoining rooms with little, if any, reduction in noise level. Sound absorptive materials should be used in and near areas of high noise levels to limit airborne noise at the source of the noise and reduce the effects of noise along corridors.

The transmission of noise from one completely enclosed room to an adjoining room separated by a partition wall may be either direct transmission through the wall, indirect transmission through other walls, ceilings, and floors common to both rooms, or through corridors adjacent to such rooms.

In some older wood frame houses, the open troughs between studs and joists are efficient sound transmission paths. This noise transmission by indirect paths is known as "flanking transmission" (see Figure 4-10 and 4-11). In addition to the flanking paths, there may be noise leaks particularly along the ceiling, floor, and sidewall edges of the wall. In order to obtain the highest sound insulation performance, a partition wall must be of airtight construction. Care must be exercised to seal all openings, gaps, holes, joints, and penetrations of piping and conduits with a nonsetting caulking compound. Even hairline cracks, particularly at

adjoining wall, floor. and ceiling edges, transmit a substantially greater amount of noise than would normally be expected on the basis of the size of the crack.

It is often helpful to use one sound to drown out another disturbing noise; for example, music on the radio can be used to drown out the noise of traffic. The use of sound to drown out noise is particularly useful in masking noises that occur infrequently, such as accelerating or braking vehicles, periodic mechanical equipment noise, barking dogs, laughter, or shouting.

B Structure-Borne Noise

Figure 4-11. Flanking Transmission Of Impact And Structure-borne Noise

Structure-borne noise occurs when wall, floor, or other building elements are set into vibration by direct contact with vibrating sources such as me chanical equipment or domestic appliances. A small, vibrating pipe firmly attached to a plywood or gypsum wall panel will amplify the vibration noise. An illustration of this amplification of structure borne noise is provided by the sound board of a piano. The major sources of structure-borne noise are the impact of walking on wood floors or of slamming doors, plumbing system noises, heating and air-conditioning system noises, noise from mechanical equipment or appliances, and vibration from sources outside the building. If the vibration is severe enough, it may have adverse effects not only on tile occupants of a building but also on the building structure.

Household appliances such as refrigerators, washing machines, sewing machines, clothes dryers, televisions, and pianos should be vibration isolated from the floor by means of rubber mounts placed under them if disturbing structure-borne noise is to be avoided. Residents should also be cautioned against locating these noise sources along party walls and in particular against mounting these appliances and kitchen cabinets 'directly on party walls so that the walls act as sounding boards in adjoining apartments. Window air-conditioners should be completely vibration isolated from the surrounding window frame by rubber gaskets and padding. The importance of isolating a vibrating source from the structure in the control of equipment noise cannot be overemphasized.

Another source of disturbing structure-borne noise is squeaking of wood floors. Some squeaks can be eliminated by lubricating the tongues of wood floor boards with mineral oil applied sparingly to the openings between adjacent boards. Loose finish flooring may be securely fastened to subflooring by surface nailing into the subfloor and preferably the joists. Ring-type nails or sawtooth staples properly spaced should be used in nailing finish flooring to subflooring. In an exposed joist structure, where finish flooring is warped, driving screws up through the subfloor and into the finish floor will be effective in drawing the layers of flooring tightly together to reduce noise.

Of course, noise caused by the impact of walking or scraping can be substantially reduced by the use of carpets. In the case of door slams, the impact noise may be eliminated by the use of door closers or rubber bumpers.

The noisy hammering of a plumbing system is usually caused by the sudden interruption of water flow, for example, by a quick closing or opening of a tap.

Air chambers can be built into the plumbing system to reduce water hammer. The air pockets, rubber inserts, or spring elements in air chambers act to reduce noise. Air chambers are explained in Chapter 6.

Defective, loose, or worn valve stems create intense chattering of the plumbing system. The defective device can frequently be found without difficulty, since immediate use of the device causes the vibration, which generally occurs at some low-flowvelocity setting and diminishes or disappears at a higher flow setting. For example, if a chattering noise occurs when a particular faucet or tap is opened partially and diminishes when fully opened, the faucet more than likely has some loose or defective parts and should be repaired.

Noise can be a very complex problem. The housing inspector is not expected to be an acoustics expert. Nor is he expected to be able to analyze and solve the noise problems that an acoustics consultant would normally handle. He can, however, help teach the public that the annoyances and stress caused by noise can be partially alleviated by a simple awareness of common noise problems found in many residences.

Although the housing inspector is not an expert in the fields of zoning, plumbing, building, and electrical systems, he should- be familiar with the applicable code in each of the respective fields. Familiarization with these codes will better enable him to recognize violations.

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Chapter 5: Zoning Ordinances in Relation to the Housing Inspection

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Zoning is essentially a means of ensuring that a community's land uses are compatibly located for the health, safety, and general welfare of the community. Experience has shown that some type of controls are needed in order to provide orderly growth in relation to the community plan for development. Just as a capital improvement program governs public improvements such as streets, parks, and other recreational facilities, schools, and public buildings, so zoning governs the planning program with respect to the use of public and private property.

When a person buys or builds a house or other structure in a municipality that has a zoning ordinance in effect, he is presumed to know and obliged by law to comply with the zoning regulations governing the use of buildings and land in the section of the community in which his property is located. If he either erects a structure or converts a house or building that is within that particular district by the local zoning ordinance into another type of use he still has acquired no property right to continue the forbidden use. An example would be the conversion of a single family residence into multifamily units. Even if the owner has obtained a building permit for this work already completed, the building permit would be voided, because the work was started in violation of the zoning code and because a building permit can be valid only when issued for a lawful purpose. The building inspector is therefore obliged to refuse issuance of a building permit if the proposed work is in violation of the zoning ordinance.

It is very important that the housing inspector know the general nature of zoning regulations, since properties in violation of both the housing code and the zoning ordinance must be brought into full compliance with the zoning ordinance before the housing code can be enforced. In many cases the housing inspector may be able to eliminate some of the properties in violation of the housing code through enforcement of the zoning ordinance.

I. Background of Zoning

Zoning regulations have been used for several centuries. In the early settlement of our country, gunpowder mills and storehouses were prohibited from being located within the heavily populated portions of town, owing to the frequent fires and explosions. Later, zoning took the form of fire districts, and under implied legislative powers, wooden buildings were prohibited from certain sections of the municipality.

Massachusetts passed one of the first zoning laws in 1692. This law authorized Boston, Salem, Charlestown, and certain other market towns in the province to assign certain locations in each town for the establishment of slaughterhouses and stillhouses for currying of leather.

Act and Resolves of the Province of Massachusetts Bay 1692-93 C.23

"Be it ordained and enacted by the Governor, Council and Representatives convened in General Court or Assembly, and by the authority of the same,

Sect. 1 That the selectmen of the towns of Boston, Salem, and Charlestown respectively, or other market towns in the province, with two or more justices of the peace dwelling in the town, or two of the next justices of the country, shall at or before the last day of March, one thousand six hundred ninety-three, assign some certain places of the said towns (where it may be least offensive) for the erecting or setting up of slaughterhouses for the killing of all meat, stillhouses, and houses for trying of tallow and currying of leather (which houses may be erected of timber, the law referring to building with brick or stone not withstanding) and shall cause an entry to be made in the townbook of what places shall be by them so assigned, and make known the same by posting it up in some public places of the town; by which houses and places respectively, and no other, all butchers, slaughtermen, distillers, chandlers, and curriers shall exercise and practice their respective trades and mysteries; on pain that any butcher or slaughterman transgressing of this act by killing of meat in any other place, for every conviction thereof before one or more justices of the peace, shall forfeit and pay the sum of twenty shillings (shilling worth about 12-16?); and any distiller, chandler or currier offending against this act, for every conviction thereof before their majesties justices at the general sessions of the peace for the county, shall forfeit and pay the sum of five pounds (a pound equals 20 shillings and was worth somewhere between $2.40 and $3.20); one-third part of said forfeitures to be the use of the majesties for the support of the government of the province and incident charges thereof, one-third to the poor of the town when such offense shall be committed, and the other third to him or them that shall inform and sue for the same...."

II. Definitions

A Accessory Structure - A detached building or structure in a secondary or subordinate capacity from the main or principal building or structure on the same premises. Example: garage behind a single-family dwelling.

B Accessory Use- A use incidental and subordinate to the principal use of a structure. Example: a home-located physician's office.

C Alteration - A change or rearrangement of the structural parts of a building, or an expansion or enlargement of the building.

D Building Area - That portion of the lot remaining available for construction after all required open space and yard requirements are met.

E Dwelling - Any enclosed space that is wholly or partially used or intended to be used for living or sleeping by human occupants provided that temporary housing shall not be regarded as a dwelling. Temporary housing is defined as any tent, trailer, mobile home, or any other shelter designed to be transportable and not attached to the ground, to another structure, or to any utility system on the same premises for more than 30 consecutive days.

F Dwelling, Two Family - A structure containing two dwelling units and designed for occupancy by no more than two families.

G Dwelling, Multifamily - A residential structure equipped with more than two dwelling units.

H Dwelling Unit - Any room or group of rooms located within a dwelling and forming a single habitable unit with facilities that are used or intended to be used by a single family for living, sleeping, cooking, and eating.

I Exception - Sometimes called "special use." An exception is a land use that can be made compatible with a district upon the imposition by the board of adjustment of special provisions covering its development, even though it would not otherwise be permitted in the district. Example: Fire substation being permitted to locate in a residential area.

J Family - One or more individuals living together and sharing common living, sleeping, cooking, and eating facilities.

K Home Occupation - An occupation conducted in a dwelling unit subject to the restrictions of the zoning ordinance. Limitations of interest to housing inspectors are the following: (a) Only the occupant or members of his family residing on the premises shall be engaged in the occupation, (b) the home occupation use shall be subordinate to its use for residential purposes and shall not occupy more than 25 per cent of the floor area of the dwelling unit, (c) the home occupation shall not be conducted in an accessory structure, (d) no offensive noise, glare, vibration, heat, smoke, dust, or odor shall be produced.

L Lot- Parcel of land considered as a unit devoted to either a particular use or to occupancy by a building and its accessory structures.

M Lot Depth - The average horizontal distance between the front and rear lot line measured at right angles to the structure.

N Lot Width - The average horizontal distance between the sides of a lot measured at right angles to the lot depth.

O Nonconforming Use - (a) Use of a building or use of land that does not conform to the regulations of the district in which located. (b) Nonconforming use also means a building or land use that does not conform to the regulations of the district in which the building or land is but that is nevertheless legal since it existed before enactment of the ordinance.

P Open Space - Unoccupied space that is open to the sky and on the same lot with the building.

Q Variance - Easing or lessening of the terms of the zoning ordinance by a public body so that relief for hardships will be provided but with the public interest still protected.

Inspectors should refer to the definitions in the zoning ordinance of their municipality for additions and changes.

III. Zoning Objectives

As stated earlier, the purpose of a zoning ordinance is to ensure that the land uses within the community are regulated not only for the health, safety, and welfare of the community but also in keeping with the comprehensive plan for community development. The objectives contained in the zoning ordinance that help to achieve a- development providing for the health, safety, and welfare are the following:

A Regulate Height, Bulk, and Area of Structure. In order to provide established standards of healthful housing within the community, regulations dealing with building heights, lot coverage, and floor areas must be established. These regulations then ensure that adequate natural lighting, ventilation, privacy, and recreational area for children will be realized. These are all fundamental physiological needs that have been determined to be necessary for a healthful environment.

Safety from fires is enhanced because of building separations needed to meet yard and open-space requirements.

Through prescribing minimum lot area per dwelling unit, population density controls are established.

B Avoid Undue Levels of Noise, Vibration, Glare, Air Pollution, and Odor. By providing land use category districts, these

environmental stresses upon the individual can be reduced. As in the first item, the absence of these stresses has been determined to be a fundamental physiological individual need.

C Lessen Street Congestion Through Off-Street Parking and Off-Street Loading Requirement.

D Facilitate Adequate Provisions of Water, Sewerage, Schools. Parks, and Playgrounds.

E Secure Safety From Flooding.

F Conserve Property Values. Through careful enforcement of the provisions property values will be stabilized and conserved

IV. What Zoning Cannot Do

In order to understand more fully the difference between zoning and the other devices such as subdivision regulations, building codes, and housing ordinances, the housing inspector must know the things that cannot be accomplished by a zoning ordinance.

Items that cannot be accomplished in a zoning ordinance include:

A Correcting Existence of Overcrowding or Substandard Housing. Zoning is not retroactive and cannot correct conditions such as those cited. These are corrected through enforcement of a minimum standards housing code.

B Materials and Methods of Construction. Materials and methods of construction are enforced through the building codes rather than through zoning.

C Cost of Construction. Quality of construction and hence construction costs are often regulated through deed restrictions or covenants. Zoning does, however, stabilize property values in an area by prohibiting incompatible development such as the location of a heavy industry in the midst of a well established subdivision.

D Subdivision Design and Layout. Design and layout of subdivisions as well as provisions for parks and streets are controlled through subdivision regulations.

V. Content of the Ordinance

Zoning ordinances establish districts of whatever size, shape, and number the municipality deems best for carrying out the purposes of the zoning ordinance. Most cities use three major districts: residential, commercial, and industrial. These three may then be subdivided into many subdistricts, depending on local conditions. These districts specify the principal and accessory uses, exceptions, and prohibitions.

In general these permitted land uses are based on intensity of land use, a less intense land use being permitted in a more intense district but not vice versa. For example, a single-family residence is a less intense land use than a multifamily dwelling. A multifamily dwelling would not, however, be permitted in a single family district.

In recent years, some ordinances are being partially based on performance standards rather than solely on land use intensity. For example, some types of industrial developments may be permitted in a less intense use district provided that the proposed land use creates no noise, glare, smoke, dust, vibration, or other environmental stress exceeding acceptable standards and provided further that adequate offstreet parking, screening, landscaping, and other similar measures are taken.

VI. Bulk and Height Requirements

To further achieve the earlier stated objectives of the zoning ordinance, other regulations within a particular zoning district are imposed to gain control of population densities and to provide adequate light, air, privacy, and other elements needed for a safe and healthy environment.

Most early zoning ordinances stated that within a particular district the height and bulk of any structure could not exceed certain dimensions and specified that dimensions for front, side, and rear yards must be provided. Today some zoning ordinances use floor area ratios for regulation. Floor area ratio is the relationship between the floor space of the structure and the size of the lot on which it is located. For example, a floor area ratio of I would permit either a two-story building covering 50 per cent of the lot, or a one-story building covering 100 per cent of the lot. This is illustrated in Figure 5-1. Other zoning ordinances specify the maximum amount of the lot that can be covered or else merely require that a certain amount of open space must be provided for each structure and leave the flexibility of the location to the builder. Still other ordinances, rather than specify a particular height for the structure, specify an angle of light obstruction within a particular district that will assure air and light to the surrounding structures. An example of this is shown in Figure 5-2.

Figure 5-1. Floor Area Ratios of 1.

Figure 5-2. Angle of Light Obstruction.

VII. Yard Requirements

Zoning ordinances also contain yard requirements that are divided into front, rear, and side yard requirements. These requirements, in addition to stating the lot dimensions. usually designate the amount of setback required. Most ordinances permit the erection of auxiliary buildings in rear yards provided they are located at stated distances from all lot lines and provided sufficient stated open space is maintained. If the property is a corner lot, additional requirements are set to allow visibility for motorists.

VIII. Offstreet Parking

Space for offstreet parking and offstreet loading is also contained in the ordinance. These requirements are based on standards relating floor space or seating capacity to land use. For example, a furniture store would require fewer offstreet parking spaces in relation to the floor area than a movie theater would.

IX. Nonconforming Uses

Since zoning is not retroactive, all zoning ordinances must contain a provision for nonconforming uses. If a use has already been established within a particular district before adoption of the ordinance. it must be permitted to continue. Provisions are, however, put into the ordinance to aid in eliminating nonconforming use. These provisions generally prohibit the following: (1) An enlargement or expansion of the nonconforming uses, (2) reconstruction of the nonconforming use if more than a certain portion is destroyed, (3) resumption of the use after it has been abandoned for a period of specified time, and (4) changing the use to a higher classification or to another nonconforming use. Some zoning ordinances further provide a period of amortization during which the nonconforming land use must be phased out.

X. Variances

Zoning ordinances contain provisions for permitting variances and providing a method of granting these variances subject to certain specified conditions. A variance may be granted when, owing to a particular lot shape, topography, or other lot characteristics, an undue hardship would be imposed on the owner if the exact content of the ordinance is adhered to. For example, assume we have a piece of irregularly shaped property located in a district having the side yard requirements of 20 feet on a side and total lot size requirement of 10,000 square feet. Suppose that our property contains 10,200 feet and thus meets the area requirements; however, let us further assume that, owing to the irregular shape of the property, we can provide side yards of only 15 feet on a side. Since a hardship would be imposed if the exact letter of the law is held to, the zoning board of adjustment could be asked for a variance. Since there is sufficient total open area and since a lessening of the ordinance is not detrimental to the surrounding property, a variance would probably be granted.

Before a variance can be granted, it must be shown that (l) there is a practical hardship, (2) that the variance is needed for the owner to realize a reasonable return on the property, (3) that the original intent of the ordinance will be adhered to, (4) that the character of the neighborhood will not be changed, and (5) that the public's safety and welfare will be preserved.

XI. Exceptions

An exception is often confused with a variance. In every city there are some necessary uses that do not correspond to the permitted land uses within the district. The zoning code recognizes, however, that if proper safeguards were to be provided, these uses would not have a detrimental eftect on the district. An example would be a fire substation, which could be permitted in a residential area provided the station house is designed to resemble a residential dwelling and further provided the property is properly landscaped.

XII. Administration

The key man in the zoning process is the zoning inspector, since he must come in contact with each case. In many cases the zoning inspector may also be the building inspector or the housing inspector. Since the building inspector or housing inspector is already in the field making inspections, it is relatively easy for him to check compliance with a zoning ordinance. This compliance can be checked by comparing the actual land use against that allowed for the area and shown on the zoning map.

Each zoning ordinance has a map as a part of the ordinance giving the permitted usage for each block. By taking a copy of this map with him, the inspector can make a preliminary check of the land use in the field. If the use does not conform, the inspector must then check with the Zoning Board to see if the property in question was a "nonconforming use" at the time of passage of the ordinance and if an exception has been granted. In cities where up-to-date records of existing nonconforming uses and exceptions granted are maintained, the inspector can check the use in the field against the records.

When violation is observed and the property owner is duly notified of the violation, he then has the right of hearing before a Zoning Board of Adjustment (sometimes also called the Zoning Board of Appeals). The Board may uphold the zoning enforcement officer or may rule in favor of the property owner. If the action of the zoning enforcement officer is upheld, the property owner may, if he so desires, seek relief through the courts; otherwise the violation will be corrected to conform to the zoning code.

XIII. How Zoning Can Benefit the Housing Inspector

It is of critical importance for the housing inspector, the building inspector, and the zoning inspector to work closely together in cities where these positions and responsibilities are separate. Experience has shown that when illegal conversions or uses of properties occur, these illegally converted properties are often among the most substandard encountered in the city and often contain especially dangerous housing code violations.

In communities where the zoning code is enforced effectively, the resulting zoning compliance in new and existing housing helps advance, as well as sustain, many of the minimum standards of the housing code such as occupancy, ventilation, light, and unimpeded egress. By the same token, building or housing inspectors can often aid the zoning inspector by helping eliminate some nonconforming uses through code enforcement.

XIV. Example of Zoning and Housing Relationships

The following cases will illustrate these relationships:

A Case 1

Two and one-half-story, 13-room house. Originally it had these features:

a Five-room dwelling unit on first floor including a three-piece bathroom.

b Eight-room dwelling unit occupying the second and third floors including one bathroom of three pieces on the second floor. The second and third floors are served by only one staircase.

c Two oil burners, one heating first floor, the other the second and third floors.

It is located in a residential zoning district where two-family housing is the maximum use permitted.

Five years later, while making a regular inspection, the zoning officer found this house in the process of being converted into a three-family use in violation of the zoning ordinance. The owner has already done these things.

a Made second floor into a separate five-room dwelling unit.

b Started converting the three rooms on the third floor into another apartment by:

1 Installing a three-piece bathroom, 35 square feet in area, against the windowless west wall of the center bedroom, the habitable area being thus reduced to 40 square feet, and setting up the remainder of the area as the living room by providing a coffee table, lamp, and two overstuffed chairs;

2 Putting in a wall kitchenette consisting of a sink with cold water and a stove, plus a table, lamp, and cupboards in the rear bedroom that is 60 square feet in area;

3 Equipping the front bedroom that is 90 square feet in size with two beds, chest of drawers, and other bedroom furnishings for two.

He admitted, however, that he had not checked on state tenement house law requirements since he did not realize multiple dwellings of three families or more are covered by this law.

Two and one-half-story. 13-room house. Originally Question: How many violations (either housing or it had these features: zoning) can you find?

Answer: As a result of these actions by the owner, the house now has one more dwelling unit than is permitted by the zoning ordinance in this residential district and also contains these obvious housing code violations:

(a) Threatened over occupancy of the third-floor dwelling unit (only 190 square feet available, but 250 square feet habitable floor space is the minimum required for two occupants).

(b) Size of the front bedroom inadequate by 30 square feet if it is used by two occupants. The back bedroom lacks the requirements needed for occupancy by one person (70 square feet). If a third person lived in the dwelling unit the minimum required habitable floor area would then become 350 square feet.

(c) The bathroom does not meet the light and ventilation requirements. (d) The kitchen sink does not have hot water.

(e) No refrigerator is provided.

(f) From the description it sounds as if one might have to go through a sleeping room to reach the bathroom. This would be a violation.

(g) Both the second and third floor units are in violation since they lack two means of egress.

B Case 2

Assume that a three-family dwelling unit is the largest size permitted in the zoning district where the building in question is located. The housing inspector's investigation of the three-story dwelling from cellar to roof showed that it contained:

1 Four dwelling units, two with six rooms each and two with three rooms each.

2 Five families, three in separate dwelling units and the two on the third floor in one unit.

3 A bathroom and a kitchen on the second floor shared by two families.

4 The bathroom and kitchen on the third floor also being shared by two families.

5 Inadequate means of egress from the dwelling unit in the third floor.

Question: If you were the housing inspector, what actions would you take?

Answer: In this situation there are definite housing code violations. The housing inspector also knows there is a zoning violation. Because he knows that the property must meet zoning requirements before complying with the housing code, the inspector would refer this case to the zoning department for action.

The housing inspector should never speak for the zoning department and tell the owner that he is in violation of a zoning ordinance unless he and the zoning inspector are the same individual. The housing inspector should complete his housing inspection and leave. Responsibility for informing the owner of any zoning violation lies with the zoning department.

In this particular case, some housing code violations will be corrected through enforcement of zoning. However, there are still violations of requirements for egress, a third kitchen, and a third bathroom.

After compliance with the zoning ordinance has been obtained, the zoning department should notify the housing inspector so that he can then enforce any housing violations that may still exist.

C Case 3

Mr. Jones, a zoning inspector, gets a report that at 1212 Oak Street the owner, Mr. Smith, is converting his single-family house into two apartments and has already started alterations. Investigations of the zoning map shows that in this district, apartments, up to four, are permitted if 1,500 square feet of open land area is provided for each apartment. Mr. Jones checks and finds that no building permit has been issued. A site investigation reveals that Mr. Smith has only 2,000 square feet of open area available. He then informs Mr. Smith that he is in violation of the zoning ordinance.

Mr. Smith then appeals to the Zoning Board of Adjustment for a variance to allow him to have two apartments even though he does not have the required 3,000 square feet of open area. His appeal is denied by the board since no real hardship exists. As a result, Mr. Smith must rent the property as a single-family dwelling and is unable to recover the money he has already spent in starting alterations.

Discuss: **1** The actions of Mr. Jones. Answer: Mr. Jones was justified in citing Mr. Smith for a zoning violation since the proposed open area would have been inadequate.

2 The action of the Board of Adjustment.

Answer: The Board of Adjustment was also justified in upholding the zoning regulations. If the board had not acted in this manner, the crowding on this property could well have started deterioration in surrounding properties.

