NATIONAL BUREAU OF STANDARDS REPORT

10 400

USER PERFORMANCE REQUIREMENTS FOR PERSONAL SANITATION FACILITIES IN HOUSING

Technical Report to the

Department of Housing and Urban Development

on Housing Performance Criteria

U.S. DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

NATIONAL BUREAU OF STANDARDS

The National Bureau of Standards[1] was established by an act of Congress March 3, 1901. The Bureau's overall goal is to strengthen and advance the Nation's science and technology and facilitate their effective application for public benefit. To this end, the Bureau conducts research and provides: (1) a basis for the Nation's physical measurement system, (2) scientific and technological services for industry and government, (3) a technical basis for equity in trade, and (4) technical services to promote public safety. The Bureau consists of the Institute for Basic Standards, the Institute for Materials Research, the Institute for Applied Technology, the Center for Computer Sciences and Technology, and the Office for Information Programs.

THE INSTITUTE FOR BASIC STANDARDS provides the central basis within the United States of a complete and consistent system of physical measurement; coordinates that system with measurement systems of other nations; and furnishes essential services leading to accurate and uniform physical measurements throughout the Nation's scientific community, industry, and commerce. The Institute consists of a Center for Radiation Research, an Office of Measurement Services and the following divisions:

Applied Mathematics—Electricity—Heat—Mechanics—Optical Physics—Linac Radiation[2]—Nuclear Radiation[2]—Applied Radiation[2]—Quantum Electronics[3]—Electromagnetics[3]—Time and Frequency[3]—Laboratory Astrophysics[3]—Cryogenics[3].

THE INSTITUTE FOR MATERIALS RESEARCH conducts materials research leading to improved methods of measurement, standards, and data on the properties of well-characterized materials needed by industry, commerce, educational institutions, and Government; provides advisory and research services to other Government agencies; and develops, produces, and distributes standard reference materials. The Institute consists of the Office of Standard Reference Materials and the following divisions:

Analytical Chemistry—Polymers—Metallurgy—Inorganic Materials—Reactor Radiation—Physical Chemistry.

THE INSTITUTE FOR APPLIED TECHNOLOGY provides technical services to promote the use of available technology and to facilitate technological innovation in industry and Government; cooperates with public and private organizations leading to the development of technological standards (including mandatory safety standards), codes and methods of test; and provides technical advice and services to Government agencies upon request. The Institute also monitors NBS engineering standards activities and provides liaison between NBS and national and international engineering standards bodies. The Institute consists of the following technical divisions and offices:

Engineering Standards Services—Weights and Measures—Flammable Fabrics—Invention and Innovation—Vehicle Systems Research—Product Evaluation Technology—Building Research—Electronic Technology—Technical Analysis—Measurement Engineering.

THE CENTER FOR COMPUTER SCIENCES AND TECHNOLOGY conducts research and provides technical services designed to aid Government agencies in improving cost effectiveness in the conduct of their programs through the selection, acquisition, and effective utilization of automatic data processing equipment; and serves as the principal focus within the executive branch for the development of Federal standards for automatic data processing equipment, techniques, and computer languages. The Center consists of the following offices and divisions:

Information Processing Standards—Computer Information—Computer Services—Systems Development—Information Processing Technology.

THE OFFICE FOR INFORMATION PROGRAMS promotes optimum dissemination and accessibility of scientific information generated within NBS and other agencies of the Federal Government; promotes the development of the National Standard Reference Data System and a system of information analysis centers dealing with the broader aspects of the National Measurement System; provides appropriate services to ensure that the NBS staff has optimum accessibility to the scientific information of the world, and directs the public information activities of the Bureau. The Office consists of the following organizational units:

Office of Standard Reference Data—Office of Technical Information and Publications—Library—Office of Public Information—Office of International Relations.