3 The action of Mr. Smith. Answer: Mr. Smith had no legitimate complaint when the Board ruled against him. If he had first sought to obtain a building permit, as required by law, he would have been told that his proposed alterations would not meet zoning regulations and hence would not have suffered a monetary loss.

D Case 4

Mr. Edwards requests a building permit to change a three-story single-family house into a two-family unit. Since two-family units

are permitted in this district and he has sufficient open area, the permit is granted.

Six months later, the housing inspector, while making a systematic code enforcement inspection, finds that the converted house now has an apartment on each of the three floors. The bath on the second floor is shared by families on the second and third floors. This is a violation of the housing code.

Knowing that all the other houses on this street are only one- or two-family units, he also suspects a zoning violation. After returning to the office, he contacts the zoning department and learns that Mr. Edwards is in violation of the zoning ordinance as well as of the housing code.

Question: Which ordinance must be enforced first and why?

Answer: The zoning ordinance must be enforced first, since a zoning ordinance is a "primary" ordinance and determines the land use of a particular property. A housing code ordinance is a "secondary" ordinance and sets standards of residential usage on the property.

E Case 5

During a routine inspection, the housing inspector finds a house with three families, one of which is living in a cellar apartment.

Question: What actions should he take? Answer: The inspector should immediately cite the owner for a violation of the ordinance and then follow through to see that the situation is corrected. If the family living in the cellar requires housing assistance as a result of corrective measures taken, the housing inspector should inform them of public agencies available for assistance.

F Case 6

During a routine inspection of a district zoned for up to three-family use, the housing inspector encounters a house that the owner says contains two dwelling units in addition to his own, and also one rooming unit. The inspector finds a cookstove in the "rooming unit."

Question: What actions should he take?

Answer: Although a rooming unit would be permitted in this district, the addition of a cookstove changes the rooming unit into a dwelling unit.

The inspector should refer this case to the zoning department for immediate action and then follow up for housing violations at a later date.

G Case 7

The housing inspector is investigating a complaint of alleged housing violations. The owner refuses to admit the inspector inside the building and becomes belligerent .

Question: What should the inspector do next?

Answer: The inspector should remain courteous and not lose his temper. If the inspector is not able to obtain permission to inspect without further arousing the owner, he should leave.

Since recent decisions of the U.S. Supreme Court have dictated the inclusion of requirements to obtain a search warrant in cases where entry to the inspector is denied, the inspector should obtain a warrant. He will then return at a later time with someone to serve the warrant.

H Case 8

During an inspection in July, the housing inspector finds a house that has been converted into two apartments. While checking the basement, he sees that the furnace appears in an unsafe condition. Further checking reveals that there is no provision for heat in the second apartment.

Question: What action should the inspector take since it is July and heat is not now needed. Besides, how does he know that the owner will not install heat before winter?

Answer: The inspector should cite the owner for a violation of the housing code anyway. In his notice of violations, because it is July, he can give the owner sufficient time to comply. He would also send a copy of the letter to the heating inspector for follow up.

I Case 9

During an inspection, the housing inspector is greeted at the door by a 10-year-old boy who is alone. The boy says it is all right to make the inspection.

Question: Should he? Why?

Answer: No. Permission to enter must be obtained from a responsible adult. Suppose that instead of the 10-year-old boy, he had found a 16-year-old girl. Question: How would this change things? Why? Answer: It would not change things, since the 16-yearold girl is not considered a responsible adult. For the protection of the inspector, some housing departments would not permit him to enter alone when the house is occupied by only a female, especially one under age.

J Case 10

During his inspections the housing inspector finds a house that has no bathroom but does have an outside pit privy.

Question: What action should be taken?

Answer: The inspector should issue a violation for lack of indoor toilet facilities and follow through the regular steps established by his housing department. A copy of the violation should also be sent to the health department for any actions that they may wish to take for elimination of the privy.

K Case 11

A number of violations are found in a residence, but the family is occupying the unit under a land purchase contract agreement with the landlord. The owner holds title until enough rent is paid to equal the sale price. The repairs needed are more than the family can afford and are such that the building should be declared unfit for occupancy. The family now has $2,000 worth of equity in the property.

Questions: What actions should the inspector take? Who is responsible for repairs? Who will lose money?

Answer: The inspector would cite the owner of record for a housing violation, since the owner of record is responsible for repairs. If the owner will not bring the building into compliance with the code, the building should be posted as unfit for habitation and the family removed.

The family buying will probably lose in this situation. Before contracting to buy, they should have obtained a certificate of inspection from the housing department showing any violations existing at the time of purchase.

L Case 12

The property at 112 East Street is owned by an out-of-state individual. The housing inspector found the property unfit for habitation and has had the family renting the property removed. The house is now vacant and the out-of-town owners will not make the repairs since the cost of the necessary repairs would be too great in relation to the value of the property. The property is in an area that will probably be included in a future urban renewal project within the next few years.

Complaints have been made to the housing department by the neighbors that the house has its windows broken out and its doors broken open. Children play inside during the day and have almost set the building on fire several times. Moreover, vagrants occasionally sleep inside at night.

Question: What action would you take if you were the housing inspector?

Answer: After following standard department procedures, the housing inspector should recommend that the house be demolished and this cost assessed as a lien against the property. If allowed to remain, the house will be a detriment to surrounding properties and also to the neighborhood.

M Case 13

During a routine inspection, you find a house with very poor premises sanitation and evidence of roaches, flies, and rats. The property meets minimum housing standards otherwise.

Question: What action can you take?

Answer: The action depends on local regulations and procedures. In many communities the housing program is organizationally located within the health department. In that case, the housing inspector would probably follow through in requiring elimination of the infestation. If the housing inspection program were located within a department other than the health department, the housing inspector may refer the case to the health department for action.

N Case 14

While making a systematic code inspection, the housing inspector encounters a lady who questions the inspector regarding his findings on the house next door, which she is sure is much worse than hers.

Question: How should the inspector deal with the lady?

Answer: The inspector must be very courteous and tactful in his conversation and inform her that he is not permitted to discuss his survey findings for other properties.

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Chapter 6 Plumbing Elements of a Housing Inspection

Plumbing may be defined as practice, materials, and fixtures used in the installation, maintenance, and alteration of all piping, fixtures, appliances, and appurtenances in connection with sanitary or storm drainage facilities, the venting system, and the public or private water supply systems. Plumbing does not include the trade of drilling water wells, installing water softening equipment, or the business of manufacturing or selling plumbing fixtures, appliances, equipment, or hardware. A plumbing system consists of three separate parts: an adequate potable water supply system; a safe, adequate drainage system; and ample fixtures and equipment.

I. Background Factors

The generalized inspector of housing is concerned with a safe water supply system, an adequate drainage system, and ample and proper fixtures and equipment. This chapter covers the major features of a residential plumbing system and the basic plumbing terms the inspector must know and understand to identify properly housing code violations involving plumbing and the more complicated defects that he will refer to the appropriate agencies.

II. Definitions

1 Air Chambers - Air Chambers are pressure absorbing devices that eliminate water hammer. They should be installed as close as possible to the valves or faucet and at the end of long runs of pipe.

2 Air Gap (Drainage System) - The unobstructed vertical distance through the free atmosphere between the outlet of a water pipe and the flood level rim of the receptacle into which it is discharging.

3 Air Gap (Water Distribution System) - The unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture, or other device and the flood level rim of the receptacle.

4 Air Lock - An air lock is a bubble of air which restricts the flow of water in a pipe.

5 Backflow - Backflow is the flow of water or other liquids, mixtures, or substances into the distributing pipes of a potable water supply from any source or sources other than the intended source. Back siphonage is one type of backflow.

6 Back Siphonage - Back siphonage is the flowing back of used, contaminated, or polluted water from a plumbing fixture or vessel into a potable water supply due to a negative pressure in the pipe.

7 Branch - A branch is any part of the piping system other than the main, riser, or stack.

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- CDC Fact Book 2000/2001
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8 Branch Vent - A vent connecting one or more individual vents with a vent stack.

9 Building Drain - The building (house) drain is the part of the lowest piping of a drainage system that receives the discharge from soil, waste, or other drainage pipes inside the walls of the building (house) and conveys it to the building sewer beginning 3 feet outside the building wall.

10 Cross Connection -Any physical connection or arrangement between two otherwise separate piping systems, one of which contains potable water and the other either water of unknown or questionable safety or steam, gas, or chemical whereby there may be a flow from one system to the other, the direction of flow depending on the pressure differential between the two systems. (See Backflow and Back siphonage.)

11 Disposal Field - An area containing a series of one or more trenches lined with coarse aggregate and conveying the effluent from the septic tank through vitrified clay Pine or perforated, non-metallic pipe, laid in such a manner that the flow will be distributed with reasonable uniformity into natural soil.

12 Drain - A drain is any pipe that carries waste water or water-borne waste in a building (house) drainage system.

13 Flood Level Rim - The top edge of a receptacle from which water overflows.

14 Flushometer Valve - A device that discharges a predetermined quantity of water to fixtures for flushing purposes and is closed by direct water pressures.

15 Flush Valve - A device located at the bottom of the tank for flushing water closets and similar fixtures.

16 Grease Trap - See Interceptor

17 Hot Water - Hot water means potable water that is heated to at least 120?F and used for cooking, cleaning, washing dishes, and bathing.

18 Insanitary - Contrary to sanitary principles injurious to health.

19 Interceptor - A device designed and installed so as to separate and retain deleterious, hazardous, or undesirable matter from normal wastes and permit normal sewage or liquid wastes to discharge into the drainage system by gravity.

20 Leader - An exterior drainage pipe for conveying storm water from roof or gutter drains to the building storm drain, combined building sewer, or other means of disposal.

21 Main Vent - The principal artery of the venting system, to which vent branches may be connected.

22 Main Sewer - See Public Sewer.

23 Pneumatic - The word pertains to devices making use of compressed air as in pressure tanks boosted by pumps.

24 Potable Water - Water having no impurities present in amounts sufficient to cause disease or harmful physiological effects and conforming in its bacteriological and chemical quality to the requirements of the Public Health Service drinking water standards or meeting the regulations of the public health authority having jurisdiction.

25 P & T (Pressure and Temperature) Relief Valve - A safety valve installed on a hot water storage tank to limit temperature and pressure of the water.

26 P Trap - A trap with a vertical inlet and a horizontal outlet.

27 Public Sewer - A common sewer directly controlled by public authority.

28 Relief Vent - An auxiliary vent that permits additional circulation of air in or between drainage and vent systems.

29 Septic Tank - A watertight receptacle that receives the discharge of a building's sanitary drain system or part thereof and is designed and constructed so as to separate solid from the liquid, digest organic matter through a period of detention, and allow the liquids to discharge into the soil outside of the tank through a system of open-joint or perforated piping, or through a seepage pit.

30 Sewerage System - A sewerage system comprises all piping, appurtenances, and treatment facilities used for the collection and disposal of sewage, except plumbing inside and in connection with buildings served. and the building drain.

31 Soil Pipe - The pipe that directs the sewage of a house to the receiving sewer, building drain, or building sewer.

32 Soil Stack - The vertical piping that terminates in a roof vent and carries off the vapors of a plumbing system.

33 Stack Vent - An extension of a solid or waste stack above the highest horizontal drain connected to the stack. Sometimes called a waste vent or a soil vent.

34 Storm Sewer - A sewer used for conveying rain water, surface water, condensate. cooling water, or similar liquid waste.

35 Trap - A trap is a fitting or device that provides a liquid seal to prevent the emission of sewer gases without materially affecting the flow of sewage or waste water through it.

36 Vacuum Breaker - A device to prevent backflow (back siphonage) by means of an opening through which air may be drawn to relieve negative pressure (vacuum).

37 Vent Stack - The vertical vent pipe installed to provide air circulation to and from the drainage system and that extends through one or more stories.

38 Water Hammer - The loud thump of water in a pipe when a valve or faucet is suddenly closed.

39 Water Service Pipe - The pipe from the water main or other sources of potable water supply to the water-distributing system of the building served.

40 Water Supply System - The water supply system consists of the water service pipe, the water-distributing pipes, the necessary connecting pipes, fittings, control valves, and all appurtenances in or adjacent to the building or premises.

41 Wet Vent - A vent that receives the discharge of waste other than from water closets.

42 Yoke Vent - A pipe connecting upward from a soil or waste stack to a vent stack for the purpose of preventing pressure changes in the stacks.

III. Main Features of an Indoor Plumbing System

The primary functions of the plumbing system within the house are as follows:

1 To bring an adequate and potable supply of hot and cold water to the users of the dwelling.

2 To drain all waste water and sewage discharged from these fixtures into the public sewer, or private disposal system.

It is, therefore, very important that the housing inspector familiarize himself fully with all elements of these systems so that he

may recognize inadequacies of the structure's plumbing as well as other code violations In order to aid the inspector in understanding the plumbing system, a series of drawings and diagrams has been included at the end of this chapter.

IV. Elements of a Plumbing System

1 Water Service: The piping of a house service line should be as short as possible. Elbows and bends should be kept to a minimum since these reduce the pressure and therefore the supply of water to fixtures in the house.

The house service line should also be protected from freezing. The burying of the line under 4 feet of soil is a commonly accepted depth to prevent freezing. This depth varies, however, across the country from north to south. The local or state plumbing code should be consulted for the recommended depth in your area of the country.

A typical house service installation is pictured in Figure 6-1.

The materials used for a house service may be copper, cast iron, steel or wrought iron. The connections used should be compatible with the type of pipe used.

a Corporation stop - The corporation stop is connected to the water main. This connection is usually made of brass and can be connected to the main by use of a special tool without shutting off the municipal supply. The valve incorporated in the corporation stop permits the pressure to be maintained in the main while the service to the building is completed.

b Curb stop - The curb stop is a similar valve used to isolate the building from the main for repairs, nonpayment of water bills, or flooded basements

Since the corporation stop is usually under the street and would necessitate breaking the pavement to reach the valve, the curb stop is used as the isolation valve.

c Curb stop box - The curb stop box is an access box to the curb stop for opening and closing the valve. A long-handled wrench is used to reach the valve.

Figure 6-1. House Service Installation

d Meter stop -The meter stop is a valve placed on the street side of the water meter to isolate the meter for installation or maintenance. Many codes require a gate valve on the house side of the meter to shut off water for house plumbing repairs. The curb and meter stops are not to be used frequently and can be ruined in a short time if used very frequently.

e Water meter - The water meter is a device used to measure the amount of water used in the house. It is usually the property of the city and is a very delicate instrument that should not he abused.

Since the electric system is usually grounded to the water line, a grounding loop-device should be installed around the meter. Many meters come with a yoke that maintains electrical continuity even though the meter is removed.

2 Hot and Cold Water Main Lines: The hot and cold water main lines are usually hung from the basement ceiling and are attached to the water meter and hot-water tank on one side and the fixture supply risers on the other.

These pipes should be installed in a neat manner and should be supported by pipe hangers or straps of sufficient strength and number to prevent sagging.

Hot and cold water lines should be approximately 6 inches apart unless the hot water line is insulated. This is to insure that the cold water line does not pick up heat from the hot water line.

The supply mains should have a drain valve or stop and waste valve in order to remove water from the system for repairs. These valves should be on the low end of the line or on the end of each fixture riser.

a The fixture risers start at the basement main and rise vertically to the fixtures on the upper floors. In a one-family dwelling, riser branches will usually proceed from the main riser to each fixture grouping. In any event the fixture risers should not depend on the branch risers for support but should be supported with a pipe bracket.

b Each fixture is then connected to the branch riser by a separate line. The last fixture on a line is usually connected directly to the branch riser. Figure 6-2 is a diagram of a typical single-family residence water supply system.

Figure 6-2. Water Distribution System for Small Residence

3 Hot Water Heaters: Hot water heaters are usually powered by electricity, fuel oil, gas, or in rare cases, coal or wood. They consist of a space for heating the water and a storage tank for providing hot water over a limited period of time.

All hot water heaters should be fitted with a temperature-pressure relief valve no matter what fuel is used.

This valve will operate when either the temperature or the pressure becomes too high due to an interruption of the water supply or a faulty thermostat.

Figure 6-3 shows the correct installation of a hot water heater.

Figure 6-3. Proper Water Heater Installation

4 Pipe Sizes: The size of basement mains and risers depends on the number of fixtures supplied. However, a 3/4 inch pipe is usually the minimum size used. This allows for deposits on the pipe due to hardness in the water and will usually give satisfactory volume and pressure.

B Drainage System

The water supply brought into the house and used is discharged through the drainage system. This system is either a sanitary drainage system carrying just interior waste water or a combined system carrying interior waste and roof runoff. The sanitary system will be discussed first.

1 Sanitary Drainage System: The proper sizing of the sanitary drain or house drain depends on the number of fixtures it serves. The usual minimum size is 6 inches in dial diameter. The materials used are usually cast iron, vitrified clay, plastic, and in rare cases, lead. For proper flow in the drain the pipe should be sized so that it flows approximately one-half full. This ensures proper scouring action so that the solids contained in the waste will not be deposited in the pipe.

a Sizing of house drain - The Uniform Plumbing Code Committee has developed a method of sizing of house drains in terms of "fixture units." One ''fixture unit" equals approximately 7? gallons of water per minute. This is the surge flow-rate of water discharged from a wash basin in 1 minute. All other fixtures have been related to this unit.

A table fixture unit values is shown in Table 6-1

Table 6-1. Fixture Unit Values

The maximum number of fixture units attached to a sanitary drain is shown in Table 6-2.

Table 6-2. Sanitary Drain Sizes

b Grade of house drain-A house drain or building sewer should be sloped toward the sewer to ensure scouring of the drain. Figure 6-4 shows the results of proper and improper Ditch of a house drain.

Figure 6-4. Results of Proper and Improper Pitch of a House Drain

The usual pitch of a house or building sewer is ? inch fall in 1 foot of length.

c House drain installation-A typical house drain installation is shown in Figure 6-5. Typical branch connections to the main are shown in Figure 6-6.

Figure 6-5. Typical House Drain Installation

d Fixture and branch drains - A branch drain is a waste pipe that collects the waste from two or more fixtures and conveys it to the building or house sewer. It is sized in the same way as the house sewer, taking into account that all water closets must have a minimum 3-inch diameter drain, and only two water closets may connect into one 3-inch drain.

All branch drains must join the house drain with a "Y" -type fitting as shown in Figure 6-6. The same is true for fixture drains joining branch drains.

Figure 6-6. Typical Branch Connections to the Main

The "Y" fitting is used to eliminate, as much as possible, the deposit of solids in or near the connection. A build-up of these solids will cause a blockage in the drain.

The recommended minimum size of fixture drain is shown in Table 6-3.

e Traps-A plumbing trap is a device used in a waste system to prevent the passage of sewer gas into the structure and yet not hinder the fixture's discharge to any great extent. All fixtures connected to a household plumbing system should have a trap installed in the line.

Table 6-3. Minimum Fixture Service

The effect of sewer gases on the human body are known; many are extremely harmful. Additionally, certain sewer gases are explosive. A trap will prevent these gases from passing into the structure.

"P" trap -The most common trap found today is the "P" trap. Figure 6-7 is a drawing of a "P" trap.

Figure 6-7. Diagram of a "P" Trap

The depth of the seal in a trap is usually 2 inches. A deep seal trap has a 4-inch seal.

As was mentioned earlier, the purpose of a trap is to seal out sewer gases from the structure. Since a plumbing system is subject to wide variations in flow, and this flow originates in many different sections of the system, there is a wide variation in pressures in the waste lines. These pressure differences tend to destroy the water seal in the trap.

To counteract this problem mechanical traps were introduced. It has been found, however, that the corrosive liquids flowing in the system corrode or jam these mechanical traps. It is for this reason that most plumbing codes prohibit mechanical traps.

There are many manufacturers of traps, and all have varied the design somewhat. Figures 6-8 and 6-9 show various types of "P" traps. The "P" trap is usually found in lavatories, sinks, urinals, drinking fountains, showers, and other installations that do not discharge a Great deal of water.

Figure 6-8. Various Types of "P" Traps

Figure 6-9. Traps on Wall-hung Fixtures

Drum trap - The drum trap is another water seal-type trap. They are usually used in the 4x5-inch or 4x8-inch sizes. These traps have a greater sealing capacity than the "P" trap and pass large amounts of water quickly. Figure 6-10 shows a drum trap.

Figure 6-10. A 4x8 Inch Drum Trap

Drum traps are commonly connected to bathtubs, foot baths, sitz baths, and modified shower baths. Figure 6-11 shows a drum trap connected to a bathtub and shower.

Figure 6-11. (a) Drum Trap on Bathtub Outlet; (b) Drum Trap on Shower Installation

Objectionable traps - The "S" 1 and the 3h "S" trap should not be us in plumbing installations. They are almost impossible to ventilate properly, and the 3h "S" trap forms a perfect siphon.

The bag trap, an extreme form of "S" trap, is seldom found. Figure 6-12 shows these types of "S" traps.

Figure 6-12. Types of "S" Traps

Figure 6-13 shows one type of mechanically sealed trap. Any trap that depends on a moving part for its effectiveness is usually inadequate and has been prohibited by the local plumbing codes.

Figure 6-13. Mechanically Sealed Trap

Figure 6-14 shows various types of internal partition traps. These traps work, but their design usually results in their being higher priced than the "P" or drum traps.

It should be remembered that traps are used only to prevent the escape of sewer gas into the structure. They do not compensate for pressure variations. Only proper venting will eliminate pressure problems.

f Ventilation - A plumbing system is ventilated to prevent trap seal loss, material deterioration. and flow retardation.

Figure 6-14. Partition Traps

1. Trap seal loss-The seal in a plumbing trap may be lost due to siphonage (direct and indirect or momentum), back pressure, evaporation, capillary attraction, or wind effect. The first two named are probably the most common causes of loss.

   If a waste pipe is placed vertically after the fixture trap, as in an "S" trap, the waste water continues to flow after the fixture is emptied and clears the trap. This is caused by the pressure of air on the fixture water's being greater than the pressure of air in the waste pipe. The action of the water discharging into the waste pipe removes the air from that pipe and thereby causes a negative pressure in the waste line.

   In the case of indirect or momentum siphonage, the flow of water past the entrance to a fixture drain in the waste pipe removes air from the fixture drain. This reduces the air pressure in the fixture drain, and the entire assembly acts as an aspirator such as the physician uses to spray an infected throat. Figures 6-15 and 6-16 show examples of siphonage.

   Figure 6-15. Examples of Direct Siphonage: (a) Seal Intact, (b) Fixture Discharging,(c) Loss of Seal

   Figure 6-16. Loss of Trap Seal

2. Back pressure-The flow of water in a soil pipe varies according to the fixtures being used. A lavatory gives a small flow and a water closet a large flow. Small flows tend to cling to the sides of the pipe, but large ones form a slug of waste as they

drop. As this slug of water falls down the pipe the air in front of it becomes pressurized. As the pressure builds it seeks an escape point. This point is either a vent or a fixture outlet. If the vent is plugged or there is no vent, the only escape for this air is the fixture outlet. The air pressure forces the trap seal up the pipe into the fixture. If the pressure is great enough the seal is blown out of the fixture entirely. Figures 6-17 and 6-18 illustrate this type of problem.

Figure 6-18. Individual Ventilation of Lavatories, Sinks, Drinking Fountains, etc.

3. Vent sizing - Vent pipe installation is similar to that of soil and waste pipe. The same fixture unit criteria are used. Table 6-3 shows minimum vent pipe sizes.

   Vent pipes of less than 1? inches in diameter should not be used. Vents smaller than this diameter tend to clog and do not perform their function.

4. Individual fixture ventilation - Figure 6-19 shows a typical installation of a wall-hung plumbing unit. This type of ventilation is generally used for sinks, lavatories, drinking fountains, and so forth

   Figure 6-19. Individual Ventilation of Lavatories, Sinks, Drinking Fountains, etc.

   Figure 6-20 shows a typical installation of a bathtub or shower ventilation system.

   Figure 6-20. Individual Ventilation of Bathtubs, Showers and Urinals

   Figure 6-21 shows the proper vent connection for a water closet or slop sink. The water closet can be either a tank type or a flushometer valve type.

   Figure 6-21. Individual Ventilation of Water Closets, Clinic Sinks, or Stop Sinks

5. Unit venting- Figures 6-22 to 6-24 Picture a back-to-hack ventilation system for various common plumbing fixtures. The unit venting system is commonly used in apartment buildings. This type of system saves a great deal of money and space when fixtures are placed back to back in separate apartments.

   Figure 6-22. Unit Vent Method of Ventilating Wall-hung Fixture Traps

   Figure 6-23. Unit Vent used in Bathtub Installation

   Figure 6-24. Unit Vent used in Water Closet Installation

   Figure 6-25 shows a double combination "Y" used for joining the fixtures to the common soil pipe. The deflectors are to prevent waste from one fixture flowing back up into the waste in the attached fixture on the other side of the wall.

   Figure 6-25. Double Combination Y and 1/8 Bend with Deflectors

6. Wet venting - Wet venting of a plumbing system is common in household bathroom fixture grouping. It is exactly what the name implies: the vent pipe is used as a waste line.

   6-26 shows a typical wet-vent installation in a home.

   Figure 6-26. West Vent Used in Connection With Bathroom Group of Fixtures

7. Total drainage system-Up to now we have talked about the drain, soil waste, and vent systems of a plumbing system separately. For a working system, however, they must all be connected. Figures 6-27 through 6-32 show some typical

drainage systems that are found in homes and small apartment buildings.

Figure 6-27. Drain Soil Waste and Vent Pipe Layout

Figure 6-28. Plumbing Layout for a Two-Story Residence, Showing Individual Ventilation of Fixtures

Figure 6-29.Typical Plumbing Layout for a Two-Story Apartment Building

Figure 6-30. Plumbing Layout for a Duplex Residence

Figure 6-31. Direct Cross Connection

Figure 6-32. Cross Connection

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Chapter 7 Heating and Environmental Control

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I. Introduction

The function of a heating system is to provide for human comfort. The variables to be controlled are temperature, air motion, and relative humidity. Temperature must be maintained uniformly throughout the heated area. Field experience indicates a variation from 6 to 10? F from floor to ceiling. The adequacy of the heating device and the tightness of the structure or room determine the degree of personal comfort within the dwelling.

Coal, wood, oil, gas, and electricity are the main sources of heat energy. Heating systems commonly used are steam, hot water, and hot air. The housing inspector should have a knowledge of the various heating fuels and systems to be able to determine their adequacy and safety in operation. To cover fully all aspects of the heating system, the entire area and physical components of the system must be considered.

II. Definitions

A Anti-flooding Control - A safety control that shuts off fuel and ignition when excessive fuel accumulates in the appliance.

B Appliance:

1 High-heat - a unit that operates with flue entrance temperature of combustion products above l,500?F.

2 Medium heat - same as high-heat, except above 600?F

3 Low heat - same as high heat, except below 600?F.

C Boiler:

1 High pressure - a boiler furnishing pressure at 15 psi or mole.

2 Low pressure -(hot water or steam)-a boiler furnishing steam at a pressure less than 15 psi or hot water not more than 30 psi.

D Burner - A device that provides the mixing of fuel, air, and ignition in a combustion chamber.

E Chimney - A vertical shaft containing one or more passageways.

1 Factory-built chimney - a tested and accredited flue for venting gas appliances, incinerators and solid or liquid fuel-burning appliances.

2 Masonry chimney - a field-constructed chimney built of masonry and lined with terra cotta flue or firebrick.

3 Metal chimney - of metal field-constructed chimney.

4 Chimney Connector-A pipe or breeching that connects the heating appliance to the chimney.

F Clearance - The distance separating the appliance, chimney connector, plenum, and flue from the nearest surface of combustible material.

G Central Heating System - A boiler or furnace, flue connected, installed as an integral part of the structure and designed to supply heat adequately for the structure.

H Controls:

1 High-low limit control - an automatic control that responds to liquid level changes and pressure or temperature changes and that limits operation of the appliance to be controlled.

2 Primary safety control - the automatic safety control intended to prevent abnormal discharge of fuel at the burner in case of ignition failure or flame failure.

3 Combustion safety control - a primary safety control that responds to flame properties, sensing the presence of flame and causing fuel to be shut off in event of flame failure.

I Convector - A convector is a radiator that supplies a maximum amount of heat by convection, using many closely-spaced metal fins fitted onto pipes that carry hot water or steam and thereby heat the circulating air.

J Conversion - a boiler or furnance, flue connected, originally designed for solid fuel but converted for liquid or gas fuel.

K Damper - a valve for regulating draft. Generally located on the exhaust side of the combustion chamber, usually in the chimney connector.

L Draft Hood - a device placed in and made a part of the vent connector (chimney connector or smoke pipe) from an appliance, or in the appliance itself, that is designed to (a) ensure the ready escape of the products of combustion in the event of no draft, back-draft, or stoppage beyond the draft hood; (b) prevent backdraft from entering the appliance; (c) neutralize the effect of stack action of the chimney flue upon appliance operation.

M Draft Regulator - a device that functions to maintain a desired draft in oil-fired appliances by automatically reducing the chimney draft to the desired value. Sometimes this device is referred to, in the field, as air-balance, air-stat, or flue velocity control.

N Fuel Oil - a liquid mixture or compound derived from petroleum that does not emit flammable vapor below a temperature of 125?F.

O Heat - the warming of a building, apartment, or room by a stove, furnace. or electricity.

P Heating Plant - the furnance, boiler, or the other heating devices used to generate steam, hot water, or hot air, which then is circulated through a distribution system. It uses coal, gas, oil, or wood as its source of heat.

Q Limit Control - a thermostatic device installed in the duct system to shut off the supply of heat at a predetermined temperature of the circulated air.

R Oil Burner - a device for burning oil in heating appliances such as boilers, furnaces, water heaters, and ranges. A burner of this type may be a pressure-atomizing gun type, a horizontal or vertical rotary type, or a mechanical or natural draft vaporizing type.

S Oil Stove - a flue-connected, self-contained, self-supporting oil-burning range or room heater equipped with an integral tank not exceeding 10 gallons; it may be designed to be connected to a separate oil supply tank.

T Plenum Chamber - an air compartment to which one or more distributing air ducts are connected.

U Pump, Automatic Oil - a device that automatically pumps oil from the supply tank and delivers it in specific quantities to an oil-burning appliance. The pump or device is designed to stop pumping automatically in case of a breakage of the oil supply line.

V Radiant Heat - a method of heating a building by means of electric coils, hot water, or steam pipes installed in the floors, walls, or ceilings.

W Register - a grille-covered opening in a floor or wall through which hot or cold air can be introduced into a room. It may or may not be arranged to permit closing of the grille.

X Room Heater - a self-contained, free-standing heating appliance intended for installation in the space being heated and not intended for duct connection (space heater).

Y Smoke Detector - a device installed in the plenum chamber or in the main supply air duct of an air-conditioning system to shut off the blower automatically and close a fire damper in the presence of smoke.

Z Tank - a separate tank connected, directly or by pump, to an oil-burning appliance.

AA Thimble - a term applied to a metal or terra cotta lining for a chimney or furnace pipe.

BB Valve - Main Shut-off Valve-a manually operated valve in an oil line for the purpose of turning on or off the oil supply to the burner.

CC Vent System - the gas vent or chimney and vent connector, if used, assembled to form a continuous, unobstructed passageway from the gas appliance to the outside atmosphere for the purpose of removing vent gases.

III. Fuels

A Coal

Classification and composition-the four types of coal are: anthracite, bituminous, subbituminous, and lignitic.

Coal is prepared in many sizes and combinations of sizes. The combustible portions of the coal are fixed carbons, volatile matter (hydrocarbons), and small amounts of sulfur. In combination with these are non-combustible elements composed of moisture and impurities that form ash. The various types differ in heat content. The heat content is determined by analysis and is expressed in British Thermal Units (BTU) per pound.

The type and size of coal used are determined by the availability and by the equipment in which it is burned. The type and

size of coal must be proper for the particular heating unit; that is, the furnace grate and flue size must be designed for the particular type of coal. Excessive coal gas can be generated through improper firing as a result of improper fuel or improper furnace design, or both.

The owner should be questioned about his procedure for adding coal to his furnace. It should be explained that a period of time must be allowed to pass before damping to prevent the release of excessive coal gas. This should also be done before damping for the night or other periods when full draft is not required.

Improper coal furnace operation can result in an extremely hazardous and unhealthful occupancy the inspector should be able to offer helpful operational procedures. Ventilation of the area surrounding the furnace is very important in order to prevent heat buildup and to supply air for combustion.

B Fuel Oil

Fuel oils are derived from petroleum, which consists primarily of compounds of hydrogen and carbon (hydrocarbons) and smaller amounts of nitrogen and sulfer.

Classification of fuel oils - Domestic fuel oils are controlled by rigid specifications. Six grades of fuel oil are generally used in heating systems; the lighter two grades are used primarily for domestic heating.

These grades are:

1. Grade Number 1 -A volatile, distillate oil for use in burners that prepare fuel for burning solely by vaporization (oil-fired space heaters).
2. Grade Number 2 - A moderate-weight, volatile, distillate oil used for burners that prepare oil for burning by a combination of vaporization and atomization. This grade of oil is commonly used in domestic heating furnaces.
3. Grade Number 3 - A low-viscosity, distillate oil used in burners wherein fuel and air are prepared for burning solely by atomization.
4. Grade Number 4 - A medium-viscosity oil used in burners without preheating. (Small industrial or apartment house applications.)
5. Grade Number 5 - A medium-viscosity oil used in burners with preheaters that require an oil of lower viscosity than Grade Number 6. (Industrial or apartment house application.)
6. Grade Number 6 - A high-viscosity oil for use in burners with preheating facilities adequate for handling oil of high viscosity. (Industrial applications.)
7. Heat content - Heating values of oil vary from approximately 152,000 BTU per gallon for Number 6 oil to 136,000 BTU per gallon for Number 1.

Oil is more widely used today than coal and provides a more automatic source of heat and comfort. It also requires more complicated systems and controls.

If the oil supply is used within the basement or cellar area, certain basic regulations must be followed (see Figure 7-1). No more than two 275-gallon tanks may be installed above ground in the lowest story of any one building. The tank shall not be closer than 7 feet horizontally to any boiler, furnace, stove, or exposed flame. Fuel oil lines should be embedded in a concrete or cement floor or protected against damage if they run across the floor. Each tank must have a shutoff valve that will stop the flow from each tank if a leak develops in the line to or in the burner itself.

The tank or tanks must be vented to the outside, and a gauge showing the quantity of oil in the tank or tanks must be tight and operative. Tanks must be off the floor and on a stable base to prevent settlement or movement that may rupture the connections.

A buried outside tank installation is shown in Figure 7-2.

Figure 7-1. Piping Hook-up for Inside Tank Installation

Figure 7-2. Piping Hook-up for Buried Outside Tank

C Gas

Commercial gas fuels are colorless gases. Some have a characteristic pungent odor, while others are odorless and cannot be detected by smell. Although gas fuels are easily handled in heating equipment, their presence in air in appreciable quantities becomes a serious health hazard. Gases diffuse readily in the air, making explosive mixtures possible. (A proportion of combustible gas and air that is ignited burns with such a high velocity that an explosive force is created.) Because of these characteristics of gas fuels, precautions must be taken to prevent leaks, and care must be exercised when gas-fired equipment is lit.

Classification of gas-Gas is broadly classified as natural or manufactured.

1. Manufactured Gas - This gas as distributed is usually a combination of certain proportions of gases produced by two or more processes as obtained from coke, coal, and petroleum. Its BTU value per cubic foot is generally closely regulated, and costs are determined on a guaranteed BTU basis, usually 520 to 540 per cubic foot.

2. Natural Gas - This gas is a mixture of several combustible and inert gases. It is one of the richest gases and is obtained from wells ordinarily located in petroleum-producing areas. The heat content may vary from 700 to 1,300 BTU's per cubic foot with a generally accepted average figure of 1,000 BTU's per cubic foot. Natural gases are distributed through pipe lines to point of utilization and are often mixed with manufactured gas to maintain a guaranteed BTU content.

3. Liquified Petroleum Gas -Principal products of liquified petroleum gas are butane and propane. Butane and propane are derived from natural gas or petroleum refinery gas and are chemically classified as hydrocarbon gases.

Specifically, butane and propane are on the borderline between a liquid and a gaseous state. At ordinary atmospheric pressure butane is a gas above 33?F and propane a gas at -42?F. These gases are mixed to produce commercial gas suitable for various climatic conditions. Butane and propane are heavier than air. The heat content of butane is 3,274 BTU's per cubic foot while that of propane is 2,519.

The gas burner should be equipped with an automatic cutoff in case the flame fails. Shutoff valves should be located within I foot of the burner connection and on the output side of the meter.

CAUTION - Liquefied petroleum gas is heavier than air; therefore, the gas will accumulate at the bottom of confined areas. If a leak should develop, care should be taken to ventilate the appliance before lighting.

D Electricity

Electricity is gaining popularity in many regions, particularly where costs are competitive with other sources of heat energy. With an electric system, the housing inspector should rely mainly on the electrical inspector for proper installation. There are a few items, however, to be concerned with to ensure safe use of the equipment. Check to see that the units are accredited testing agency approved and installed according to the manufacturer's specifications. Most convector-type units are required to be installed at least 2 inches above the floor level, not only to ensure that proper convection currents are established through the unit, but also to allow sufficient air insulation from any combustible flooring material. The housing inspector should check for curtains that extend too close to the unit or loose, long pile rugs that are too close. A distance of 6 inches on the floor and 12 inches on the walls should separate rug or curtains from the appliance.

Radiant heating plastered into the ceiling or wall is technical in nature and not a part of the housing inspector's competence. He should, however, be knowledgeable about the system used. These systems are relatively new. If wires are bared in the plastering they should be treated as open and exposed wiring.

IV. Central Heating Units

The boiler should be placed in a separate room whenever possible; in new construction this is usually required. In most housing inspections, however, we are dealing with existing conditions; therefore, we must adapt the situation as closely as possible to acceptable safety standards. In many old buildings the furnace is located in the center of the cellar or basement, and this location does not lend itself for practical conversion to a boiler room. A Boiler Location Consider the physical requirements for a boiler room.

1. Ventilation - More circulating air is required for the boiler room than for a habitable room, in order to reduce the heat buildup caused by the boiler or furnace as well as to supply oxygen for combustion.

2. Fire Protection Rating - As specified by various codes (fire code, building code, and insurance underwriters) the fire regulations must be strictly adhered to in areas surrounding the boiler or furnace. This minimum dimension from which a boiler or furnace is to be spaced from a wall or ceiling is shown in Figure 7-3.

Many times the enclosure of the furnace or boiler creates a problem of providing adequate air supply and ventilation for the room. Where codes and local authority permit, it may be more practical to place the furnace or boiler in an open area. The ceiling above the furnace should be fire protected to a distance of 3 feet beyond all furnace or boiler appurtenances and this area should be free of all storage material.

The furnace or boiler should be set on a firm foundation of concrete if located in the cellar or basement. If the codes permit furnace installations on the first floor, then the building code must be consulted for proper setting and location.

Figure 7-3. Minimum Clearance for Various Types of Central Heating Systems

B Heating Boilers

Boilers may be classified according to several kinds of characteristics. The material may be cast iron or steel. Their construction may be section, portable, fire-tube, water-tube; or special. Domestic heating boilers are generally of low-pressure type with a maximum working pressure of 15 pounds per square inch for steam and 30 pounds per square inch for hot water.

All boilers have a combustion chamber for burning fuel. Automatic fuel-firing devices help supply the fuel and control the combustion. Handfiring is accomplished by the provision of a grate, ash pit, and controllable drafts to admit air under the fuel bed and over it through slots in the firing door. A check draft is required at the smoke pipe connection to control chimney draft. The gas passes from the combustion chamber to the flue passages (smoke pipe) designed for maximum possible transfer of heat from the gas. Provisions must be made for cleaning flue passages.

The term boiler is applied to the single heat source that can supply either steam or hot-water (boiler is often called a heater).

Cast iron boilers are generally classified as:

1. Square or rectangular boilers with vertical sections.

2. Round, square, or rectangular boilers with horizontal pancake sections.

Cast iron boilers are usually shipped in sections and assembled at the site.

C Steel Boilers

Most steel boilers are assembled units with welded steel construction and are called portable boilers. Larger boilers are installed in refractory brick settings built on the site. Above the combustion chamber a group of tubes is suspended, usually horizontally, between two headers. If flue gases pass through the tubes and water surrounds them, the boiler is designated as the fire-tube type. When water flows through the tubes, it is termed watertube. Fire-tube is the predominant type.

D Heating Furnaces

Heating furnaces are the heat sources used when air is the heat-carrying medium. When air circulates because of the different densities of the heated and cooled air, the furnace is a gravity type. A fan may be included for the air circulation; this type is called a mechanical warm-air furnace. Furnaces may be of cast iron or steel and burn various types of fuel.

V. Fuel-Burning Procedures and Automatic Firing Equipment

A Coal- Many localities throughout the nation still use coal as a heating fuel.

1. Hand Stoking - In many older furnaces, the coal is stoked or fed into the fire box by hand.

2. Automatic Stokers - The single-retort, underfeed-type bituminous coal stoker is the most commonly used domestic-type steam or hot water boiler (see Figure 7-4). The stoker consists of a coal hopper, a screw for conveying coal from hopper to retort, a fan that supplies air for combustion, a transmission for driving coalfeed and fan, and an electric motor for supplying power. The air for combustion is admitted to the fuel through tuyeres at the top of the retort. The stoker feeds coal to the furnace intermittently in accordance with the temperature or pressure demands.

Figure 7-4. Typical Underfeed Coal Stoker Installation in Small Boiler

B Oil Burners-Oil burners are broadly designated as distillate, domestic, and commercial or industrial. Distillate burners are usually found in oil-fired space heaters. Domestic oil burners are usually power driven and are used in domestic heating plants. Commercial or industrial burners are used in larger central-heating plants for steam or power generation.

1 Domestic Oil Burners - These vaporize and atomize the oil, and deliver a predetermined quantity of oil and air to the combustion chambers. Domestic oil burners operate automatically to maintain a desired temperature.

a Gun-type burners - These burners atomize the oil either by oil pressure or by low-pressure air forced through a nozzle.

The oil system pressure atomizing burner (see Figure 7-5) consists of a strainer, pump, pressure-regulating valve, shutoff valve, and atomizing nozzle. The air system consists of a power-drive fan and an air tube that surrounds the nozzle and electrode assembly. The fan and oil pump are generally connected directly to the motor. Oil pressures normally used are about 100 pounds per square inch, but pressures considerably in excess of this are sometimes used.

The form and parts of low-pressure air atomizing burners (see Figure 7-5), are similar to high-pressure atomizing burners except for addition of a small air pump, and a different way of delivering air and oil to the nozzle or orifice.

b Vertical rotary burners - The atomizing type burner, sometimes known as a radiant or suspended-flame burner, atomizes oil by throwing it from the circumference of a rapidly rotating motor-driven cup. The burner is installed so that the driving parts are protected from the heat of the flame by a hearth of refractory material at about the grate elevation. Oil is fed by pump or gravity, while the draft is mechanical or a combination of natural and mechanical.

c Horizontal rotary burners -These were originally designed for commercial and industrial use but are available in sizes suitable for domestic use. In this burner, oil is atomized by being thrown in a conical spray from a rapidly rotating cup. Horizontal rotary burners employ electric gas or gas-pilot ignition and operate with a wide range of fuels, primarily with Numbers 1 and 2 fuel oil. Primary safety controls for burner operation are necessary. An anti-flooding device must be a part of the system so that, if ignition in the burner should fail, the oil will not continue to flow. Likewise, a stack control is necessary to shut off the burner if the stack temperatures become excessive. A reset button on the older stack control units releases if excessive (predetermined) temperatures are exceeded and thus cuts off all power to the burner. This button must be reset before starting can be attempted. The newer models now use electric eye type control on the burner itself.

Figure 7-5. Cut-Away of Typical High-Pressure Gun Burner

2 Ignition - On the basis of the method employed to ignite fuels, burners are divided into five groups as follows:

a Electric -A high-voltage electric spark is made in the path of an oil and air mixture and this causes ignition. This electric spark may be continuous or may be in operation only long enough to ignite the oil. Electric ignition is almost universally used. Electrodes are located near the nozzles (see Figure 7-5) but not in the path of the oil Spray.

b Gas pilot -A small gas pilot light that burns continuously is frequently used. Gas pilots usually have expanding gas valves that automatically increase flame size when motor circuit starts. After a fixed interval, the flame reverts to normal size.

c Electric gas -An electric spark ignites a gas jet, which in turn ignites the oil air mixture.

d Oil pilot -A small oil flame is used.

e Manual - A burning wick or torch is placed in the combustion space through peepholes and thus ignites the charge. Operator should stand to one side of the fire door to guard against injury from chance explosion.

VI. Refractory

The refractory lining or material should be an insulating fireproof brick-like substance. Never use ordinary firebrick. The insulating brick should be set on end so as to build a 2 inch-thick wall in the pot. Size and shape of the refractory pot vary from furnace to furnace (see Figure 7-6 for various shapes). The shape can be either round or square, whichever is more convenient to build. It is important to use a special cement having properties similar to that of the insulating refractory-type brick.

Figure 7-6. Refactory Pot Details

VII. Heating Systems

A Steam Heating Systems -Steam heating systems are classified according to the pipe arrangement, accessories used, method of returning the condensate to the boiler, method of expelling air from the system, or the type of control employed. The successful operation of a steam heating system consists of generating steam in sufficient quantity to equalize building heat loss at maximum efficiency, expelling entrapped air, and returning all condensate to the boiler rapidly. Steam cannot enter a space filled with air or water at pressure equal to the steam pressure. It is important, therefore, to eliminate air and to remove water from the distribution system. All hot pipe lines exposed to contact by residents must be properly insulated or guarded.

Steam heating systems are classified according to the method of returning the condensate to the boiler.

1 Gravity One-pipe Air-vent System - The gravity one-pipe air-vent system is one of the earliest types used. The condensate is returned to the boiler by gravity. This system is generally found in one-building-type heating systems. The steam is supplied by the boiler and carried through a single system or pipe to radiators as shown in Figure 7-7. Return of the condensate is dependent on hydrostatic head. Therefore, the end of the steam main, where it attaches to the boiler, must be full of water (termed a wet return) for a distance above the boiler line to create a pressure drop balance between the boiler and the steam main.

Radiators are equipped with an inlet valve and with an air valve (see Figure 7-8). The air valve permits venting of air from the radiator and its displacement by steam. Condensate is drained from the radiator through the same pipe that supplies steam.

Figure 7-7 Typical Gravity One-Pipe Steam Heating System & Figure 7-8. Safety Air Valve

2 Two-pipe Steam Vapor System with Return Trap -The two-pipe vapor system with boiler return trap and air eliminator is an improvement of the one-pipe system. The return connection of the radiator has a thermostatic trap that permits flow of condensate and air only from the radiator and prevents steam from leaving the radiator. Since the return main is at atmospheric pressure or less, a boiler return trap is installed to equalize condensate return pressure with boiler pressure. B Hot Water Heating Systems - All hot water heating systems are similar in design and operating principle.

1 One-pipe Gravity System - The one-pipe gravity hot water heating system is the most elementary of the gravity systems and is shown in Figure 7-9. Water is heated at the lowest point in the system. It rises through a single main because of a difference in density between hot and cold water. The supply rise or radiator branch takes off from the top of the main to supply water to the radiators. After the water gives up heat in the radiator it goes back to the same main through return piping from the radiator. This cooler return water mixes with water in the supply main and causes the water to cool a little. As a result, the next radiator on the system has a lower emission rate and must be larger.

Note in Figure 7-9 that the high points of the hot water system are vented and the low points are drained. In this case, the radiators are the high points and the heater is the low point.

2 One-pipe Forced-feed System -If a pump or circulator is introduced in the main near the heater of the one-pipe system, we have a forced system that can be used for much larger applications than the gravity type. This system can operate at higher water temperatures than the gravity system. The faster moving higher temperature water makes a more responsive system with a smaller temperature drop through each radiator. Higher operating temperatures and lower temperature drops permit the use of smaller radiators for the same heating load.