---

[1] Headquarters and Laboratories at Gaithersburg, Maryland, unless otherwise noted; mailing address Washington, D.C. 20234.
[2] Part of the Center for Radiation Research.
[3] Located at Boulder, Colorado 80302.

NATIONAL BUREAU OF STANDARDS REPORT

NBS PROJECT
4213401

July 1971

NBS REPORT
10 400

USER PERFORMANCE REQUIREMENTS FOR PERSONAL SANITATION FACILITIES IN HOUSING

Technical Report to the

Department of Housing and Urban Development

on Housing Performance Criteria

by
Dr. Dwight E. Erlick
Technical Analysis Division, IAT

U.S. DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

ACKNOWLEDGEMENT

The author appreciates the direction, advice, and assistance provided by the project leader, Dr. Robert Wehrli, Chief, Building Systems Section, Building Research Division.

TABLE OF CONTENTS

Summary

The objective of this study is to present a pool of requirements for personal sanitation facilities in housing. The requirements are based on the activities generally involved in a personal sanitation setting and are formulated in terms of attributes of the environment. Criteria for the selection of environmental attributes are outlined and 21 environmental attributes that appear relevant to accomplishing the user activities are enumerated. Requirements for personal sanitation are specified under the various environmental attributes. Health and safety aspects of the environment are discussed and potential hazards associated with each activity are listed.

I. INTRODUCTION

A. The Performance Approach

Houses are designed for people. The primary evaluation of the effectiveness of a house should be how well it serves its users in carrying out their lifestyle. Among building designers, this approach -- determining the adequacy of a house on the basis of its relevance to people -- is known as the Performance Approach. "In the performance approach a specific building system, component or material is subservient to the delivery of an attribute. That in turn is subservient to the satisfaction of human needs."[1]

B. Advantages in Using Performance Statements

The advantages of using performance statements are many; the most obvious being that the focus of attention is always on the ultimate purpose of the structure -- the service of its occupants. As J.R. Wright indicates, "regulations that are stated in performance terms would encourage innovation among builders and manufacturers of building components and systems. The wide adoption of the performance approach would go beyond consideration of health and safety, which are the main concern of most building codes, to a more comprehensive satisfaction of user needs. It would provide a humanistic basis for the technological revolution that is needed if the housing goal is to be attained and if significant economies in construction are to be achieved."[2]

---

[1]James R. Wright. "Performance Criteria in Building," Scientific American, March 1971, Vol. 224, No. 3.

[2]Ibid.

C. Problems in Specifying Performance

One of the major problems encountered in developing performance statements is writing criteria in measurable terms that will satisfy the wide range of user needs associated with housing. Some needs, for example, the environmental attributes that involve the human physiology (i.e., temperature, humidity, illumination, odor, etc.) have rather narrow tolerance ranges in terms of the requirements for a wide segment of the population. On the other hand, psychological and sociological needs -- acquired or modified as a function of various socio-cultural environments -- are quite broad and diversified, especially in a population such as exists in the United States.

Determining the relative importance of these various user needs is a very complex problem. A house poorly designed for psychological needs may be more detrimental to the user, especially on a long-term basis, than a house which inadequately meets his physiological needs.

D. Personal Sanitation

The activities and attitudes associated with personal sanitation facilities vary quite extensively from family to family and culture to culture. Some people view a personal sanitation facility as a refuge from people and a place to relax in a bath, while others view such a facility as simply a place for cleansing the body. Some people desire complete visual and auditory privacy, while carrying out various bodily processes, but for others, privacy is not a major concern. The range of activities carried out in the confines of a personal sanitation facility can be numerous depending on individual desires and resources e.g., steam

bathing, artificial sun treatment, exercising, etc. The uses of a personal sanitation facility also vary as a function of the introduction of new technology, as well as the changing of attitudes over time. In developing requirements for personal sanitation facilities in this document, a broad definition of personal sanitation is used to include many of the more frequent activities carried out or desired to be carried out in the vicinity of personal sanitation facilities.