Figure 7-9. One Pipe Gravity Hot Water Heating System

3 Two-Pipe Gravity Systems -One-pipe gravity systems may become a two-pipe system if the return radiator branch connects to a second main that returns water to the heater (see Figure 7-10). Water temperature is practically the same in all the radiators.

Figure 7-10. Two-Pipe Gravity Hot-Water System

4 Two-pipe Forced-circulation System - This system is similiar to a one-pipe forced-circulation system except that the same piping arrangement is found in the two-pipe gravity flow system.

5 Expansion Tanks -When water is heated it tends to expand. Therefore, in a hot water system an expansion tank is necessary. The expansion tank, either of open or closed type, must be of sufficient size to permit a change in water volume within the heating sv m. If the expansion tank is of the open type it must be placed at least 3 feet above the highest point of the system. It will require a vent and an overflow. The open tank is usually in an attic, where it needs protection from freezing.

The enclosed expansion tank is found in modern installations. An air cushion in the tank compresses and expands according to the change of volume and pressure in the system. Closed tanks are usually at the low point in the system and close to the heater. They can, however, be placed at almost any location within the heating system. C Hot Air Heating Systems

1 Gravity-Warm-Air Heating Systems - These operate because of the difference in specific gravity of warm air and cold air. Warm air is lighter than cold air and rises if cold air is available to replace it (see Figure 7-11).

Figure 7-11. Hot Air Furnance

1. Approximately 12 pounds of air is required for complete combustion of 1 pound of hard coal.

2. Approximately 5 pounds of hard coal is consumed per hour for each square foot of grate area 3. Approximately 12 inches of fire bed will heat most efficiently.

4. Anthracite coal burns more slowly than soft coal, is cleaner to handle-hence more widely used.

5. Large-size coal does not compact-hence the air spaces are too great and allows gases to escape into the flue unburned. Small size coal compacts too much and inhibits airflow through the coal to allow for good combustion. Mixing of coal size is recommended, i.e., stove and chestnut.

6. Fires burn best when the weather is clear and cold, because of reduced atmospheric pressure on the air in the flue-hence greater draft velocity. During periods of heavy atmosphere or rainy weather the temperature of flue gases must exceed

normal temperatures to overcome the heavier atmospheric weight.

7. During extreme cold weather, coal should be added to a fire once in approximately 8 hours: moderate weather-12 hours.

a Operation - Satisfactory operation of a gravity-warm-air heating system depends on three factors. They are: (1) size of warm air and cold ducts, (2) heat loss of the building, (3) heat available from the furnace.

b Heat distribution - The most common source of trouble in these systems is insufficient pipe area usually in the return or cold air duct. The total cross-section area of the cold duct or ducts must be at least equal to the total cross-section area of all warm ducts.

c Pipeless furnaces- The pipeless hot-air furnace is the simplest type of hot-air furnace and is suitable for small homes where all rooms can be grouped about a single large register (see Figure 7-3). Other pipeless gravity furnaces are often installed at floor level. These are really oversized jacketed space heaters. The most common difficulty experienced with this type of furnace is supplying a return air opening of sufficient size on the floor.

2 Forced - Warm-Air Heating Systems - The mechanical warm-air furnace is the most modem type of warm-air equipment (see Figure 7-12). It is the safest type because it operates at low temperatures. The principle of a forced warm air heating system is very similar to that of the gravity system, except that a fan or blower is added to increase air movement. Because of the assistance of the fan or blower, the pitch of the ducts or leaders can be disregarded and it is therefore practical to deliver heated air in the most convenient places.

a Operation -In a forced-air system, operation of the fan or blower must be controlled by air temperature in a bonnet or by a blower control furnacestat. The blower control starts the fan or blower when the temperature reaches a certain point and turns the fan or blower off when the temperature drops to a predetermined point.

b Heat distribution - Dampers in the various warm-air ducts control distribution of warm air either at the branch takeoff or at the warm-air outlet.

Humidifiers are often mounted in the supply bonnet in order to regulate the humidity within the residence.

D Space Heaters - Space unit heaters are the least desirable from the viewpoint of fire safety and housing inspection. All space unit heaters must be vented to the flue.

Figure 7-12. Cross Sectional View of Building Showing Forced-Warm-Air Heating System

l Coal-Fired Space Heaters (Cannon stove) - This is illustrated in Figure 7-13 and is made entirely of cast iron. In operation, coal on the grates receives primary air for combustion through the grates from the ash-door draft intake. Combustible gases driven from the coal by heat burn in the barrel of the stove, where they received additional or secondary air through the feed door. Side and top of the stove absorb the heat of combustion and radiate it to the surrounding space.

2 Oil-Fired Space Heaters - Oil-fired space heaters have atmospheric vaporizing-type burners. The burners require a light grade of fuel oil that vaporizes easily and is comparatively low in temperature. In addition, the oil must be such that it leaves only a small amount of carbon residue and ash within the heater.

Oil-fired space heaters are basically of two types:

a Perforated-sleeve burner -The perforated sleeve burner (see Figure 7-14) consists essentially of a metal base formed of two or more angular fuel-vaporizing bowl burners (see Figure 7-15) and is widely used in space heaters and some water heaters.

Figure 7-13. Cannon Stove

Figure 7-14. Perforated-Sleeve Burner.

Figure 7-15. Natural-Draft Pot Burner

The burner consists essentially of a bowl, 8 to 13 inches in diameter, with perforations in the side that admit air for combustion. The upper part of the bowl has a flame ring or collar. When several space heaters are installed in a building, an oil supply from an outside tank to all heaters is often desirable. Figure 7-16 shows the condition of a burner flame with different rates of fuel flow and indicates the ideal flame height .

Figure 7-16. Condition of Burner Flame with Different Rates of Fuel Flow

3 Gas-Fired Space Heaters - There are three types of gas-fired space heaters: natural, manufactured, and liquefied petroleum gas. Space heaters using natural, manufactured, or liquefied petroleum gases have a similar construction. All gas-fired space heaters must be vented to prevent a dangerous buildup of poisonous gases.

Each unit console consists of an enamel steel cabinet with top and bottom circulating grilles or openings, gas burners, heating element, gas pilot, and gas valve (see Figure 7-17). The heating element or combustion chamber is usually cast iron.

Figure 7-17. Typical Gas-Fired Space Heater

CAUTION: All gas-fired space heaters and their connections must be of the type approved by the American Gas Association (AGA). They must be installed in accordance with the recommendations of that organization or the local code.

a Venting - Use of proper venting materials and correct installation of venting for gas-fired space heaters is necessary to minimize harmful effects of condensation and to ensure that combustion products are carried off. (Approximately 12 gallons of water are produced in the burning of 1,000 cubic feet of natural gas. The inner surface of the vent must therefore be heated above the dew point of the combustion products to prevent water from forming in the flue.) A horizontal vent must be given an upward pitch of at least 1 inch per foot of horizontal distance.

When the smoke pipe extends through floors or walls the metal pipe must be insulated from the floor or wall system by an air space (see Figure 7-18). Avoid sharp bends. A 90? vent elbow has a resistance to flow equivalent to a straight section of pipe having a length of 10 times the elbow diameter. Be sure vent is of a rigid construction and resistant to corrosion by flue gas products. Several types of venting material are available such as B-vent and several other ceramic -type materials. A chimney lined with fire-brick type of terra cotta must be relined with an acceptable vent material if it is to be used for venting gas-fired appliances.

Use the same size vent pipe throughout its length. Never make a vent smaller than heater outlet except when two or more vents converge from separate heaters. To determine the size of vents beyond the point of convergence, add one-half the area of each vent to the area of the largest heater's vent.

Figure 7-18. Wall and Ceiling Clearance Reduction

Install vents with male ends of inner liner down to ensure condensate is kept within pipes on a cold start. The vertical length of each vent or stack should be at least 2 feet greater than the length between horizontal connection and stack.

Run vent at least 3 feet above any projection of the building within 20 feet to place it above a possible pressure zone due to wind currents (see Figure 7-19). End it with a weather cap designed to prevent en entrance of rain and snow.

Gas-fired space heaters as well as gas furnaces and hot water heaters must be equipped with a backdraft diverter (see Figure 7-20) designed to protect heaters against downdrafts and excessive updrafts. Use only draft diverters of the type approved by the AGA.

Figure 7-19. Draft Relation to Height of Chimney.

Figure 7-20. Location and Operation of Typical Backdraft Diverter

The combustion chamber or firebox must be insulated from the floor, usually with an airspace of 15 to 18 inches, or the firebox is sometimes insulated within the unit and thus allows for lesser clearance for combustibles.

Where coal space heaters are located, a floor protection should be provided. This would be a metal-covered asbestos board or a similar durable insulation material. One reason for the floor protection would be to allow cooling off of hot coals and ashes if they drop out while ashes are being removed from the ash chamber. Walls and ceilings of a non-combustible construction exposed to furnace radiation should be installed, and the following clearances are recommended:

Space heaters-A top or ceiling clearance of 36 inches, a wall clearance of 18 inches, and a smoke pipe clearance of 18 inches, **(see Figure 7-18).**

VIII. Domestic Hot Water Jack Stoves (Coal Stoves)

Domestic hot water jack stoves (coal stoves) equipped with water jackets to supply hot water for domestic use are to be treated as coal-fired furnaces or boilers previously discussed. Note that flue connections should not exceed two to the same flue unless the draft and size are sufficient to accommodate both exhausting requirements. One flue with one smoke pipe is the rule; however, housing inspectors may find a jack stove and main furnace connected to the same flue. Where these conditions are encountered and no complaint about malfunctioning of this system is found, it can be assumed that the system is operating satisfactorily. Where more than two units, other than gas, are attached to a single flue, the building agency should be notified, since this can be considered an improper installation. Gas, oil, and electric hot water heating units for domestic hot water should be treated the same as previously discussed for central heating units.

IX. Hazardous Installations

A Generalities - The housing inspector should be on the alert for unvented open burning flame heaters, such as manually operated gas logs. Coil-type wall-mounted hot-water heaters that do not have safety relief valves are not permitted. Kerosene (portable) units for cooking or heating should be prohibited. Generally, open-flame portable units are not allowed under; fire safety regulations.

In oil heating units, other than integral tank units, the oil filling and vent must be located on the exterior of the building. Filling of oil within buildings is prohibited.

Electric wiring to heating units must be installed as indicated in the electrical section. Cutoff switches should be close to the entry but outside of the boiler room. The inspector should be able to appraise the heating installation and determine its adequacy. Any installation that indicates haphazard location, workmanship, or operation, whether it be building, zoning, plumbing, electrical, or housing, will dictate further inspection.

B Chimneys (see Figure 7-21 and 7-22) - Chimneys, as all inspectors know, are an integral part of the building. The chimney is a point of building safety and should be understood by the housing inspector. The chimney, if of masonry, must be tight and sound; flues should be terra cotta lined, and where no linings are installed, the brick should be tight to permit proper draft and elimination of combustion gases.

Chimneys that act as. flues for gas-fired equipment must be lined with either B-vent or terra cotta.

To the inspector, on exterior inspection, "banana peel" on the portion of the chimney above the roof will indicate trouble and a need for rebuilding. Exterior deterioration of the chimney will, if let go too long, gradually permit erosion from within the flues and eventually block the flue opening.

Rusted flashing at the roof level will also contribute to the chimney's deterioration. Effervescence on the inside wall of the chimney below the roof and on the outside of the chimney, if exposed, will show salt accumulations - a tell-tale sign of water penetration and flue gas escape and a sign of chimney deterioration. In the spring and fall, during rain seasons, if terra cotta chimneys leak, the joint will be indicated by dark areas permitting actual counting of the number of flues inside the masonry chimney. When this condition occurs, it usually requires 2 or 3 months to dry out. Upon drying out, the mortar joints are discolored (brown), and so

after a few years of this type of deterioration the joints can be distinguished wet or dry. The above listed conditions usually develop during coal operation and become more pronounced usually 2 to 5 years after conversion to oil or gas.

An unlined chimney can be checked for deterioration below the roof line by checking the residue deposited at the base of the chimney, usually accessible through a cleanout (door or plug) or breaching. Red granular or fine powder showing through coal soot or oil soot will generally indicate, if in quantity (a handful), that deterioration is excessive and repairs are needed.

Gas units attached to unlined chimneys will be devoid of soot, but will usually show similar tell-tale brick powder and deterioration as previously mentioned. Manufactured gas has a greater tendency to dehydrate and decompose brick in chimney flues than natural gas. For gas installations in older homes, utility companies usually specify chimney requirements before installation, and so older chimneys may require the installation of terra cotta liners, lead-lined copper liners, or transite pipe. Oil burner operation using a low air ratio and high oil consumption is usually indicated by black carbon deposits around the top of the chimney. Prolonged operation in this burner setting results in long carbon water deposits down the chimney for 4 to 6 feet or more and should indicate to the inspector a possibility of poor burner maintenance. This will accent his need to be more thorough on the ensuing inspection. This type of condition can result from other related causes, such as improper chimney height or exterior obstructions such as trees or buildings that will cause downdrafts or insufficient draft or contribute to a faulty heating operation.

Rust spots and soot-mold usually occur on galvanized smoke pipe deterioration.

Figure 7-21. Chimney Plan

C Fireplace - Careful attention should be given to the construction of the fireplace. Improperly built fireplaces are a serious safety and fire hazard (see Figure 7-22). The most common causes of fireplace fires are thin walls, combustible materials such as studding or trim against sides and back of the fireplace, wood mantels, and unsafe hearths.

Fireplace walls should be not less than 8 inches thick, and if built of stone or hollow masonry units, not less than 12 inches thick. The faces of all walls exposed to fire should be lined with firebrick or other suitable fire-resistive material. When the lining consists of 4 inches of firebrick, such lining thickness may be included in the required minimum thickness of the wall.

The fireplace hearth should be constructed of brick, stone, tile, or similar incombustible material and should be supported on a fireproof slab or on a brick arch. The hearth should extend at least 20 inches beyond the chimney breast and not less than 12 inches beyond each side of the fireplace opening along the chimney breast. The combined thickness of the hearth and its supporting construction should be not less than 6 inches at any point.

It is important that all wooden beams, joists, and studs are set off from the fireplace and chimney so that there is not less. than 2 inches of clearance between the wood members and the sidewalls of the fireplace or chimney and not less than 4 inches of clearance between wood members and the back wall of the fireplace.

The housing inspector is a very important person in maintaining sound, safe, and healthful community growth. This should be a challenge to every inspector to provide himself with the necessary tools for better and more efficient housing inspection. He must develop the extra senses so necessary in spotting and correcting faults. He must know when to refer and to whom the referral is to be made; he must be continually seeking knowledge, which may be found by consulting with technicians, tradesmen, and professionals. No finer satisfaction can be realized than to know and feel that the security, safety, and comfort of each and every family within your community has a better and more healthful life because of that extra bit of knowledge you have imparted. "An inspector who stops learning today is uneducated tomorrow."

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Chapter 8 Electrical Aspects of a Housing Inspection

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There are two basic codes concerned with residential wiring that are of importance to the housing inspector. The first is the local electrical code. The purpose of this code is to safeguard persons and buildings and their contents from hazards arising from the use of electricity for light, heat, and power. The electrical code contains basic minimum provisions considered necessary for safety. Compliance with this code and proper maintenance will result in an installation essentially free from hazard but not necessarily efficient, convenient, or adequate for good service or future expansion.

The majority of local electrical codes are modeled after the National Electrical Code, published by the National Fire Prevention Association. Further reference to the Code in the remainder of this chapter will indicate the National Electrical Code, 1975 Edition. (1)

Just because an electrical installation was safe and adequate under the provisions of the electrical code at the time of installation does not indicate that the system is safe and adequate for use today. Hazards often occur because of overloading of wiring systems by methods or usage not in conformity with the code. This occurs because initial wiring did not provide for increases in the use of electricity. For this reason it is recommended that the initial installation be adequate and that reasonable provisions for system changes be made as may be required for future increase in the use of electricity.

The other code that contains electrical provisions is the local housing code. It establishes minimum standards for artificial and natural lighting and ventilation, specifies the minimum number of electric outlets and lighting fixtures per room, and prohibits temporary wiring except under certain circumstances. In addition, the housing code usually requires that all components of the electrical system be installed and maintained in a safe condition so as to prevent fire or electric shock.

This chapter contains electrical terms and major features of a residential wiring system that should be familiar to the housing inspector. It also contains a review of the steps involved in the electrical inspection, as well as commonly found conditions.

I. Definitions

A Electricity - is energy that can be used to run household appliances; it can produce light and heat, shocks and numerous other effects.

B Current - the flow of electricity through a circuit.

1 Alternating current is an electrical current that reverses its direction of flow at regular intervals: For example, it would alternate 60 times every second in a 60-cycle system. This type of power is commonly found in homes.

2 Direct current is an electric current flowing in one direction. This type of current is not commonly found in today's homes.

C Ampere - the unit used in measuring intensity of flow of electricity. Symbol for it is "I."

D Volt - the unit for measuring electrical pressure or force, which is known as electromotive force. Symbol for it is "E."

E Watt - is the unit of electric power. Volts X Amperes = Watts.

F Circuit - the flow of electricity through two or more wires from the supply source to one or more outlets and back to the source.

G Circuit Breaker - a safety device used to break the flow of electricity by opening the circuit automatically in the event of overloading or used to open or close it manually.

H Short Circuit-is a break in the flow of electricity through a circuit due to the load caused by improper connection between hot and neutral wires (have the electrical inspector check for its location).

I Conductor - any substance capable of conveying an electric current. In the home, copper wire is usually used.

1 Bare conductor is one with no insulation or covering.

2 Covered conductor is one covered with one Or more layers of insulation.

J Fuse - a safety device that cuts off the flow of electricity when the current flowing through the fuse exceeds its rated capacity.

K Ground - to connect with the earth-as to ground an electric wire directly to the earth or indirectly through a water pipe or some other conductor. Usually a green-colored wire is used for grounding the whole electrical system to the earth. A white wire is then usually used to ground individual electrical components of the whole system.

L Conductor Gauge - a numerical system used to label electric conductor sizes, given in American Wire Gauge (AWG). The larger the AWG number the smaller the wire size.

M Hot Wires - those that carry the electric current or Power to the load; they are usually black or red.

N Service - the conductor and equipment for delivering energy from the electricity supply system to the wiring system of the premises.

O Service Drop - the overhead service connectors from the last pole or other aerial support to and including the splices, if any, connecting to the service entrance conductors at the building or other structure.

P Insulator - a material that will not permit the passage of electricity.

Q Neutral Wire - the third wire in a three-wire distribution circuit; it is usually white or light gray and is connected to the ground.

R Service Panel - main panel or cabinet through which electricity is brought to building and distributed. It contains the main disconnect switch and fuses or circuit breakers.

S Voltage Drop - a voltage loss when wires carry current. The longer the cord the greater the voltage drop.

II. Flow of Electric Current

Electricity is usually generated by a generator that converts mechanical energy into electrical energy. The electricity is then run through a transformer where voltage is increased to several hundred thousand volts and in some instances to a million or more volts. This high voltage is necessary in order to increase the efficiency of power transmission over long distances.

This high-transmission voltage is then stepped down (reduced) to normal 115/230-volt household current by a transformer located near the point of use (residence). The electricity is then transmitted to the house by a series of wires called a "service drop." In areas where the electric wiring is underground, the wires leading to the building are buried in the ground.

In order for electric current to flow, it must travel from a higher to a lower potential voltage. In an electrical system the hot wires (black or red) are at a higher potential than the neutral or ground wire (white or green). Therefore, current will flow between the hot wires and the neutral or ground wires.

The voltage is a measure of the force at which electricity is delivered. It is similar to pressure in a water supply system.

Current is measured in amperes and is the quantity of flow of electricity. It is similar to measuring water in gallons per second.

A watt is equal to volts times amperes. It is a measure of how much power is flowing. Electricity is sold in quantities of watt-hours.

The earth, by virtue of moisture contained within the soil, serves as a very effective conductor. Therefore, in power transmission, instead of having both the hot and neutral wires carried by the transmission poles, one lead of the generator is connected to the ground, which serves as a conductor (see Figure 8-1). Only hot wires are carried by the transmission towers. At the house, or point where the electricity is to be used, the circuit is completed by another connection to ground.

The electric power utility provides a ground somewhere in its local distribution system; therefore, there is a ground wire in addition to the hot wires within the service drop. In Figure 8-1 this ground can be seen at the power pole that contains the stepdown transformer.

In addition to the ground connection provided by the electric utility, every building is required to have an independent ground, called a "system ground."

The system ground provides for limiting the voltage upon the circuit, which might otherwise occur through exposure to lighting, or for limiting the maximum potential to ground due to normal voltage. Therefore, the system ground's main purpose is to protect the electric system itself and offer limited protection to the user.

Figure 8-1. Electrical Power Flow

The system ground serves the same purpose as the power company's ground, however, being closer to the building it has a lower resistance.

The "equipment ground," which we will discuss later in this chapter, protects man from potential harm during the use of certain electrical equipment.

The system ground should be a continuous wire of low resistance and of sufficient size to conduct current safely from lightning and overloads.

III. Electric Service Entrance

A Service Drop

The "Entrance Head" (see Figure 8-2) should be attached to the building at least 10 feet above ground, to prevent accidental contact by people. The conductor should clear all roofs by at least 8 feet and residential driveways by 12 feet. For public streets, alleys, roads, and driveways on other than residential property the clearance must be 18 feet.

The wires or conductor should be of sufficient size to carry the load and not smaller than No. 8 copper or equivalent.

Figure 8-2. Entrance Head

For connecting wire from the entrance head to the service drop wires, the National Electrical Code requires that the service entrance conductors be installed either (I) below the level of the service head, or (2) below the termination of the service entrance cable sheath. Drip loops must be formed on individual conductors. This will prevent water from entering the electric service system.

The wires that form "entrance cable" should extend 36 inches from the entrance head, to provide a sufficient length to connect service drop wires to the building with insulators (see Figure 8-2).

The entrance cable may be a special type of armored outdoor type of wire or it may be enclosed in a conduit. The electric power meter may be located either within or outside the building. In either instance, the meter must be located before the main power disconnect.

Figure 8-3 shows an armored cable service entrance. The armored cable is anchored to the building with metal straps spaced every 4 feet. The cable is run down the wall and through a hole drilled through the building. The cable is then connected to the service panel, which should be located within 1 foot of where the cable enters the building.

The ground wire need not be insulated. This ground wire may be either solid or stranded copper, or a material with an equivalent resistance.

Figure 8-3. Service Entrance, Armored Cable

Figure 8-4 shows the use of thin-wall conduit in a service entrance.

Figure 8-4. Service Entrance, Conduit Type

B Underground Service

When wires are run underground they must be protected from moisture and physical damage. The opening in the building foundation where the underground service enters the building must be moisture proof. Local codes should be referred to, concerning allowable materials for this type of service entrance.

C Electric Meter

The electric meter may be located inside or outside the building, as shown in Figure 8-3 or 8-4. The meter itself is weatherproof and is plugged into a weatherproof socket (see Figure 8-5). The electric power company furnishes the meter, the socket may or may not be furnished by the power company.

Figure 8-5. Electric Meter

IV. Grounding

The system ground consists of grounding the neutral incoming wire as well as the neutral wire of the branch circuits. The equipment ground consists of grounding the metal parts of the service entrance, such as the service switch, as well as the service entrance conduit, armor, or cable.

The usual ground connection is to a water pipe of the city water system. The connection should be made to the street side of the cold water meter as shown in Figure 8-6.

Figure 8-6.View of a Typical Service Entrance

If the water meter is located near the street curb, then the ground connection should be made to the cold water pipe as close as possible to where it enters the building.

It is not unusual for a water meter to be removed from a building for service. If the ground connection is made at a point in the water piping system on the building side of the water meter, the ground circuit will be broken upon removal of the meter. This broken ground circuit represents a shock hazard if both sides of the water meter connections should be touched simultaneously.

In some instances the connections between the water meter to pipes are electrically very poor. In this case, if the ground connection is made on the building side of the water meter, there may not be an effective ground.

In order to prevent the two aforementioned situations the code requires that an effective bonding shall be provided around any equipment that is likely to be disconnected for repairs or replacement. This is illustrated in Figure 8-7. The same jumper arrangement would be required for a water meter that is installed near the curb. In many installations the water meter mounting bracket is designed to serve as an electric jumper.

Figure 8-7. Water Meter Jumper

Often an amateur mechanic, in the process of doing a household repair, will disconnect the house ground. Therefore, the housing inspector should always check the house ground to see if it is properly connected.

Figure 8-8 shows a typical grounding scheme at the service box of a residence. In this figure, only the grounded neutral wires are shown. The neutral strap is an uninsulated metal strip that is riveted directly to the service box. The ground wires from the service entrance, branch circuits, and house ground are joined by this strip.

Figure 8-8. Typical Grounding Scheme at Entrance

When a city water supply is not available for grounding, a substitute must be made. The most common ground is a pipe or rod that is driven into the ground a distance of at least 8 feet. If the pipe is made of steel or iron, it must be 3% inch in diameter and galvanized. A copper ground pipe of 34 inch diameter is sufficient.

The code requires that a ground rod be entirely independent of and kept at least 6 feet from any other ground of the type used for radio, telephone, or lightning rods.

V. Two- or Three-Wire Electric Services

One of the wires in every installation is grounded. This neutral wire is always white. The hot wires are usually black or red or some other color. but never white.

The potential difference or voltage between the hot wires and the ground or neutral of a normal residential electrical system is 115 volts. Thus, where we have a two-wire installation (one hot and one neutral) only 11 5-volt Power is available (see Figure 8-9).

When three wires are installed (two hot and one neutral) either 115- or 230-volt power is available. In a three-wire system the voltage between the neutral and either of the hot wires is 115; between the two hot wires it is 230 volts.

Figure 8-9. Ground Connection

The major advantage of a three-wire system is that it permits the operation of heavy electrical equipment such as laundry dryers, cooking ranges, and air conditioners, the majority of which require 230-volt circuits. In addition, the three-wire system is split at the service panel into two 115-volt systems to supply power for small appliances and electric lights. The result is a doubling of the number of circuits, and possibly a corresponding increase in the number of branch circuits, with a reduction of the probability of fire caused by overloading electrical circuits.

VI. Residential Wiring Adequacy

The use of electricity in the home has risen sharply since the 1930's. Many home owners have failed to repair or improve their wiring to keep it safe and up to date. The National Electrical Code recommends that individual residences be provided with a minimum of 100-ampere three-wire service. This type service is sufficient in a one-family house or dwelling unit to provide safe and adequate electric supply for the lighting, refrigerator, iron, and an 8,000-watt cooking range, plus other appliances requiring a total of up to 10,000 watts altogether.

Some homes have a 60-ampere, three-wire service. It is recommended that these homes be rewired for at least the minimum of 100 amperes recommended in the National Code since they are safely capable of supplying current only for lighting and portable appliances such as a cooking range and regular dryer (4,500 watts), or an electric hot-water heater (2,500 watts) and cannot handle additional major appliances.

Other homes today have only a 30-ampere, 115-volt, two-wire service. This system can safely handle only a limited amount of lighting, a few minor appliances, and no major appliances. Therefore, this size service is substandard in terms of modern household needs for electricity. Furthermore, it constitutes a fire hazard and a threat to the safety of the home and the occupants.

VII. Wire Size and Types

A Wire Size

Electric power flows over wire. It flows with relative ease (little resistance) in some materials such as copper and with a substantial amount of resistance in iron. If iron wire were used it would have to be 10 times as large as copper wire.

Copper wire sizes are indicated by a number. No. 14 is most commonly used in residential branch circuits. No. 14 is the smallest permitted by the Code for use in a branch circuit with a 15-ampere capacity. No. 16, 18, and 20 are progressively smaller than No. 14 and are usually used for extension wires. As the number of the wire becomes smaller the size and current capacity of the wire increases. No. 1 is the heaviest wire usually used in ordinary household wiring.

Wire of correct size must be used for two reasons: current capacity and voltage drop.

1. When current flows through a wire it creates heat. The greater the amount of flow, the greater the amount of heat generated. (Doubling the amperes without changing the wire size increases the amount of heat by four times.) The heat is electric energy that has been converted into heat energy by the resistance of the wire; the heat created by the coils in a toaster is an example. This heat developed in an electrical conductor is wasted, and thus the electric energy used to generate it is wasted. If the amount of heat generated by the flow of current through the wire becomes excessive, a fire may result. Therefore, the code sets the maximum permissible current that may flow through a certain type and size wire.

   The following are examples of current capacities for copper wire of various sizes:

Size wire(AWG) #14 #12 #10 #8

Max. capacity, 15 20 30 40 amperes

1. In addition to heat generation there will be a reduction in voltage as a result of attempting to force more current through a wire than it is capable of carrying. Certain appliances, such as induction-type electric motors, may be damaged if operated at too low a voltage.

B Wire Types

1. Wire markings - All wires must be marked to indicate the maximum working voltage, the proper type letter or letters for the type wire specified in the code, the manufacturer's name or trademark. and the AWG size or circular-mil area.

2. Insulations used-There are a variety of wire types which can be used for a wide range of temperature and moisture conditions. The 1975 National Electrical Code should be consulted to determine the proper wire for specific conditions.

C Types of Cable

1. Nonmetallic Sheathed Cable - This type of cable consists of wires wrapped in a paper layer, followed by another spiral layer of paper, and enclosed in a fabric braid, which is treated with moisture-resistant and fire-resistant compounds. Figure 8-10 shows this type of cable, which often is marketed under the "Romex" name. This type of cable can be used only indoors and in permanently dry locations.

2. Armored Cable - This type of cable is commonly known by the BX or Flexsteel trade names. Wires are wrapped in a tough paper and covered with a strong spiral flexible steel armor. This type of cable is shown in Figure 8-11 and may be used only in permanently dry indoor locations. Armored cable must be supported by a strap or staple every 6 feet and within 24 inches of every switch or junction box, except for concealed runs in old work where it is impossible to mount straps.

3. Other Cable -Cables are also available with other outer coatings of metals such as copper, bronze, and aluminum for use in a variety of conditions.

D Flexible Cords

Flexible cords are used to connect lamps, appliances, and other devices to outlets. Each wire consists of many strands of fine wire for flexibility. Extension cords in AWG sizes 16 to 18 are usually fine for lamps and smaller appliances, if the cord is not too long. A commonly accepted standard limits their length to 8 feet of unspliced cord. This keeps the cords short enough to prevent the excessive voltage drops, minimizes the possibility of fire caused by overheating of the wire due to overload, and also minimizes the danger of someone's tripping over them.

E Open Wiring

Open wiring is a wiring method using knobs, nonmetallic tubes, cleats, and flexible tubing for the protection and support of insulated conductors in or on buildings and not concealed by the structure. The term "open wiring" does not mean exposed, bare wiring. In dry locations when not exposed to severe physical damage, conductors may be separately encased in flexible tubing. Tubing should be in continuous lengths not exceeding 15 feet and secured to the surface by straps not more than 4? feet apart. They should be separated from other conductors by at least 2? inches and should have a permanently maintained airspace between them and any and all pipes they cross.

Figure 8-10. Nonmetallic Sheath Cable

Figure 8-11. Armored Cable

F Concealed Knob and Tube Wiring

Concealed knob and tube wiring is a wiring method using knobs, tubes, and flexible nonmetallic tubing for the protection and support of insulated wires concealed in hollow spaces of walls and ceilings of buildings. This wiring method is similar to open wiring, and like open wiring, is usually found only in older buildings.

VIII. Electric Service Panel

Service Switch

This is a main switch that will disconnect the entire electrical system at one time. The main fuses or circuit breakers are usually located within the "Service Switch" box. The branch circuit fuse or circuit breaker may also be located within this box.

According to the code, the switch must be "externally operable." This condition is fulfilled if the switch can be operated without the operator's being exposed to electrically active parts. Older switches use external handles as shown in Figure 8-12.

Figure 8-12. Two Wire Single Phase Grounded Service Panel (Fuse Type)

Most of today's service switches do not have hinged switch blades. Instead, the main fuse is mounted on a small insulated block that can be pulled out of the switch. When this block is removed, the circuit is broken just as if the blades had been operated with a handle.

The neutral terminal or wire of a grounded circuit must never be interrupted by a fuse or circuit breaker. In some installations the service switch is a "solid neutral" switch. This means that the neutral wire in the switch is not broken by the switch or a fuse.

When circuit breakers instead of fuses are used in homes, the use of main circuit breakers may or may not be required. If it takes not more than six movements of the hand to open all the branch circuit breakers, no main breaker or switch or fuse will be required ahead of the branch-circuit breakers. Thus, a house with seven or more branch circuits requires a separate disconnect means or a main circuit breaker ahead of the branch circuit breakers (see Figure 8-13).

Figure 8-13. Three Wire Grounded Single Phase Circuit Breaker Service Panel

IX. Overcurrent Devices

The amperage (current flow) in any wire is limited to the maximum permitted by using an overcurrent device of a specific size as specified by the code. Two types of overcurrent devices are in common use: circuit breakers and fuses; both are rated in amperes. The overcurrent device must be rated at equal or lower capacity than the wire of the circuit it Protects.

A Circuit Breakers (Fuseless) Service Panels

A circuit breaker (see Figure 8-14) looks something like an ordinary electric light switch. There is a handle that may be used to turn power on or off. Inside is a simple mechanism that, in case of a circuit overload, trips the switch and breaks the circuit. The circuit breaker may be reset by simply flipping the switch. A circuit breaker is capable of taking harmless short-period overloads (such as the heavy initial current required in the starting of a shut off valve washing machine or air conditioner) without tripping but protects against prolonged overloads. After the cause of trouble has been located and corrected, the power is easily restored by flipping the circuit breaker switch (circuit breakers are modem substitutes for fuses). Fuseless service panels are usually broken up into the following circuits.

Figure 8-14. Circuit Breaker

1 A 100-ampere or larger main circuit breaker that shuts off all power.

2 A 40-ampere circuit for an appliance such as an electric cooking range.

3 A 30-ampere circuit for clothes dryer, hot water heater, or central air conditioning.

4 A 20-ampere circuit for kitchen, small appliances, and power tools.

5 A 15-ampere circuit for general purpose lighting, TV, and vacuum cleaner.

6 Space for circuits to be added if needed for future IICP.

B Fused Ampere Service Panel or Fuse Box

Fuse-type panel boxes are generally found in older homes. They are equally as safe and adequate as a circuit breaker of equivalent capacity, provided fuses of the proper size are used.

A fuse (see Figure 8-15), like a circuit breaker, is designed to protect a circuit against the dangers of overloading and short circuits and does this in two manners:

a When a fuse is blown by a short circuit the metal strip is instantly heated to an extremely high temperature, and this heat causes it to vaporize. A fuse blown by a short circuit may be easily recognized because the window of the fuse usually becomes discolored.

b In a fuse blown by overload the metal strip is melted at its weakest point, and this breaks the flow of current to the load. In this case the window of the fuse remains clear; therefore, a blown fuse caused by an overload may also be easily recognized.

Sometimes, although a fuse has not been blown, the bottom of the fuse may be severely discolored and pitted. This indicates a loose connection due to the fuse's not being screwed in properly.

Generally, all fused panel boxes are wired similarly for two- and three-wire systems. In a two-wirecircuit panel box the black or red hot wire is connected to a terminal of the main disconnect, and the white or light gray neutral wire is connected to the neutral strip, which is then grounded to the pipe on the street side of the water meter.

In a three-wire system the black and red hot wires are connected to separate terminals of the main disconnect, and the neutral wire is grounded the same as for a two-wire system (see Figure 8-12). Below each fuse is a terminal to which a black or red wire is connected. The white or light gray neutral wires are then connected to the neutral strip. Each fuse indicates a separate circuit.

1. Non-tamperable Fuses - All ordinary plug fuses, shown in Figure 8-15, have the same diameter and physical appearance regardless of their current capacity. Thus, if a circuit designed for a 15-ampere fuse is overloaded so that the 15-ampere fuse blows out, nothing will prevent a person from replacing the 15-ampere fuse with a 20- or 30-ampere fuse, which may not blow out. If a circuit wired with No. 14 wire (current capacity 15 amperes) is fused with a 20- or 30-ampere fuse and an overload develops, more current than the No. 14 wire is safely capable of carrying could pass through the circuit. The result would be a heating of the wire and a potential fire.

   Type S fuses, shown in Figure 8-15, have different lengths and diameter threads for each different amperage capacity. An adapter is first inserted into the ordinary fuse holder, which adapts the fuse holder for only one capacity fuse. Once the adapter is inserted, it cannot be removed.

2. Cartridge Fuses

   Figure 8-15 shows two different types of cartridge fuses. A cartridge fuse protects an electric circuit in the same manner as an ordinary plug fuse already described protects it. Cartridge fuses are often used as main fuses.

Figure 8-15. Types of Fuses

X. Electric Circuits

An electric circuit in good repair carries electricity through two or three wires from the source of supply to an outlet and hack to

the source.

A Branch Circuit

A branch circuit is an electric circuit that supplies electric current to a limited number of electric outlets and fixtures. A residence generally has many branch circuits. Each is protected against short circuits and overloads by a 15- or 20 ampere fuse or circuit breaker.

The number of outlets per branch circuit varies from building to building. The code requires enough light circuits so that 3 watts of power will be available for each square foot of floor area in a house. A circuit wired with No. 14 wire and protected by a 15-ampere overcurrent protection device provides 15 X 115 or 1,725 watts; each circuit is obviously enough for 1,725/3 or 575 square feet.

Note that 575 is a minimum figure; if future use is considered, 500 or even 400 square feet per branch circuit should be used

B Special Appliance Circuits

The branch circuit will provide electric power for lighting, radio, television, and small portable appliances. However, the larger electric appliances usually found in the kitchen consume more power and must have their own special circuit.

Section 220-3b of the code requires two special circuits to serve only appliance outlets in kitchen, laundry, pantry, family-room, dining room, and breakfast room. Both circuits must be extended to the kitchen; the other rooms may be served by either one or both of these circuits. No lighting outlets may be connected to these circuits, and they must be wired with No. 12 wire and protected by a 20-ampere overcurrent device. Each circuit will have a capacity of 20 X 115 or 2,300 watts, which is not too much when one considers that toasters often require over 1,600 watts.

C Individual Appliance Circuits

It is customary to provide a circuit for each of the following appliances:

1. Range
2. Water heater
3. Automatic laundry
4. Clothes dryer
5. Garbage disposer
6. Dishwasher
7. Furnace
8. Water pump

Note that these circuits may be either 115 volts or 230 volts, depending on the particular appliance or motor installed.

D Outlet Switch and Junction Boxes The code requires that every switch, outlet, and joint in wire or cable be housed in a box. Every fixture must be mounted on a box. Most boxes are made of metal with a galvanized finish. Figure 8-16 shows a typical outlet box.

When a cable of any style is used for wiring, the code requires that it be securely anchored with a connector to each box it enters.

Figure 8-16. Outlet Box

E Grounding Outlets

An electrical appliance may appear to be in good repair, and yet it might be a danger to the user. Consider a portable electric drill. It consists of an electric motor inside a metal casing. When the switch is depressed, the current flows to the motor, and the drill rotates. As a result of wear, however, the insulation on the wire inside the drill may deteriorate and allow the hot side of the power

cord to come in contact with the metal casing. This will not affect the operation of the drill.

A person fully clothed using the drill in the living room, which has a dry floor, will not receive a shock, even though he is in contact with the electrified drill case. His body is not grounded, because of the dry floor. If, however, the operator should be standing on a wet basement floor, his body might be grounded, and when he touches the electrified drill case, current will pass through his body.

In order to protect man, the drill case is usually connected to the system ground by means of a wire called an "appliance ground." In this instance, as the drill is plugged in, current will flow between the shorted hot wire and the drill case and cause the overcurrent device to break the circuit. Thus the appliance ground has protected man.

The appliance ground is the third wire found on many appliances.

The appliance ground on the appliance will be of no use unless the outlet into which the appliance is plugged is grounded. The outlet is grounded by being in physical contact with a ground outlet box. The outlet box is grounded by having a third ground wire, or a grounded conduit, as part of the circuit wiring.

All new buildings are required to have grounded outlets (as shown in Figure 8-17). The outlet may be tested by using a circuit tester. The circuit tester should light when both of its leads are plugged into the two elongated parallel openings of the outlet. In addition, the tester should light when one lead is plugged into the round third opening and the other is plugged into the hot side of the outlet.

If the conventional two-opening outlet is used, it still may be grounded. In this instance the screw that holds the outlet cover plate is the third-wire ground. The tester should light when one lead is in contact with a clean paint-free metal outlet cover plate screw and the hot side of the outlet. If the tester fails to light then the outlet is not grounded. If the outlet is not grounded then the tester will not function.

If a two-opening outlet is grounded, it may be adapted for use by a three-wire appliance by using an adapter. The loose-wire portion of the adapter should be secured behind the metal screw of the outlet plate cover.

Many appliances such as electric shavers and some new hand tools are double insulated and are safe without having a third ground wire.

Figure 8-17. Grounded Type Receptacle

XI. Common Electrical Violations

A The most apparent requirements that a housing inspector must check are the existence of the power supply; the types, locations, and conditions of the wiring in use; and the existence of the number of wall outlets or ceiling fixtures required by his local code and their condition. In making his investigations, these considerations will serve as useful guides:

1. **Power Supply** - Where is it located, is it grounded properly, and is it at least of minimum capacity required to supply current safely for lighting and the major and minor appliances in the dwelling?

2. **Panel Box Covers or Doors** - These should be accessible only from the front and should be sealed in such a way that they can be operated safely without the danger of contact with live or exposed parts of the wiring system.

3. **Switch, Outlets, and Junction Boxes**-These also must be covered to protect against danger of electric shock.

4. **Frayed or Bare Wires**- These are usually the result of long use and a drying out and cracking of the insulation, which leave the wires exposed, or else a result of constant friction and rough handling of the wire, which cause it to fray or become bare. Wiring in this condition constitutes a safety hazard, and correction of such defects should be ordered immediately.

5. **Electric Cords Under Rugs or Other Floor Coverings** - Putting electric cords in locations such as these is prohibited because of the potential fire hazard caused by continuing contact over a period of time between these heat-bearing cords

and the flammable floor coverings. Direct the occupant to shift the cords to a safe location, explain why, and make sure it is done before you leave.

6. **Bathroom Lighting** - It should include at least one permanently installed ceiling or wall light fixture with a wall switch and plate so located and maintained that there is no danger of short circuiting from use of other bathroom facilities or splashing of water. Fixture or cover plates should be insulated or grounded.

7. **Lighting of Public Hallways, Stairways, Landings, and Foyers** - A common standard here is sufficient lighting to provide illumination of 10 foot-candles on every part of these areas at all times. Sufficient lighting means that a person can clearly see his feet on all parts of the stairways and halls. Every public hall and stairway in a structure containing less than three dwelling units may be supplied with conveniently located light switches controlling an adequate lighting system that may be turned on when needed. instead of full-time lighting.

8. **Habitable Room Lighting** - The standard here may be two floor convenience outlets - although floor outlets are dangerous unless protected by proper dust and water covers-or one convenience outlet and one wall or ceiling electric light fixture. This number constitutes an absolute and often inadequate minimum given the contemporary widespread use of electricity in the home. The minimum should be that number required to provide adequate lighting and power to accommodate lighting and appliances normally used in each room.

9. **Octopus Outlets or Wiring** - This term is applied to outlets into which plugs have been inserted and are being used to permit more than two lights or portable appliances, such as a TV, lamp, or radio, to be connected to the electrical system. The condition occurs where the number of outlets is insufficient to accommodate the normal use of the room. This practice overloads the circuit and is a potential source of fire, which may be caused by overloading the circuit.

10. **Outlet Covers**- Every outlet and receptacle must be covered by a protective plate to prevent contact of its wiring or terminals with the body, combustible object or splashing water.

The following items are conditions that cause needless dangers and must also be corrected:

Excessive or faulty fusing -The wire's capacity must not be exceeded by the fuse or circuit breaker capacity or be left unprotected by faulty fusing or circuit breakers. Fuses and circuit breakers are safety devices designed to "blow" as a means of protection against over loadings of the electrical system or one or more of its circuits. Pennies under fuses are put there to bypass the fuse. These are illegal and must be removed. Overfusing is done for the same reason. The latter can be prevented by the installation of modern fusestats, which prevent use of any fuse of a higher amperage than can be handled by the circuit it serves.

Cords run through walls or doorways and hanging cords or wires-This is a makeshift-type installation and most often is installed by an unqualified handyman or do-it-yourself occupant. The inspector should check with his local electrical section to determine the policy regarding this type of insulation and govern his action in accordance with the electrical section's policies.

Temporary wiring - This type of installation should not be allowed, with the exception of extension cords that go directly from portable lights and electric fixtures to convenience outlets.

Excessively long extension cords - This requirement does not apply to specially designed extension cords for operating portable tools and trouble lights. Cities operating under modern code standards limit the length of loose cords or extension lines to a maximum of 8 feet. This is necessary because those that are too long will overheat if overloaded or if a short circuit develops and thus create a fire hazard. Even shorter lengths are feasible in housing with new or updated wring systems that include one convenience outlet every 12 feet around the perimeter of the room.

Dead or dummy outlets - These are sometimes installed to deceive the inspection agency. This is why all outlets must be tested or the occupants questioned to see if these are alive and functioning properly. A dead outlet cannot be counted to determine compliance with the code.

XII. Steps Involved in Actual Inspection

A Testing Tools

The basic tools required by an inspector of housing for making an electrical inspection are a fuse and circuit tester and a flashlight.

B Danger of Techniques

The first thing is to remember you are in a strange house and the layout is unfamiliar to you. The second thing to remember is that you are dealing with electricity-take no chances. Go to the water meter and check the ground. It should connect to the water line on the street side of the water meter or else be equipped with a jumper wire. Do not touch any box or wire until you are sure of the ground. Go to the main fuse box and check all fuses in all boxes. Note the condition of the wiring and of the box itself and check whether it is overfused or not. Examine all wiring in the cellar. Make sure you are standing in a dry spot before touching any electrical device. Do not disassemble the fuse box or other devices. Decisions must be made on what you see. If in doubt, consult your supervisor.

Make note whether any fuse boxes or junction boxes are uncovered. Examine all wiring for frayed or bare spots, improper splicing, or rotted, worn, or inadequate insulation. **Avoid all careless touching. When in doubt - DON'T! If you see bare wire, have the owner call an electrician.** Look for wires or cords in use in the cellar. Many work benches are lighted by an old lamp that was once in the parlor and now has a spliced or badly frayed cord or both. Be certain all switch boxes and outlets are in a tight, sound condition.

Make sure that the emergency switch for the oil burner is at the top of the cellar stairs, not on top of the unit.

If you find an electric clothes washer-clothes dryer combination in a dwelling, it should have a 240-volt circuit 30-ampere service connected to a separate fuse or circuit breaker. Washer-dryer combinations and other portable appliances in the entire house should be served by sufficiently heavy service. If either of these special lines is not available under the above-stated conditions, consult your supervisor.

An electric range needs a 50-ampere circuit, 240 volts. A dishwasher needs a 20-ampere, 120-volt circuit. A separate three wire circuit must be installed for an electric water heater. Continue your inspection this way through the house. In the bathroom look for the usual items, but also check for dangerous items such as radios or plug in portable electric heaters. Have them removed immediately. Such items have killed thousands of people either because they touched them after getting out of the bathtub or shower while still wet or because the appliance fell into the water. Look for brass pull chains in bathroom lighting fixtures. If one exists, have owner attach a string to the end of it as a temporary precaution, then order it replaced with a wall switch as required by the electrical code.