E. Objective

The purpose of this study was to develop a broad range of requirements (R's) for personal sanitation facilities that can be used as a means of further developing the RCTC's (Requirement, Criteria, Test, Commentary) used in the Breakthrough Guide Criteria.[3] These R's can be used as a pool from which, by means of a selection process, R's can be selected and supplied with criteria (C), test (T), and commentary (C) for application to a particular building facility.[4]

II. METHODOLOGY

A. Data

The source of data for formulating requirements in this document was available literature on the subject. Two excellent studies of the bathroom, one by Langford,[5] and the other by Kira,[6] present a comprehensive

---

[3]Pfrang, E.O. (Manager). Guide Criteria for the Evaluation of: OPERATION BREAKTHROUGH, Housing Systems. NBS Report 10 200 4 Volumes. December 1970

[4]Wehrli, R. People and Performance -- the New Breakthrough. 11 June 1971.

[5]Langford, Marilyn. Personal Hygiene Attitudes and Practices in 1,000 Middle-Class Households, Ithaca, N.Y.,: Cornell University Agricultural Experiment Station Memoir 393, 1965.

[6]Kira, A. The Bathroom. Center for Housing and Environmental Studies - Cornell University, Ithaca, N.Y. 1966.

view of attitudes toward personal sanitation as well as design criteria for personal sanitation facilities. In developing user activities and environmental attributes, these studies have been used extensively. The information on personal sanitation obtained from these and other documents has been restructured into a format that is compatible with the upgrading of the Breakthrough Guide Criteria.[7]

B. Relation to the Breakthrough Guide Criteria

The information contained in this document is similar to that in the Breakthrough Guide Criteria.[7] In fact, much of the material used in the Guide Criteria is referenced in specific sections of this report. The main difference is in the methodology used. The Guide Criteria starts by enumerating Built Elements and defines various attributes necessary to satisfy implied user needs. This document begins by defining user needs; then determines the environmental quality which can help satisfy those needs. Determination of the appropriate built element is viewed by the author of this report as a dependent variable, changing as a function of technological innovation.

C. Level of Specification

No attempt has been made to specify measurements regarding environmental attributes. The emphasis has been put on making the analysis comprehensive in terms of the range of attributes covered. If detailed information on the general environmental attributes related to Structure, Fire, Atmosphere, Illumination, Acoustics, Durability/Reliability is

---

[7]Pfrang, E.O. Op. Cit.

desired, reference should be made to the Guide Criteria. For more detailed specification concerning such items as the shape, size, and control of various personal sanitation fixtures and hardware, reference should be made to the study carried out by Kira on the Bathroom.[8]

III. USER's CAPACITY TO ACT

Personal sanitation facilities are used by the entire family under various conditions of health. Therefore, particular consideration should be given in design to allow for the wider range of behaviors involved when dealing with the elderly, the infirm, the overweight, the pregnant, children, and small infants. In general, consideration should be given to the use of properly designed and located hand grips to assist users in moving about safely in this environment of water and equipment. In the case of children, a major design concern is with the avoidance of accidents due to the presence of water and dangerous drugs, cleaning and grooming agents, etc.

In this document, unless specified otherwise, the assumption is made that users have a "normal" range of behavior capabilities regarding sensory motor activity and cognition. When requirements specifically involve children or the aged, "normal" behavioral capabilities are assumed for the age group under discussion. (Normal in this context is meant to indicate that no major behavioral impediments exist.)

---

[8] Kira, A. Op. cit.

IV. USER ACTIVITIES

The user's activity has been categorized at a conceptual level that appears relevant for interacting with the built elements in the environment. Therefore, processes internal to the user are not categorized unless they appear to have a direct bearing on the design of built elements.

The specific user activities are not listed in the sequence in which they often are carried out. However, consideration has been given to the impact of sequential relationships among various activities on the requirements for built elements.