To sum up, in broad terms, the housing inspector's investigation of specified electrical elements in a house is made to detect any obvious evidence of an insufficient power supply, to ensure the availability of adequate and safe lighting and electrical facilities, and to discover and correct any obvious hazard. Because electricity is a technical, complicated field, the housing inspector, when in doubt, should consult his supervisor. He cannot, however, close the case until appropriate corrective action has been taken on all such referrals

XIII. Wattage Consumption of Electrical Appliances

XIV. Motor Currents

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For state and local health department assistance:CDC Emergency Response (24--hour assistance during emergencies) **770-488-7100.**

Toll-free telephone number for information and faxes on childhood lead poisoning, cruise ship inspection, cholesterol measurements, and list of publications: NCEH Health Line 1-888-232-6789

Chapter 9 Safety in the Home Environment

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Public Health agencies and personnel are concerned with the total environment as it affects the health, safety, and well-being of man. One of the greatest threats to man's safety exists within the home in the form of accidental injury.

Statistics place accidents as the fourth leading cause of death. among the total population and as the leading cause of death for age groups 1 through 37. Accidents cost money-over $43 billion a year-in the form of time away from work and a loss in productivity, medical expenses, administrative costs, and property loss. Medical attention is required by over 15 million persons injured each year in home accidents. This medical attention is an extremely expensive factor by itself.

Most of us regard home as a place of safety and security. Yet home accidents are the most frequent place of injury. One-third of all nonfatal accidental injuries and more than one-fourth of all fatal injuries occur in and around the home. The very young and the 65-and-over age group are particularly vulnerable to accidents. It is estimated that over 22 million persons (or one out of every nine Americans) were injured in the home environment last year. Disabling injuries numbered 4,100,000 including 110,000 with some degree of permanent impairment. This emphasizes the fact that our homes are not as safe as we think.

Accidental death and injury occur at all socioeconomic levels. No home or individual is immune against accidents. People accept and adapt themselves to new conveniences and labor-saving devices without learning to live safely within the new environment created by them.

It must be emphasized that potential dangers from the modern devices designed to make life easier and more pleasant are related to the human factors as well as the nature of the devices themselves. The human factors are lack of skill, error of judgment, lack of knowledge, and so forth.

I. Definitions

A Accident - may be visualized as an event or incident resulting from an interaction among a host (people), agent (things), and environment (places).

B Home accident - occurrence within the home and its immediate premises.

C Injury - harm or hurt; a wound or maim, usually applied to damage inflicted to the body by an external force.

D Hazard - a source of danger.

E Glass, annealed - type of glass most frequently found in windows, doors, and fixed glass panels. Annealed glass breaks with a small impact into many cutting surfaces, often of dagger shape.

F Glass, safety-

1 Laminated - commonly used in auto windshields. Consists of two layers of annealed glass held together with a sheet of plastic cemented between. Upon impact, it breaks into a jagged pattern, but plastic interior holds the pieces together, greatly reducing the injury potential.

2 Wired glass - commonly seen in fire doors, is annealed glass in which is imbedded wire that serves the same holding function as plastic in laminated glass.

3 Tempered glass - product of special heat treatment process. The safety feature is that when broken its breaking pattern resembles rock salt; pieces are rounded or cubical and inflict little or no injury. Its impact resistance greatly exceeds that of similar thickness of annealed glass.

G L-P Gas (Liquified Petroleum Gas) - any product composed of any or a mixture of the following hydrocarbons: propane, propylene, and the butanes. Being heavier than air, it tends to settle and accumulate in low places.

H Natural Gas - gas issuing from earth's crust through natural openings or bored wells. Most commonly found as a source of fuel in today's homes. The gas is lighter than air, and this property causes it to rise to upper levels.

II. Background

Accidents do not happen by themselves. Contributing to each accident, whether it is in the home, in the factory, or out on the street, are the factors relating to the man or host, the agent, and the environment in which we live.

A The human being can be of any age and physical status and have varied emotions and behavior.

B Agents can be of physical or chemical nature and be part of the environment.

C Environment can be not only visible, but can also be noise, ventilation and design.

> Any environment may place limitations on man's behavior, capabilities, and tolerances of stress. For example, a well-designed stairway with a handrail and acceptable lighting, while normal for most, can prove to be an obstacle to a toddler or an elderly person. In your inspections to develop a safe environment, consider the human beings within the existing environment.

III. Objectives

A To enable the inspector to become more aware of potential hazard within the home.

B To minimize these hazards through practical control of environment.

C To recognize that even a "safe" environment at times can be a hazard for certain human beings.

IV. Relationship to Housing Inspector

You can help reduce home accidents and injuries by increasing your awareness of potential hazards as they relate to the environment in and around the home.

You can help the residents of this environment to become aware of these hazards; you can suggest corrective measures that can be taken; you can refer them to agencies, if needed, for corrective action; you can help them to understand that their "normal" environment can place limitations on their behavior and capabilities.

V. Content

Since most inspections of the house and home premises are made on an area-by-area basis, this section will attempt to bring out the primary environmental hazards for each.

A Kitchen

l Fire-The many types of activities carried out in the kitchen make it perhaps the most dangerous room in the home. The resident is most often not aware of the numerous possible sources of injury here. There are many opportunities for fire to occur in this area. The inspector or sanitarian should look for curtains that may be capable of being blown into the flame by breezes coming through open windows. Drying of towels above stoves should be discouraged since they may overheat and catch fire. The occupant should be advised about the use of flame-retardant fabrics in this area and should adjust the curtains in such a manner as to lessen the fire potential.

Foods frying in fats and cooking oils present a definite fire hazard. This hazard is increased by the absence of a properly fitted lid on frying pans. If the burner flame or electric heat source is turned to a high position, fats and cooking oils may reach a temperature sufficient to cause ignition from heat alone; no actual flame is necessary to cause this ignition. This type of fire often occurs and becomes uncontrollable when an adult is not present in the kitchen at all times.

The inspector should impart useful information about methods of controlling a fire. It would be helpful to mention that a grease fire in a skillet or similar container can be effectively controlled by a dry chemical or carbon dioxide fire extinguisher. Water applied to the flaming cooking oils and liquid greases will only intensify and cause the fire to spread. In the case of an oven fire, close the oven door; with skillet or container fires, cover the pan with a lid to exclude the oxygen. Ordinary baking soda can also be used to control small grease fires effectively in containers and in ovens. The soda should be dumped or thrown into the fire from a safe distance. The baking soda, in the presence of heat, produces carbon dioxide, which shuts off the oxygen to the flames and causes the flames to be extinguished. All fires can be more easily controlled if the burner flame or heat source has been turned off

There is normally a tendency to store aerosol cans in the kitchen area. Caution should be taken to see that these cans are not stored in direct sunlight, where the temperature may exceed 120?F, or close to heat-producing appliances. Most aerosol cans are kept under pressure, and with increased temperature the cans may explode spraying the area with its contents or fragments of the can. In addition, the contents of some types of aerosols are extremely flammable and should not be sprayed near any open flame. A suggestion should be made to the resident to read and follow the label on all aerosol cans. It will contain information about proper use, flammability, and storage directions.

The inspector should also be aware of detectable gas leaks that could lead to an explosion. He should immediately call this to the attention of the occupant or personally contact the fuel supplier to inform them of this hazard. Both natural gas and liquified petroleum gas (LP) these been odorized to aid in determining the presence of a small leak.

In homes using kerosene as a cooking or heating fuel, special problems exist. Leaking fuel lines, burners, and fuel containers are a definite fire hazard. Due to the type of fuel and manner of use, these units must he cleaned often.

If coal- or wood-burning stoves are used for cooking and if flammable liquids are used to ignite these fuels, care should be urged in their proper use and storage. Under no condition should gasoline or tractor fuel be used to assist in starting a fire. Kerosene or liquid starters sold for this purpose can be used, but they should never be applied once a fire is going or when the possibility of live coals exists.

Some city and area ordinances prohibit the use of certain types of portable liquid-fuel heat producing devices. Your knowledge of any such restrictions-end subsequent recommendations about their use to the proper person or agency are vital.

Electric appliances should be observed for frayed cords and exposed wiring, since these may result in electrical fires and electrical shock hazards. Face plates for electrical wall outlets should be examined for serviceability. Broken face plates should be called to the attention of the occupant and replacement ordered.

Overloading of electrical outlets in the kitchen is a common fire hazard. No single outlet should have more than two small portable

appliances attached at one time, and preferably only one should be in use at any given time.

2 Carbon Monoxide - A properly adjusted gas cook stove burner will burn with a blue and well-shaped flame. If the flame appears irregular, lazy, and yellow, the burner is not properly adjusted and will most often produce carbon monoxide, a tasteless, colorless, and odorless gas that is often fatal. In nearly all areas, a local gas company or fuel supplier will respond immediately to calls concerning proper burner adjustment. Such a situation should be observed by the inspector and ordered corrected immediately.

3 Poisons - Small children have a curious nature and are quite at home in the kitchen. Their natural curiosity often leads the child to eat, drink, or taste items such as bleach, soap powder, furniture polish, wax, and other commonly used household products. All such items should be kept out of their sight and reach. A locked storage area for nonfood items is recommended in homes where small children are present. Provisions should be made for separate storage of food and nonfood items to prevent accidental contamination. If commonly used household products, drugs, and poisons are observed in homes where small children are present, a suggestion should be made that all such articles be placed out of sight and in safe storage.

4 Cuts - The storage of sharp kitchen utensils should be arranged so that the cutting edge is down or so that the utensils are placed in special wall or drawer holders. Knives should be kept out of children's sight and reach to prevent accidental cuts.

5 Falls - Injuries resulting from falls often occur in the kitchen because of grease and other liquids spilled and left on the floors. Improper storage of brooms, mops, and so forth, create a fall or trip hazard. Mop and broom handles should be placed in a wall rack or secured in an upright position. Broken, tom, or curled edges on floor coverings, including linoleum floors, present a trip hazard. The observed use of chairs and makeshift means to reach upper cabinet shelves should be brought to the attention of the occupant as an injury potential with a suggestion to use step stools or ladders when climbing.

6 Burns - Children are often severely burned because of their curiosity to reach for and pull on appliance cords and panhandles. Burns from hot substances and liquids can be prevented by turning handles in so that they will not protrude beyond the stove's edge.

Electrical cords should not be left dangling over a work surface or left attached to the appliance or wall outlet after their use. The wearing of loosely fitting, long-sleeved house dresses or robes while one is cooking food may result in the ignition of the garment. Short sleeves are much safer and should be recommended.

B Living Room

I Falls - In the living area, emphasis should be placed on furniture arrangement and floor covering. Rugs should be of a nonskid nature with smooth edges in order to prevent possible tripping or slipping under foot. Unstable scatter rugs are not limited to this area but remain a problem throughout much of the house. Furniture should be arranged in a manner that is best to provide a definable and normal path of travel. Sharp edges on furniture are especially hazardous to children and elders. Their placement should be considered for children and the elderly to prevent injury. If furniture is used for support by older persons, it should be a type that is sturdy enough to withstand any unusual push, lunge, or unsteadiness of the individual.

2 Fire - Open fireplaces should be checked for substantial fire-resistant screens in order to prevent hot coals or sparks from being thrown onto the rug. Brickwork in chimneys should be examined for condition of construction and missing mortar, and the flue should be checked for blockage that will prevent the exhausting of toxic gases and smoke.

Numerous electrical extension wires present a fire hazard in that there is an increased possibility of overloading the existing house wiring.

This type of wiring is often called upon to carry more current than it was designed to carry and this overload results in excessive heating and the possibility of fire. The placing of electrical wires under rugs, around door sills, and in places where they may have their insulation worn bare may result in a short circuit and possibly in an electrical fire.

3 Cuts - The modern home is created to admit the beauty of nature by employment of large panes of glass. The living room is no exception. Patio doors have become popular in the past few years in the living and dining areas. These large expanses of glass present a serious injury problem in that children and adults often walk, run, or fall into the panels of glass. If the force of the

impact is great enough to cause normal annealed glass to break, it breaks into long jagged pieces that may cause the individual to receive multiple cuts and lacerations or suffer severed arteries. These hazards can be minimized by placing furniture, potted plants, or other household items in front of the stationary panels and thus cause small children or adults to slow down before contacting the glass door or panel. The use of decorative decals on glass panels will often provide sufficient warning that the door is not in an open position and thus deter a person from colliding with the glass panel.

The suggested use of safety glass will minimize the possibility of injury if the glass should break. The most common type of safety glass is tempered glass. Other types of safety glass are laminated and wired. Tempered safety glass looks no different from normal glass. Tempered safety glass is, however, five times stronger than normal annealed glass. If breakage does occur, this glass breaks into small cubical particles, much like rock salt, that may scratch or produce superficial cuts but will not produce deep, serious lacerations. All tempered safety glass will be so labeled on each panel. Homes that were built before 1963 will undoubtedly be equipped with normal annealed glass.

4 Electric Shock - Young children are extremely curious and great imitators of their parents. They closely watch and often imitate their parent when they plug an electrical appliance into a wall outlet. They do not realize the danger of shock and burn from inserting metal objects such as eating utensils, hair pins, and other items into an energized outlet. Plastic caps should be inserted and kept in each wall outlet to prevent the child from this type of hazard. Visible extension cords in the child's play area are a temptation for the teething child to bite the cord. Concealment or removal of electrical extension wires is recommended.

C Bathroom

1 Falls - The bathroom also has its hazards. Falls often occur in this area as a result of wet and slippery floors. Care should be taken to see that water is promptly cleaned up.

Where the occupants are disabled or elderly it is recommended that tub and shower stalls be provided with grab bars to assist them in getting in and out safely. Grab bars should not be confused with towel holders or handles on soap trays. These are usually insecurely attached to the wall and will not support the weight of a normal person in an emergency. Grab bars are more sturdily constructed, usually of metal, and are anchored firmly to the wall studs. Other types of grab bars can be fastened securely to the bathtub by means of bolts or clamps. Nonskid surfaces, such as adhesive strips or bath mats, should be employed to prevent slipping.

2 Electric Shock - The misuse of electrical appliances in the bathroom presents a shock hazard. No switches or outlets should be within reach of the tub or shower. Electrical equipment using household current should not be present in the bathroom unless the bathroom is specifically designed for it. All such equipment should carry the Underwriters' Laboratory (UL) label. Radios, excluding battery-operated units, present a definite shock hazard. All switch plates and electrical fixtures should be grounded. Under the 1975 Electrical Code all bathrooms must also have ground-fault circuit protection. Metal pull cords should have string pull cords attached until they can be replaced with wall switches.

3 Poisons - The medicine cabinet and sink area is often the catchall storage place for drugs and household items, many of which are poisonous when taken in excess. A reminder of their obvious presence in accessible places in homes with small children might minimize the child's temptation to taste these potential poisons. Inspectors should suggest that old, unused drugs be disposed of in a safe manner such as flushing down the toilet.

A special storage area out of reach, out of sight of children, and preferably locked, can prevent accidental ingestion of these commonly used drugs and household products.

D Bedroom

1 Fires - Smoking in bed presents a major hazard. A smoldering cigarette accidentally embedded in the bedding and mattress will produce highly toxic gases even if a fire does not result. The presence of ashtrays near the bed area will indicate this unsafe habit. To change the habits and behavior patterns of individuals is difficult, but the suggested use of flame-retardant bedspreads, mattress covers, and mattresses minimizes the risk. Wool and fiber glass bankets are flame resistant and should be used where possible.

2 Falls - Getting into and out of the bed at night without proper lighting is responsible for many fall injuries. The presence of a

nearby lamp or flashlight should be encouraged-one that can be reached before one actually leaves the bed.

As pointed out in the previous discussion, unanchored, torn, or curled edges on floor coverings should be called to the attention of the resident because of the hazard they present, especially in the dark. Proper furniture arrangement and a well-defined pathway in this area are important, especially in homes of older persons.

The presence of small children in homes with second-floor bedrooms emphasizes the need for window screens to be securely attached, but not to the point that they could prevent escape from fire.

3 Carbon Monoxide - The presence of an unvented gas heater in the bedroom as well as in any other room is extremely dangerous and illegal in most areas of the country. If an unvented space heater is found, the proper authority should be notified immediately. Flexible fuel lines are often crimped or broken and thus allow the escape of flammable gases. An adequate fresh air supply is necessary for providing proper combustion, which, in turn, minimizes the production of carbon monoxide.

E Hallway and Stairs

1 Falls - The storage of items in hallways and on stairs greatly increases the possibility of tripping and falling. Toys, especially wheeled items, are a hazard. Floor covering that is torn, worn, or with curled edges should be observed and ordered corrected. Stairs should be equipped with handrails that are securely attached to the wall so that if an individual loses balance, a serious fall will be prevented. Testing of handrails may expose those that are more ornamental than functional.

Adequate lighting of halls and especially stairs is vital in preventing falls. The top and bottom landing should be well lighted since many falls initiate at these points. Prevention can be increased through placement of larger wattage light bulbs in existing wall or ceiling outlets.

In homes where children are present, a gate or door at the head of the stairs should be kept closed to prevent children from falling down the stairs. Balusters should be close enough together to prevent a child from falling between.

2 Burns - Hot-air duct openings in the floor are often found in hallways. These and wall heaters create problems because the grills become extremely hot and will cause serious burns if someone accidentally touches them. Proper placement and screening of these openings is recommended.

F Storage Areas

l Fire - The basement and other areas are noted for storing miscellaneous items such as newspapers, furniture, and other flammable materials. The inspector should be especially aware of any accumulation that presents an unusual hazard.

Flammable liquids, including gasoline, paint, paint thinners, turpentine, and similar products, should be stored in metal containers with tightly fitting lids and in areas that are free of potential sources of ignition such as flame and electric sparks. The basement, which often contains the heating system, water heater, and electrical motors, is not a storage place for highly flammable liquids. They are to be stored outside the house in areas with adequate ventilation to carry away flammable and explosive vapors if leakage occurs.

Paints and similarly less flammable liquids are to be stored in a metal cabinet some distance from any heat-producing units.

Coals from coal-fired heating units should not be placed in combustible containers such as wood and cardboard boxes. The presence of ashes in a combustible container should prompt the recommendation of using a metal container.

Inspection of the chimney in the attic area for cracked bricks and missing mortar is essential to fire safety. Storage of combustible items near any chimney in use is dangerous; recommended removal to a minimum distance of 3 feet is suggested.

2 Cuts - The presence of power equipment from which safety guards have obviously been removed need noting, and an explanation of their potential for cutting, crushing, and shearing should be made.

Power tools not in use but connected to the power source present a temptation and hazard to children allowed to frequent the area.

The clutter of handtools in home work areas where children play frequently presents them with a temptation to imitate adults in their use, and this often results in cuts and lacerations.

3 Suffocation - The temporary storage of airtight containers such as refrigerators, freezers, and similar household items presents a temptation for children to play in them. The danger of suffocation can be minimized by removing the door or door seal, by locking the door in a shut position with a chain and lock, by blocking the door so that it cannot be completely closed, or by facing the appliance to the wall so the door cannot be opened.

4 Electric Shock - Portable electric tools used in basements and areas where electrical grounds are present should bear a three wire cord with a three-prong plug or be of the double insulated variety. If portable tools are equipped with a three-wire cord, inspection should be made to determine the presence and use of grounding adapter plugs in two hole wall outlets.

G Garage

I Fire - Flammable liquids are often stored in the garage. They should be stored in UL approved metal containers to minimize the danger of fire and explosion. Glass containers should never be used. A storage area should be maintained in a neat and orderly manner and should be so located that children do not have access to it. The inspector should examine the wiring since it is often subjected to wear and exposed to the elements and may, as a result, be in poor condition. If the inspector notices the fueling of lawn mowers in the garage, he should recommend that they be fueled outside to prevent the possible accumulation of fumes within the garage.

2 Falls -Garden and lawn tools are normally stored in the garage. They should be stored in such a manner that they cannot slide or fall and present a tripping hazard. The inspector should look for the presence of oil slicks where the car is parked. These should be brought to the attention of the resident since they present a definite slipping hazard. If miscellaneous items are stored in the loft area, care should be taken that small children cannot climb to this area where falling is a possibility.

3 Cuts - All sharp tools such as axes, knives, and saws should be stored in such a manner that the blades are not exposed. The spark plug wire to gas-powered equipment such as lawn mowers should be disconnected from the spark plug to avoid accidental starting by small children.

4 Poisons - All toxic material such as lawn and garden sprays should be stored out of children's reach and in secure, preferably locked storage areas. They should always be stored in their original containers with labels and instructions for use clearly visible.

The garage should be kept neat and orderly at all times. The accumulation of unused and unwanted material presents serious injury and fire hazards.

H Grounds and Home Premises

l Fire-In making an inspection of the premises, special emphasis should be placed on detecting possible fire hazards. Outside power lines that are bare or rubbing against tree limbs or houses should be reported to the appropriate agency for repair. The inspection of all outside electric fixtures should be undertaken to determine if birds have built their nest there and if so, a recommendation should be made for their removal by the power company. The exterior of chimneys should be inspected for durability and serviceability and, where necessary, suggestions made for its improvement.

2 Recreation - Recreational items such as swings, slides, and teeter boards should be checked for proper maintenance. Seats for swings should be covered with shock-absorbent materials to prevent accidental injury to children. Chains and hooks supporting swings should be covered with rubber plastic or other suitable protective tubing and checked periodically for wear. If teeter boards are made of wood, a recommendation should be made to the resident that adequate covering should be incorporated since weather and use will split the wood and cause splinters. Recreation items should be out of the normal path of individuals.

Surfacing around the recreation area should be sand or sawdust in order to prevent possible serious injury to children if they fall.

Hard materials such as concrete or asphalt should be avoided.

Precautions should be taken to see that ditches, wells, and cisterns are securely covered to prevent persons from falling into them.

3 Cuts - The outside area surrounding the home should be kept clean of broken glass, sharp objects, and other debris. The presence of abandoned automobiles and machinery presents not only an injury hazard to children but also health hazards to the residents and neighborhood. The lawn should be carefully cleared of items such as sticks, rocks, and glass before the lawn is mowed, in order to prevent the throwing of these objects by rotary power motors. Proper clothing should be worn to protect the mower operator's feet and legs. Children should not be allowed to play with or near a mower while in operation. Refueling a lawn mower while it is hot or running creates a fire hazard.

4 Falls - Steps and porch area should be inspected for trip hazards and loose railings to prevent personal injury. Fences offer a climbing temptation to children; therefore, their maintenance should be determined in view of the fact that wood deteriorates with age and may be unable to support children who climb on it. Ladders should not be left standing against houses or other structures for fear of children climbing them. In addition, their useful life will be extended if they are stored away from the elements.

I General

In this category we are primarily concerned about items that have not been covered or that are not applicable to all areas but nonetheless are an important phase in home safety.

Adults sometimes start a car and let the engine idle while the car is still in the garage. If the doors are closed, the carbon monoxide produced by the engine may overcome a person in the garage and cause death. The running of an auto in a garage attached to the house may allow dangerous carbon monoxide vapor to penetrate the house or heating system. Doors should always be open for safety.

Firearms present a special problem and should be carefully inspected to make sure they are unloaded and stored in a locked cabinet. All ammunition should be stored in a separate locked cabinet. The improper storage of any unlocked or usable firearm in homes with children is a realistic hazard - one to which attention should be directed.

Exits should be cleared at all times to permit easy passage from all areas in case of fires.

At night, all doors should be kept closed in order to provide additional escape time in case of fire.

Since many rural and suburban homes use LP gas, you should suggest that checks be made to determine if leaks have occurred around fittings, to prevent possible accumulation of gas in the home and consequent creation of an explosion hazard. The odor of LP gas suggests the need for immediate attention by the fuel supplier.

Telephone numbers for physician, ambulance, fire, and police departments should be posted in a conspicuous place, preferably on or near the telephone.

Inspectors often visit homes where very small children are left unattended for long periods, often while the parents are at work. If it is apparent that their absence is a definite detriment to the child's health and safety, this should be noted and called to the attention of the appropriate community agency.

The electrical service box containing fuses or circuit breakers may be found in any part of the house. The fuse or circuit breakers are "safety valves" that prevent electrical fires from occurring. When any electrical circuit is overloaded, the breaker will trip or the fuse will blow and shut off the electricity before a fire occurs. Unless larger than normal wiring, such as is necessary to electric stoves and water heaters, normal household circuits should be equipped with a 1 5-ampere fuse or circuit breaker. The current-carrying capacity can be found on the base of the fuse or on the exterior of the circuit breaker. Two commonly found violations and definite hazards are a coin behind a fuse or the splitting and turning under of the fuse edge so as to bypass the fusing element. Circuit breakers may be found secured in a closed position by taping or blocking with a match stick or a toothpick. These unsafe practices eliminate the functioning of these components as a safety valve. The inspector can greatly contribute to the safety of any building by noting and ordering correction of this fire hazard.

Most plumbing codes require the use of both a pressure relief valve and temperature control valve on water heaters. This temperature control valve is an addition to the normal temperature control found on all gas and electric water heaters. If the heater controls should fail to operate properly, the pressure relief valve and the temperature control valve will prevent the possibility of a pressure buildup and explosion. The use and proper installation of these safety valves are vital to safety.

The charcoaling of foods within the house and the use of gas range top burners for supplementary heat should be discouraged due to the increased generation of carbon monoxide gases by these appliances. The burning of charcoal within the house should be allowed only within the opening of a fireplace. An inspection should be made to determine if the flue and draft control is operable; otherwise, carbon monoxide gases can spill into the house.

While many of these points are not enforceable by the inspector, he should find it within his duty to inform the resident of the hazard and show him how to make corrections. If carried out properly, this procedure should go far toward eliminating many household hazards and reducing accidental injuries in the home and thus provide a healthful and safe environment.

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Chapter 10: Legal Aspects

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I. Introduction

The state may regulate the use and enjoyment of individual property for the good of its citizens. Such regulation does not usually conflict with the constitutional protections given to the owner or occupant of property. The right of the state (or municipality as the state's delegate) to enact and enforce a housing code is based on the state's police power. This general authority has never been precisely defined, but it has recently been called "The power inherent in a Government to enact laws within Constitutional limits to protect the order, safety, health, morals, and general welfare of society."[1]

Courts have pointed out that municipalities may properly impose restrictions on individual property owners when these restrictions are needed for the protection of the public health, safety, or welfare.

What can be done in the name of the public health, safety, and welfare may be better understood if one surveys a few cases in which housing code provisions have been held constitutional. Provisions in ordinances requiring windows and ventilation,[2] screens,[3] maintenance of hot water,[4] and many other necessities and amenities of life have been upheld,[5] even though these ordinances interfere with the rights of ownership of property and in spite of the costs to the owner for repair, installation, alteration, or demolition that can often be compelled by the law.

The substantive portions of local housing codes (that define what can or cannot be done) have been generally upheld by the courts; in the area of implementation, however, difficulties have been encountered. A just balance between the rights of the individual and the needs of each community is the goal towards which each person charged with the protection of the public health should strive. The right of an inspector to entry, the necessity and requirements of a search warrant, and the admissibility of evidence obtained in a search are three grey areas of indecision.

II. Entry

The Fourth Amendment guarantees people the right to privacy-the right to shut one's door against officials of the state unless under proper authority of law. Concepts and procedures that previously guided the conduct of housing, sanitation, and safety inspection programs in this country have been reexamined and revised in recent decisions of the Supreme Court of the United States.[6,7]

When clear and specific consent to enter premises has been freely and intentionally given, an inspector may enter the premises.

Entry on and inspection of private property (no distinction is made between residential and commercial property not open to the public) by government officials without proper consent, however, is an "unreasonable search and seizure" within the Fourth Amendment and may not be enforced unless authorized by a valid search warrant.[8]

Searches for housing violations by an agent of an administrative agency are considered significant intrusions of the interests that are protected by the Fourth Amendment[9] against arbitrary invasions by government officials and by the Fourteenth Amendment against state officials.[10] The occupant, therefore, may not be punished for refusing to permit a warrantless inspection.

Consent to inspect may, however, be given. Constitutional rights protected by the Fourth and Fifth Amendments may be voluntarily waived,[11] but there is a distinction between submission and the kind of consent that is necessary to constitute a voluntary waiver. Officers cannot demand admission to private premises in the name of the law or "under color of office;" [12] such entry has been said to be granted "in submission to authority rather than as an understanding and intentional waiver of a constitutional right." [13] In short, the consent must be clear and specific, freely and intentionally given. Where a search alleged to be based on consent is challenged, courts have required evidence showing that the consent was given in the knowledge that the occupant has the right to refuse such consent with impunity, [I4] and the Government, then, has the burden of proving by clear and positive evidence, that such consent has been given. [15]

Evidence of consent may be oral or written, and experience in the inspection field will show which is preferable. The Department of Justice "Handbook of the Law of Search and Seizure (1967)" recommends that the consent be in writing. The legal office for each housing agency should provide a form that will be suitable for its jurisdiction.

Where a verbal consent is relied on, some Federal courts have held that nothing short of a statement by the inspector advising the person of his right to refuse a warrantless search will meet the Fourth Amendment requirements that a person must knowingly waive his rights. [16]

III. Search Warrant

Since it has been decided that, without consent, a search warrant is necessary to support the entry, the question arises: Is there an available procedure for obtaining a search warrant to make an inspection? The Supreme Court recognized that the only effective way to have all premises comply with the minimum standards required by municipal codes is through routine periodic inspection of all structures.[I7] The area-inspection approach (a plan for systematic inspection, from time to time, of structures contained within a contiguous area) is considered to be a reasonable search of private property within the meaning of the Fourth Amendment. A warrant for an inspection of residential or commercial premises need not be based on reasonable cause to believe that a violation exists in the premises sought to be inspected, but can be based on reasonableness of need to conduct periodic, area-wide inspection, based on the passage of time, the nature of the building (e.g., a multifamily apartment house), or the condition of the entire area.*****

*******The matter of "blanket warrants" is one that has not been fully qualified. Until the time that guidelines pertaining to the use of blanket search warrants are established, localities are cautioned to consult with their legal advisers before proceeding in this matter.*

The recent Supreme Court decision stated the following guidelines for determination of "probable cause" to issue a warrant:

". . . it is obvious that probable cause to issue a warrant to inspect must exist if reasonable legislative or administrative standards for conducting an area inspection are satisfied with respect to a particular dwelling. Such standards, which will vary with the municipal program being enforced, may be based upon the passage of time, the nature of the building (e.g., a multifamily apartment house) or the condition of the entire area, but they will not necessarily depend upon specific knowledge of the condition of the particular dwelling."

Although the Fourth Amendment bars warrantless, nonemergency inspection of residential and commercial premises without

the occupant's consent, the Supreme Court noted that: [17]

1 Prompt inspection, even without a warrant, is possible in emergency situations. [18]

2 Since there is no compelling urgency to inspect at a particular time on a particular day in most routine area inspections, as a practical matter and in light of the Fourth Amendment's requirement that a warrant specify the property to be searched, "it seems likely that warrants should normally be sought only after entry is refused, unless there has been a citizen complaint or there is other satisfactory reason for securing immediate entry."

3 ". . . the requirement of a warrant procedure does not suggest any change in what seems to be the prevailing local policy in most situations, of authorizing entry, but not entry by force, to inspect."

The Fourth Amendment requirement that a search warrant particularly describe the "thing to be seized" may occasion some difficulty for general housing and sanitation inspections that can extend from defective appliances, hazardous conditions, and cleanliness to window screens, rat holes, and the number of electrical outlets in a room. Such a broad-ranging inspection may require a thorough search of every room in an apartment, or entire commercial premises, as well as closets, cupboards, storerooms, and related accounts and records. Rather than specify in detail every item to which the inspection will be directed, statements should be sufficient that will permit the court issuing the warrant to determine necessity for the warrant and determine the limits of the search, e.g., inspection of the physical condition of the premises, plumbing, electrical wiring and fixtures, and related conditions bearing on violations_____ of sections of the Housing Code (and of sections _____of the regulations issued thereunder). It may also be desirable to attach to the warrant copies of the cited sections of the code.

If the occupant of premises to be searched refused to comply with a warrant, how is the warrant to be enforced?

When entry under a search warrant is refused, the court can punish such refusal. In addition, the provisions in most housing codes that penalize refusal to comply with or resistance to the execution of the provisions of the code probably would be adequate to support a penalty for refusal to comply with a lawful search warrant issued to implement the inspection provisions. Entry by force, the traditional method of enforcing compliance with a warrant, is used to seize criminal evidence that may be disposed of or secreted if entry is delayed; in the case of housing violations, however, hiding the violations from the inspector actually results in giving the occupant time to correct the defects. Delay, except in the case of emergencies, does not ordinarily frustrate the public interest.

IV. Evidence

A person, then, has the right not only to refuse a warrantless entry (under the Fourth Amendment) but also may resist unauthorized entry designed to secure evidence that may be used to deprive him of life, liberty, or property (under the Fifth Amendment).

What use may be made of evidence obtained in the course of a search or inspection that is conducted without a warrant or without probable cause to believe that a local code has been violated? One result is that any seizure made during an illegal search would itself be illegal; [I9] if timely and appropriate objection is made, such evidence may not be used or remain in evidence. [20] Such evidence may not be employed in state criminal proceedings. [21] Physical, tangible materials obtained either during or as a direct result of an unlawful search are barred from trial, and intangible evidence, such as a verbal statement made during an illegal search [22] and testimony concerning objects illegally observed.[23]

The applicability of this rule emphasized the importance of establishing clearly that consent has been obtained for a warrantless search based on consent.

V. Model Ordinance Solutions

The Housing Act of 1954 required that any city applying for Federal urban renewal assistance must have a plan for code enforcement as part of its workable program. Before passage of the Act, few cities had enacted such a code; in the ensuing few years, more than 650 cities have enacted such codes. The "APHA-CDC Recommended Housing Maintenance and Occupancy

Ordinance" (a model ordinance) seeks to provide solutions to some of these areas that have been discussed.

Section XI of the "APHA-CDC Recommended Housing Maintenance and Occupancy Ordinance" states the procedures needed for a housing inspection. These procedures serve the dual purposes of informing the public of the nature of the program of inspection and of making many inspection procedures routine for the officers who carry out the provisions of the ordinance. One requirement is that the inspector provide the householder with identification and a copy of both the plan of inspection and an individual schedule of the areas and facilities to be inspected; this is an attempt to protect against unauthorized intrusions by strangers.

An area-wide inspection is more effective when the enforcing officer obtains consent to such inspection whenever possible. The model ordinance states that inspections will be made between the hours of 8:00 a.m. and 5:00 p.m., or by appointment arranged between the enforcing officer and the householder. Before an inspection is conducted, the inspector must present his credentials and a schedule of the areas and facilities he wants to survey. If the inspection is to be conducted on an area-wide basis, a copy of a plan for neighborhood inspection authorized by the agency responsible for the enforcement activities is to be shown to the householder. Before these neighborhood inspections are undertaken, cooperation is sought through consultations with organizations representative of the neighborhood residents, where these exist.

To impose penalties against those who interfere with routine inspections, an ordinance must clearly set forth the duty of the owner, occupant, or other person in charge to admit the inspector and must clearly spell out the nature of the punishment to be imposed if this requirement is violated.**[24]** The APHA-CDC Recommended Ordinance creates civil penalties for violation of its provisions (Section XV) and provides that the owner, occupant, or other person in charge shall give entry and free access; if this is refused or interfered with, an order from a competent court can be sought ordering the person in charge to cease and desist such interference.

Section XI **[21]** ,and **[27]** of the APHA-CDC Recommended Ordinance specifically provides that evidence obtained in the course of inspection shall not be admissible in any administrative or judicial proceeding not related to the housing code, unless the householder consents toe such use. This is an attempt to minimize the difficulties surrounding the use of evidence obtained without a warrant or probable cause. "Such evidence shall be considered privileged, and shall not be admissible in any judicial proceeding, without the consent of the owner, occupant, or other person in charge of the dwelling unit or rooming unit so inspected."

VI. Legal Aspects of the APHA-CDC Recommended Ordinance

The Section XIV **[25]** outlines procedures to be followed after violations of the housing ordinance have been found. The housing codes of most municipalities generally contain similar provisions. These procedures are summarized below:

Notice of violation is given when the premises fail to meet the ordinance requirements. This notice, in writing, sets forth the alleged violation, describes where the alleged violation has been committed, and provides a reasonable, specified time for correction. The owner, occupant, or other person in charge of the premises or other proper person, as described in the ordinance, is served with this notice personally or by registered mail. Although it does not constitute "legal notice," ordinary mail can generally be used for first notices. If the person cannot be found, service may be made by posting notice on the premises or by publication in a newspaper of general circulation **[26]** for the specified time.

After the reasonable time for correction has elapsed, the premises are reinspected, and if the violations have not been corrected, a second notice of violation is issued. This second notice is an order requiring that the person served with such notice, if not requesting reconsideration of petitioning for a hearing (Section XVIII), correct the failure to meet ordinance requirements within a reasonable specified time.

After expiration of the specified, reasonable time or after a final decision (Section XVIII, model ordinance) has been rendered against the person served, this second notice can be recorded in the registry of deeds so that all subsequent transferees of title to the premises are considered to have notice of the continuing existence of the violations and are liable to all the same penalties.

Civil penalties **[21]**, and **[27]** (Section XV) are provided in the form of fines, or jail terms, or both after a reasonable period, but not while reconsideration, hearing, or appeal is pending.

Repairs [28] (Section XVI) may be made by the appropriate authorized agency if they are not made by the owner or person in charge and if failure to make them will endanger public health, safety, or welfare. As specified in the model ordinance, the cost of repairs, not to exceed 50 per cent of the market value of the structure, is a debt in favor of the agency and is recoverable in a civil action if not paid. [29]

Demolition [30] (Section XVI) of a structure can be ordered if it is unfit for human habitation and does not warrant repair. If the owner does not remove the structure within a reasonable time after notice, the agency may have it removed, chargeable to the owner, on receiving approval of a demolition order from a competent court. Pending removal of the structure, the owner cannot allow a voluntarily vacated building to be reoccupied. [31] The excavation must be refilled. [32] A revolving fund [33] (Section XVI) is created from funds from penalties, license fees, judgments collected, grants, loans, gifts, and other sources[34] to support the cost of repairs and demolition.

Collection and dissemination of information [35] (Section XVII) concerning techniques of maintenance, repair, and sanitation and the requirements of the housing ordinance are authorized.

An application for reconsideration (Section XVIII) may be applied for by a person aggrieved by a notice or order requiring repair or demolition. At an informal conference36 with the appropriate authorized agency, the applicant can present his grounds for believing that the order should be revoked or modified; the agency then advises the applicant whether or not it will modify or set aside the order.

A hearing [37] (Section XVIII) (for use with this reconsideration procedure) may be petitioned for by an aggrieved person with the Hearing Agency. [38] At this time, the petitioner is given an opportunity to show cause why the notice or order should be modified or withdrawn, or the time extended for compliance. The Hearing Agency has the power to affirm, modify, revoke, or extend the time for compliance of the order or notice and may also grant variances from the provisions of the ordinance (or rules and regulations issued pursuant to the ordinance) if such variance is in harmony with the general purpose of the ordinance to secure public health, safety, and welfare.

A formal conference [36] (Section XVIII) is provided as an alternative to the above described "application for reconsideration" and "hearing." The formal conference procedure provides for the aggrieved person to petition, by letter, setting forth his grounds for contesting the notice or order. The agency sets the time and designates one or more referees to preside at the conference. The referee is authorized to administer oaths and subpoena witnesses or documents. A verbatim record is kept of the conference. The petitioner is then notified of the decision in writing.

A hearing [37] (Section XVIII) (for use with this formal conference procedure) allows the aggrieved person to protest, by petition to the Hearing Agency, the decision of the referee. The Hearing Agency notifies the petitoner and the appropriate authorizing agency of the hearing and requests a transcript of the formal conference. After the hearing, which is conducted on the basis of the verbatim record kept at the formal conference, the Hearing Agency notifies the petitioner of its decision to affirm, modify, revoke, extend compliance time, or grant variances.

Appeal[39] (Section XVIII) from the final decision of the Hearing Agency may be made by the aggrieved person by filing a petition with a court of competent jurisdiction asking that the decision be set aside in whole or in part. This petition is given to the Hearing Agency, which files a record of the proceedings upon which it based its decision. The court then affirms, modifies, or vacates the decision of the Hearing Agency. The findings of the Hearing Agency on questions of fact are sustained if they are supported by substantial evidence on the record, considered as a whole.

VII. The Inspector as a Witness

On those few occasions when appeal from the final decision of the Hearing Agency is made by the aggrieved person to a court of competent jurisdiction, the housing inspector, as part of his duties, will be required to appear as a witness in a court trial. As a witness, the inspector will be called on to relate facts that he has observed and to testify concerning evidence he has gathered in connection with the alleged violation. An inspector should be familiar with courtroom proceedings so that his testimony will effectively present information he has gathered for his agency.

The attorney that represents the housing agency will, properly, discuss the case with the inspector in advance of the trial. This will be the attorney's opportunity to determine what the inspector knows about the case and to indicate the type. kind, and amount of evidence that the attorney will need and that the inspector will be able to supply. At this time, the inspector can also properly ask the attorney about any courtroom procedures of which he is in doubt.

The inspector may be called on to present his testimony in a pretrial deposition. The attorney for the aggrieved party can require the inspector to appear for oral questioning in advance of the trial to obtain oral answers recorded in writing, under oath, concerning the inspector's knowledge of the case. It is the inspector's duty to answer questions asked him in the same manner as if he were in court. The agency's attorney will be present to guide him.

When called as a witness in the court proceedings, the inspector will generally be examined by the attorney for the housing agency on direct examination. The attorney for the opposition then has the opportunity, if he wishes, to ask questions regarding the same information on which the inspector has already testified.

The inspector is to testify to the facts as accurately as possible. Before the court appearance, he should refresh his memory about details of the case, e.g., dates, time, and location and condition of the premises. He should make available to the agency's attorney the most recent and best available evidence. Photographs, correctly labeled, should adequately show the extent of the violations and should be as recent as possible. Because there will not be a future opportunity to submit exhibits, the photographs, maps, or other displays, should be available to the inspector and attorney in the courtroom.

Just as ill-prepared and poor, outdated evidence will leave a poor impression on the court, or the jury, or both, so will a poor unkempt appearance. The inspector, as a witness, should be neat and clean. His demeanor on the witness stand will add import to his testimony. The following suggestions* will help to make more effective the information that the inspector is prepared to give:

1 Never Lose Your Temper. If a witness loses his temper, he places himself at the mercy of the cross-examiner. He appears to be prejudiced, and judges and juries are not interested in prejudiced testimony. They are interested only in the facts. Keep your temper, and your service as a witness will be more pleasant. Your testimony will be more valuable.

2 Be Attentive. You must be alert at all times you are in the witness chair so that you can hear, understand, and give a proper and intelligent

answer to each question. If the judge or jury gets the impression you are indifferent, they may not believe your story.

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3 Think Before You Speak. Hasty and thoughtless answers may be incorrect and may cause problems. This is particularly true when the opposing lawyer is cross-examining. He may ask you leading questions-questions which suggest only one answer. Make sure you understand the question; then give it an accurate answer to the best of your ability. If you do not know the answer, say so.

4 Speak Clearly. There is nothing more annoying to a court, jury, and lawyers as a witness who refuses to speak clearly enough to be heard. An inaudible voice not only detracts from the value of your testimony, but it also tends to make the court and jury think that you are not certain of what you are saying. Everyone in the courtroom is entitled to know what you have to say. There are no secrets in court; the court reporter who is recording the proceedings must be able to hear all your testimony.

5 If You Don't Understand A Question, Ask That It Be Explained. Many times, a witness will not understand a question that has been asked but will try to answer it. This is confusing to the court, the jury, and the lawyers. It also extends the time a witness will be on the witness stand because the lawyers must go back and correct any misinformation given by the witness who does not understand the question. If you do not understand the particular question, do not hesitate to say so and ask that the question be explained. It will save time and confusion.

6 Answer All Questions Directly. Too often, a witness will be so anxious to tell his story that he will want to get it all told in answer to the first question. Listen to the question. If you can answer it with a "yes" or "no," do so. Never volunteer information. The information which you volunteer may have no bearing on the case and may serve only to delay the proceedings.

7 Stick To The Facts. Don't guess or speculate. The only thing that you will be permitted to testify to is what you personally know. What you know is important. What you think is unimportant.

8 Be Helpful, Not Funny. A trial is an important matter to the parties involved. Their money, property, or freedom may be lost by your testimony. Don't try to be a wit.

REFERENCES

1 *Lees v. Bay Area Pollution Control District,* 48 Ca. Rptr. 295, 299, (1965).

2 *Richards v. City of Columbia,* 227 S.C. 538, 88 S.E. 2d (1955).

3 *Paquette v. City of Fall River,* 338 Mass. 368, 155 N.E. 2d 775 (1959).

4 Danker v. City of New York, 194 N.Y.S. 2d 975 (1959).

5 See, generally, *The Constitutionality of Housing Codes,* National Association of Housing and Redevelopment Officials, (2d. Ed. 1964).

6 *Camera v. Municipal Court of the City and County of San Francisco,* 87 S. Ct. 1727 (1967).

7 *See v. City of Seattle,* 87 S. Ct. 1937 (1967).

8 Ibid.

9 The Fourth Amendment (U.S. Constitution) provides:
"The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized."

10 Ker v. California, 374 U.S. 23, 30 (1963); Wolf v. Colorado, 338 U.S. 25, 27 (1949); Mapp v. Ohio 367 U.S. 643 (1961).

11 Zap v. United States, 328 U.S. 624.628 (1946).

12 *Amos v. United States,* 255 U.S. 313 (1921); *Johnson v. United States,* 333 U.S. 10, 13 (1948).

13 333 U.S. at 13; *United States v. Smith,* 2 Cir., 1962, 308 F 'd 657. 663.

14 *Judd v United States,* D.C. Cir. 1951. 190F. 'd 649 , 65 1; *Robbins v. MacKenzie,* I Cir., 1 966, 364 F. 2d 45, 49, cert. den.; *United States v. Como,* 2 Cir., 1955, 340 F 'd 891.

15 *McDonald v. United States,* 10 Cir., 1962, 307 F 2d 272; *Judd v. United States, supra; Simmons v. Bomar,* 6 Cir., 1965, 349 F 2d 365, 366. *Kovach v. United States,* 6 Cir., 1931, 53 F 2d 639; Channel v. United States, 9 Cir., 1960, 285 F 2d 217, 219 cf. *Parrish v. Civil Service Comm. of County Alameda,* 57 Cal. Rptr. 623 (1967).

16 *United States v. Blalock*, 255 F. Supp. 268 (1966); *United States v. Nickrasch,* 7 Cir., 1966, 36 ' F. 2d 740. 744.

Contra: *Gorman v. United States,* I Cir., 1967, 36 L.W. 2039 which held a specific Fourth Amendment warning unnecessary in the following factual situation:

"When the accused is directly asked whether he objects to the search, there must be at least some suggestion that his objection is significant or that the search waits on his consent. When this is combined with a warning of his right to counsel, which would seem in the circumstances to put him on notice that he can refuse to cooperate, we think it fair to infer that his purported consent is in fact voluntary."

17 Supra, **Footnote 6**

18 The opinion cites *North American Cold Storage Co. v. City of Chicago,* 211 U.S. 306 (seizure of unwholesome foods); *Jacobson v. Massachusetts,* 197 U.S. 11 (compulsory smallpox vaccination); *Compagnie Francaise v. Board of Health,* 186 U.S. 380 (health quarantine); Kroplin v. Truax, 119 Ohio St. 610, 165 N.E. 498 (summary destruction of tubercular cattle).

19 Evidence obtained in reinspections, as well as in initial inspections of a tenant's rooms, cannot be gathered for use against the tenant solely on the basis of the landlord's consent to a search, where the penalties to be imposed are of a criminal or quasi-criminal nature. See *Chapman vs United States,* 365 U.S. 610 (1961), where a landlord gave police officers entry to defendant's rented house wherein he maintained an illegal still. The evidence obtained in the search was declared inadmissible by the Supreme Court. Where the obligation to be enforced is - that of the landlord as opposed to the tenant, the landlord's consent to inspection of the tenant's dwelling, dwelling unit or rooming unit is, of course, binding upon him.

20 *Weeks v. United States,* 232 U.S. 383 (1914); *Silverthorne Lumber Co. v. United States,* 251 U.S. 385, 391-392 (1920); *Boyd v. United States,* 116 U.S. 616, 630(1886).

21 A continuing controversy exists as to whether evidence gathered in a health inspection made without a warrant may be employed against an offending owner, occupant, or other person in charge of the inspected structure. *Mapp vs. Ohio,* 367 U.S. 643 (1961), established that evidence obtained in a search in violation of the Fourth Amendment's proscription against unreasonable search and seizures may not be employed in State criminal proceedings, through the operation of the Fourteenth Amendment's Due Process Clause.

The proposed ordinance creates civil penalties for violation of its provisions. But courts are beginning to apply the exclusionary rule of *Mapp* to quasi-criminal and civil proceedings, as well as in criminal prosecutions. In One 1958 *Plymouth Sedan vs. Pennsylvania,* 380 U.S. 693 (1965), State liquor enforcement officers, without a warrant, stopped and searched defendant's automobile and found 31 cases of liquor therein. The state filed a petition for forfeiture of the car, a civil proceeding. The Pennsylvania State Supreme Court upheld the action, stating that the exclusionary rule applies in criminal cases only. The United States Supreme Court reversed, holding that evidence obtained by means of a search in violation of the Fourth Amendment may not be relied upon by the State, under the prohibition of the Fourteenth Amendment, to sustain a forfeiture. A forfeiture under these circumstances could lead to even greater penalties than an impermissible criminal prosecution. Such an anomalous situation, said the Court, must not be permitted to occur.

In *Incorporated Village of Laurel Hollow VS. Laverne Originals,* 171 N.Y. 2d 900, 218 NYS 2d 703 (1966), the New York Court of Appeals held that evidence obtained by a village building inspector in the course of an illegal search was improperly received in a civil contempt proceeding to impose a fine, since although the penalty was civil, such proceeding could impose a basically penal sanction.

In *Carson vs. State,* 221 Gs. 299, 144 S.E. 'd 384 (1965), an action was brought to abate gambling as a public nuisance. The Supreme Court of Georgia applied the rules of Mapp and One 1958 *Plymouth Sedan* in stating that the warrants in the case were issued without a showing of probable cause and that the evidence, therefore, must be excluded.

Two very recent cases have applied the exclusionary rule to evidence illegally obtained by private individuals in divorce proceedings. In *Williams vs. Williams,* 8 Ohio Misc. 156, (Common Pleas, Clermont County 1966), it was stated that the *Mapp* rule applies equally to civil cases and a motion for a new trial will not be granted when based upon evidence obtained in an illegal search and seizure. And in *Del Presto vs. Del Presto,* 92 N.J. Super, 305, 223 A. 2d 217, (1966), a New Jersey court held that evidence seized by forcible illegal entry of a correspondent's home was inadmissible in a divorce case, and recounted the

development of the exclusionary rule from its announcement to the present.

22 *Wong Sun v. United States,* 371 U.S. 471, 484-486 (1963); *Silverman v. United States,* 365 U.S. 505 (1961).

23 McGinnis v. United States, 1 Cir. 1955, 227 F. 2d 598, 603.

24 In *City of Saint Louis vs. Evans,* 337 S.W. 2d 918 (Sup. Ct. Mo. 1960), an ordinance empowered inspectors to enter between 9 a.m. and 6 p.m. and to obtain police assistance if admission was refused. Defendant did refuse such admission, and an officer was summoned. The defendant still refused entry. The Supreme Court of Missouri reversed the defendant's conviction, citing the failure of the ordinance to set forth a specific duty to admit or a specific penalty for those refusing admission. The Court did re mand, however, for further proceedings relative to a related charge, interfering with an officer in the performance of his offficals duties.

In *District of Columbia v. Little,* 339 U.S. 1 (1949), a mere refusal to admit was held no violation of a regulation prohibiting one from interfering with or preventing inspections. The Court found no duty to assist the inspection officers, but only a proscription against actual physical obstruction of them by means of force. From this case, and others like it, it is concluded that ordinances must clearly provide for penalties for refusal to admit inspectors.

25 This section is intended to comply with constitutional requirements of due process. As was said in *Hoehamer v. Village of Elmwood Park,* 361 III. 423, 198 N.E. 345 (1932),

"An orderly proceeding in which a person is served with notice, actual or constructive, and has an opportunity to be heard and to protect and enforce his rights before a court having power to hear and determine the cause is due process of law."

26 The service of notice by newspaper publication is optional unless otherwise required by law. Larger jurisdictions may find it easier to meet the cost of such publication than will smaller communities.

27 Civil penalties are proposed in lieu of the more common criminal sanctions. This gives implementation to the recommendations of Judah Gribetz and Frank P. Grad in "Housing Code Enforcement -Sanctions and Remedies," 66 Colum L. Rev. 1254 (1966). The inadequacy and historically demonstrable failure of the criminal sanction portrayed in that article and the plan for a shift toward a cumulative civil penalty are reflected in this ordinance.

28 Repair is designed to replace the more common remedies of placarding, vacating the premises, and receivership. The advantages of repair are that tenants in repairable multiple dwellings are not forced to look for other lodgings and that the authorized agency need not involve itself as a landlord, with buildings to manage, awaiting repairs. The cost of repairs is met both by a potential civil action and through the mechanism of the revolving fund (see Section XVI).

29 Authority for a city, under its police power, to require private action for repair and to recover the cost of work done if the individual required to make the improvement does not act has long been upheld, although it has not been frequently invoked in recent cases. See *City of Independence vs. Purdy,* 46 lowa 202 (1877), where the city filled in defendant's stagnant pond and was allowed to recover the cost in a private action. The authorization for civil recovery of such costs eliminates the long delay attendant when liens are imposed on property; these liens are mere clouds on the title, generally payable at that indefinite time in the future when the property is transferred.

30 It is well-settled law that municipal ordinances may provide for the condemnation of buildings failing to comply with their provisions. See *City of Nashville v. Weakley,* 170 Tenn. 278, 95 S.W. 2d 37 (1936), in which it was held, among other things, that a property owner has a duty to keep his property in such a state of repair the public is not endangered; when he fails in this duty, the municipality may perform demolition for him, at his expense.

31 The provision prohibiting the owner from permitting reoccupation of a voluntarily vacated dwelling, dwelling unit, or room unit in a structure scheduled for demolition represents an attempt to protect occupants from dangerous conditions, but does not apply the traditional and harsher condition that the structure be vacated forthwith at the time the demolition order is issued. This is an attempt to balance the need of the tenant to find other accommodations with the need to protect the public health, safety, and welfare.

32 The provision requiring filling the below-ground demolition site that remains when an unfit structure has been removed is an obvious, but often neglected, means of protecting the public health and safety.

33 The fund is a necessity where repair and demolition carried on by the adopting jurisdiction are contemplated.

34 The adopting jurisdiction may subsequently provide that tenants' rents may be paid into a court of competent jurisdiction, to be applied against repairs, since it permits the addition of such other revenues to the fund as the adopting jurisdiction finds necessary in its own particular situation.

35 This section grants the responsible agency powers in addition to the mere policing and licensing functions When desired, the adopting jurisdiction may adopt regulations pursuant to this section that provide for instruction to owners, occupants, and other persons in charge of structures affected by this ordinance in basic techniques of good housekeeping.

36 The conference is designed as the first step to give the aggrieved party a right to be heard. Two alternative methods for holding such conferences are provided so that the adopting jurisdiction may select the procedure most in conformity with its needs and resources. The application for reconsideration is an informal meeting that contemplates powers of persuasion will be brought to bear. Any hearing following such an informal meeting will, of course, be conducted de novo, or as a matter of first impression (first presentation to a court for examination). The formal conference procedure is designed as a full inquiry into the petitioner's complaint and calls for a hearing on the record of such conference.

37 The hearing is the second opportunity offered an aggrieved party to be heard. Depending on the type of initial "reconsideration" or "conference" adopted, this may be the first opportunity for the petitioner to state a formal case or this may be a review of a formal proceeding, based entirely on the original record.

38 The use of the term "hearing agency" permits the adopting jurisdiction to make use either of personnel responsible for the day-to-day enforcement of the ordinance, or of an independent hearing unit from outside such agency, at its option.

39 The third and final resort of the aggrieved party is to the courts. This may be through an appeal taken to an existing tribunal, preferably to a special session of that court, designated to hear cases dealing with the residential environment or to a specialized housing court, if one is to be created. The powers and duties of the Housing Court will depend on local law and should be articulated by each adopting jurisdiction to serve its particular needs. If a jurisdiction decides to create a Housing Court, such choice will, of course, be premised on the authority of the adopting jurisdiction to establish courts in general. Where a city desires a Housing Court and only the State has power to establish courts, a separate statute providing for local housing courts will be necessary. This ordinance can be adopted without the creation of such a court, but if a Housing Court is desired, it is suggested that the term "Housing Court" be substituted for "court of competent jurisdiction" in those provisions of this ordinance dealing with imposition and collection of civil penalties, appeals from decisions of the Hearing Agency, and civil actions for the recovery of expenditures made by the jurisdiction in effecting repair or demolition.

40 87 S. at 1736.

THE CONSTITUTION OF THE UNITED STATES

AMENDMENT 4

The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particular describing the place to be searched, and the persons or things to be seized.

AMENDMENT 14

Section 1. All persons born or naturalized in the United States, and subject to the jurisdiction thereof, are citizens of the United States and of the State wherein they reside. No State shall make or enforce any law which shall abridge the privileges or

immunities of citizens of the United States; nor shall any State deprive any person of life, liberty, or property, without due process of law; nor deny to any person within its jurisdiction the equal protection of the laws.

Section 2. Representatives shall be apportioned among the several States according to their respective numbers, counting the whole number of persons in each State, excluding Indians not taxed. But when the right to vote at any election for the choice of electors for President and Vice President of the United States, Representatives in Congress, the Executive and Judicial officers of a State, or the members of the Legislature thereof, is denied to any of the male inhabitants of such State, being twenty-one years of age, and citizens of the United States, or in any way abridges except for participation in rebellion, or other crime, the basis of representation therein shall be reduced in the proportion which the number of such male citizens shall bear to the whole number of male citizens twenty-one years of age in such State.

Section 3. No person shall be a Senator or Representative in Congress, or elector of President and Vice President, or hold any office, civil or military, under the United States, or under any State, who, having previously taken an oath, as a member of Congress, or as an officer of the United States, or as a member of any State legislature, or as an executive or judicial officer of any State, to support the Constitution of the United States shall have engaged in insurrection or rebellion against the same, or given aid or comfort to the enemies thereof. But Congress may by a vote of two-thirds of each House, remove such disability.

Section 4. The validity of the public debt of the United States, authorized by law, including debts incurred for payment of pensions and bounties for services in suppressing insurrection or rebellion, shall not be questioned. But neither the United States nor any State shall assume or pay any debt or obligation incurred in aid of insurrection or rebellion against the United States, or any claim for the loss or emancipation of any slave; but all such debts, obligations and claims shall be held illegal and void.

Section 5. The Congress shall have power to enforce, by appropriate legislation, the provision of this article.

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Chapter 11: Human Relations Aspects of a Housing Inspection

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I. General Considerations

The term "housing inspection" is generally understood to mean a close-up observation of actual conditions that exist in a dwelling and on its premises. It is conducted by a trained, qualified, and competent appointed official to determine whether the observed conditions meet the minimum requirements specified by the local housing ordinance. In cases where the minimum requirements are not met, the inspection procedure offers an opportunity to begin the necessary action to bring the existing conditions up to a level that will be acceptable under provisions of the ordinance.

A Purposes of the Housing Inspection

For the occupant of the dwelling unit, the inspection should be an opportunity to compare the conditions in which he lives with those considered to be minimal to protect his health and safety. In addition it provides a check on the quality of maintenance given to the facilities of his dwelling unit since the last inspection.

For the code enforcement or housing irnprovement agency, the inspection procedure provides a means for:

1 Gathering data that can be combined with other, similar data to develop a comprehensive picture of housing conditions in the community as an aid to measure improvement progress.

2 Executing its responsibility for protecting the health and safety of individual citizens as well as the public generally.

The main focus of the housing agency's activities should be primarily related to the improvement of the housing quality of the community rather than to the mere enforcement of a housing ordinance.

B The Housing Inspection as a Technique for Improving Housing Quality

The inspection procedure should be considered a technique, which used in concert with other techniques, is intended to improve continually the housing quality throughout the community. The inspection procedure, if properly used, is an effective tool in achieving code compliance.

1 It provides a reasonably accurate measurement of actual dwelling and premises conditions to indicate improvement or slippage in housing quality when compared with previously collected data.

2 It provides a convenient opportunity for consultation to take place between the occupant and the inspector regarding conditions that do not meet code requirements.

3 It provides a means of measuring the effectiveness of techniques, such as use of press, radio, TV, and neighborhood improvement projects, which may also be employed to help improve community housing quality.

4 It provides information that can be later used if some form of legal action becomes necessary to bring about code compliance.

Legal action, as a form of persuasiveness, is often considered to be the least desirable. It can cause adverse publicity for the agency that can hinder its future work. It is costly. Legal action can cause a false impression to be formed by the public regarding the purposes of the agency and the functions of its personnel. It is a last-resort effort that is in a sense an admission of failure at being able to teach housing hygiene principles and persuade their acceptance .

C The Community Housing Improvement Program

The success of a community housing improvement program generally depends upon several basic factors.

1 Adoption, by municipal officials, of a housing ordinance with realistic code provisions that will help maintain the quality of "good" housing and substantially improve the quality of "poor" housing conditions.

2 The code administration compliance program must be well planned and conducted in a systematic fashion.

3 The program must have sufficient financial support for an adequate number of personnel and other administrative needs.

4 Legal counsel and direct legal aid must be readily available to the program staff when needed.

5 Housing inspectors must be adequately trained and supervised so that they can conduct their work competently.

6 The general acceptance, support, and participation of the public in the housing improvement efforts of the program must be secured.

In the end, this last item will largely determine the measure of success or failure of the Program.

The housing agency, as all other governmental units, is a tax-supported public agency that belongs to the people it serves. In the final analysis its future existence to continue serving the needs of the people will depend upon the people's wish to maintain it. This in turn depends upon their understanding of and satisfaction with the services of the agency and the performance of its personnel. Modern thinking is along the line of doing "with" people rather than "for or to" them. When applied to a housing agency and the public it serves, the word "with" implies everything that contributes to good human relations.

II. Human Relations and Attainment of Housing Goals

The term "human relations" as used here actually refers to two types of relationships between people: The personal one-to-one or person-to-person relationship and the relationship that exists between the agency and the general public.

They are interrelated. The public is composed of individuals with attitudes and feelings that when taken jointly make up the public sentiment. This sentiment forms the basis for the relationship that develops between the housing agency and the general public.

A The Housing Inspector and Public Relations

The housing inspector is more concerned with the one-to-one or person-to-person relationships than with the relationship between the agency and the public. The latter is more a responsibility of the supervisory or executive levels of the agency; the housing inspector, however, meets individual members of the public personally on a daily basis. What he does and how he does it, even what he does not do but should do, help to shape the individual's attitudes about the inspector as well as about the agency he represents. Individual attitudes added together form the basis of the public's opinion of the agency and are important in

determining whether the public will or will not cooperate with the housing improvement efforts.

The effects of the housing inspector's contacts with the public can have even deeper implications. Since the only contact many members of the public may have with the municipal government is through the housing inspector, he may, to them, represent the municipal administration. This is especially true for the inner-city poverty area resident to whom the housing inspector may well be the municipal government. The housing inspector has more personal contact with members of the public than any other municipal employee, even the mayor. To a large degree, the success of his relationships may well determine the success or failure of many municipal programs other than the housing improvement program.

B Anatomy of the Person-To-Person Communication Interaction

Since the person-to-person relationships of the housing inspector have such far-reaching effects, it is important for him to have some idea of what takes place when two persons confront each other in an attempt to communicate.

When two persons meet and attempt to communicate with each other, their reactions to what is said by the other are dependent upon many factors. The behavior of an individual (John) in the presence of another person (Frank) is, at the same time, both a response and a stimulus to the actions of Frank. Because John knows that Frank will react to the manner in which John conducts himself, he (John) is likely to temper his behavior. John may, knowingly or unknowingly to himself, behave in such a way as to bring about certain responses from Frank. John's subsequent behavior thence depends upon whether or not he brings about the desired responses from Frank.

Of course this is an oversimplified explanation of a very complex matter explained in terms of stimulus and response, action and reaction. Under ordinary circumstances, the behavior of persons in interaction flows quite smoothly. This occurs if each party to the interaction has learned to anticipate the response that an action on his part will elicit, as well as to anticipate the responses he will make toward the actions of the other party. *Such interactions flow smoothly, however, only when both parties share the same definitions of their-own and each other's acts, as well as an understanding of their relation with each other.*

On the assumption that the housing inspector understands his job to be that of teacher and in addition to that of code enforcement officer, it is to his advantage to have a workable knowledge of the person-to-person communications technique. Armed with this advantage, his job of making people interested in the things they may not want to be interested in becomes easier.

C How To Interest People In Things They Don't Want To Know

Every normal human being is interested in many things. Certainly he is interested in himself, his family, and conditions that affect his daily life. To establish an effective communications link the housing inspector must find a way to relate what he wants to say with what the other person is already interested in. If he can do this, the inspector can reach him and teach him what he needs to know to improve his housing conditions. This is a two-step process the inspector must:

-get the attention or interest of the subject;

- then do the teaching.

Everyone the inspector tries to reach will have some interest, some need, some desire, to which he can relate himself and his message. At the start. it must be something in which the subject is interested, not something in which the inspector is interested. He must find this need or desire and use it to anchor an emotional or intellectual bridge between himself and his subject. Then he can send his messages across this bridge to his subject.

1 How To Get The Interest Of The Subject

Obviously, until the inspector has figured out what need or desire he can serve in the subject - and until he states convincingly to the subject - he cannot begin to interest the subject in anything. In fact, the person may not even know that he should have a particular need or desire. This may be especially true with dwellers of inner-city poverty areas who have lived in poor housing

conditions so long that their sensibilities to react to these conditions have been dulled. In this instance the best starting place might be to reawaken these sensibilities.

To recognize the needs and desires of the subject, one must know as much about the subject as the subject knows himself-perhaps even more. To do this effectively, the inspector must first recognize and accept certain basic facts:

a That there is no such thing as "one" or "the" public. All communities - and neighborhoods - have population subgroups based on religion, economic or social status, race, education, nationality, age, sex, and occupation.

b Childhood rearing patterns vary in each of these subgroups so that the experiences, attitudes, and behavior of individuals belonging to each of these subgroups will be different. These differences may be evident in their attitude and behavior toward the municipal government, its representatives, and even members of other subgroups. Municipal officials themselves constitute a subgroup that is further broken down by smaller sub groupings formed on the basis of rank, status, or the type of duties performed.

c Inner-city dwellers in particular may confuse the housing inspector if he is unfamiliar with their problems.

Many of these residents have migrated from remote rural areas that kept them isolated from the mainstream of technological change that has occurred so rapidly in this country. They may have received little or no education or job training. Many came to the city with the sincere hope of improving their condition and becoming a member of the American society. Being unfamiliar with city ways, however, they soon found themselves in difficulty with the law, without a job, and in living conditions that were worse than those they had left in the rural hinterlands.

Often many do not recognize an illness, much less know where to get treatment, even though a health clinic may be just down the street. Some have never been trained to perform simple technical functions such as how to use a washing machine. To survive, many fathers have had temporarily to leave their families in search of work in other cities. Some never return, leaving the women to raise the family. Boys and young men grow up with deep rooted feelings of insecurity, never having had the model of their father to guide their development into manhood. Often any municipal employee represents the real or imagined oppression of the government and is a likely target on which to vent pent-up anxieties.

d The housing inspector must realize that he also belongs to one or more population subgroups with attitudes and behavior patterns that are different from those found in other groups. As a housing inspector, he must neutralize the attitudes or behavior patterns that may evoke an undesired response from the subject. He must further make it clear to the person with whom he is trying to establish a communications link that, although there are differences between them, he is unbiased and nonjudgmental in their relationship, and that he expects the same from the subject. These are generally expected characteristics of persons belonging to the subgrouping of municipal officials.

e By using whatever background knowledge he can learn about the people with whom he must work, the inspector, with some tactful probing, should be able to determine their needs and desires and build a communications bridge to them by establishing a genuine interest in them.

2 How To Get Your Message Across

Once the communications bridge has been built, the housing inspector can begin sending messages across.

The message he has to tell must be important to the subject, related to some basic need or desire of his, and related in his terms, not the inspector's.

Then he can hope to move the subject in the direction he wants him to go, that is, toward improving his housing conditions.

Every communication has three elements, each of which determines the value of the other two. There is the content of the message, what it is the inspector wants to say. There is the form of the message, how the content is expressed and transmitted, and this includes both the medium and words used. And there is the subject of the communications, the person to whom it is

directed.

Obviously until all three of these content, form, and subject are carefully and successfully related to each other, the communication is not likely to have the desired result. The content must be properly and precisely related to the subject. How the message is stated must be properly and precisely related to the content and the subject of the communication. If these three are not effectively related, the intended message will fall short of communicating.

Finally, the communicator, that is, the inspector, must not be message oriented. Although his message may be important to the subject, it may also be new and different, and the importance of the message may have no impact on the subject. The inspector must be always conscious of whom he is trying to reach, of how that person thinks and feels; as he directs his efforts, he shapes his message and form of delivery, as best he can, to fit the subject. To do this, he must start with his subject in mind; that is where persuasive person-to-person communication starts.

D Interagency Relations

The housing inspector should realize that the housing improvement program is only one of many programs of municipal administration. During a normal work day, the housing inspector is likely to meet other municipal employees in the same neighborhoods working with the same people.

With the multiplicity of community and personal improvement programs in effect today, especially in inner-city poverty areas, the traffic of public employees can become bewildering, if not irritating, to the neighborhood residents. Naturally, all employees feel their work is important, and in their striving to achieve their goals, compete with other employees for the time, interest, and support of community residents. If competition for the attention of neighborhood residents becomes too intense, the result might well be the polarization of individuals around one or a few program activities- those that interest or benefit them most. Or worse, the result might be sheer apathy and loss of support or interest in any program's efforts.

Several things can be done to avert this very undesirable situation and make the efforts of all public employees mutually beneficial. They include the following:

1 The housing inspector should try to determine which employees have duties related to his or perform similar activities. These will usually be health, building, electrical, fire, and various public works employees. He should then try to learn as much as possible about the other employee's work that relates to his own. Then, if he discovers conditions that should be brought to the attention of other departments, he will know enough to determine whether the condition really does constitute a hazard or a violation of another ordinance. Unnecessary inspections can become costly to the municipal administration, time consuming, and bothersome for the other employees as well as for the resident .

A possible result of this type of needless activity can easily result in alienation of both the other city employees and the resident. Eventually the housing inspector will find himself without the participation and support of others in his program efforts.

2 The housing inspector should try to develop lines of liaison or channels of communications with employees of other units. Then, through these channels he should attempt either formally or informally to coordinate the planning and execution of his activities. For example, an occupant of a dwelling would rather have the housing and other necessary inspections done at the same time or on the same day rather than arrange separate appointments on different days.

3 Exchange information and views about the neighborhood and its residents. Keep it general and related only to topics that will directly help improve communications with the residents or otherwise help achieve the desired objectives. All persons regardless of their station in life have the right of freedom from invasion of privacy. The details of a person's life or living circumstances that the inspector may learn during his work should not be idly discussed.

Perhaps the most important fact the inspector should keep in mind, regarding good interagency relations, is that, although his interest is primarily focused on one program area, he is part of a larger team working together to improve the conditions of the total community.

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- Asthma
- Division of Laboratory Sciences
- Emergency and Environmental Health Services
- Environmental Hazards and Health Effects
- Global Health Office
- Health Studies
- Mold
- Preventing Lead Poisoning in Young Children
- Vessel Sanitation - Sanitary Inspection of International Cruise Ships

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