The arrary of activities carried out in a personal sanitation facility which is presented here cannot hope to be all inclusive since individual users differ in the ways they use facilities. However, the specific activities covered are fairly discrete with regard to when they are performed, thus allowing for a selection and mix of those that appear most relevant to specific users.

A broadly defined range of user activities is based mainly on Langford's survey of personal hygiene attitudes and practices of 1,000 households.[9] The typology of these activities has not been intentionally biased toward a specific set of users. However, due to the current state of available information, findings may be more relevant to some socio-economic classes than to others. No attempt has been made to relate user activities to specific types of users or home environments.

---

[9] Langford, Marilyn. Op. Cit.

The major activities are in a sense arbitrary categories used for convenience. In reality, many different combinations of these activities are often carried on in varying sequences using the same facilities, e.g., bathing - shaving legs, shaving - hair arranging, washing hands and face - oral hygiene, etc. The intent of the categorization in this document was to focus on the principle desired activities that appear to have direct implications for the design of the built elements.

Undesirable activities such as cleaning and maintenance are treated under environmental attributes as dependent variables that might be reduced as a function of innovation in designing built elements.

The following user activities are considered for the personal sanitation setting:

Bathing

Relaxing in a Bath

Showering

Washing Hands and Face

Oral Hygiene

Elimination of Body Wastes

Shaving

Minor Medical Care

Cosmetic Grooming

Hair Cleaning

Arranging Hair

Hand Laundry

Heat Treatment

Artifical Sun Treatment

Steam Treatment

A. Bathing

1. Filling the bathtub to a desired depth of water at a desired temperature
2. Undressing
3. Adding water softeners oils, etc. to the water
4. Getting into the bathtub.
5. Maintaining a fully reclined posture submersed in water with only the head left above the water.
6. Soaping, massaging and rinsing the body.
7. Maintaining the water temperature at a specified level over time.
8. Changing the water temperature to a specified level over time.
9. Getting out of the bathtub.
10. Drying the body
11. Dressing
12. Having privacy as desired.
13. Placing a child in the bathtub.
14. Washing child from a position outside the bathtub.
15. Lifting child out of bathtub.
16. Drying child.
17. Controlling air temperature and humidity.

*Potential Hazards

1. Slipping and falling
2. Bumping and bruising
3. Drowning
4. Scalding
5. Electric shock and electrocution

B. Relaxing in a Bath

1. Maintaining a reclined posture, submersed in water with only the head above the water.
2. Maintaining a reclined posture with another individual in the same body of water.
3. Controlling the temperature of the water.
4. Controlling the level of the water.
5. Controlling the illumination to suit various subsidiary activities such as reading, thinking, watching TV, etc.
6. Communicating with a telephone.
7. Reading newspapers, magazines, books, etc.
8. Eating, drinking, etc.
9. Watching TV.
10. Listening to the radio, phonograph, etc.
11. Controlling the radio, phonograph, TV, telephone, etc.
12. Looking at various objects, colors, textures within the environment.
13. Controlling artificial sunlight.
14. Controlling air temperature and humidity
15. Having privacy as desired.

*Potential Hazards

1. Slipping and falling.
2. Bumping and bruising
3. Drowning
4. Scalding
5. Electric shock and electrocution
6. Cardiovascular system problems from heat
7. Sunburn

C. Showering

1. Setting and testing the temperature, rate and direction of flow of the stream of water prior to immersing oneself in it.

2. Immersing the body, partially or fully in a continuous stream of water while either sitting or standing.

3. Temporarily withdrawing from the stream of water for short periods of time to apply cleaning agents.

4. Soaping, massaging, and rinsing the body.

5. Changing the height, width, and angle of water stream as well as the rate of flow and temperature of the water.

6. Withdrawing from the stream of water and drying the body.

7. Protecting the hair from water and water vapor.

8. Applying cleansing agents to the hair and massaging the scalp.

9. Having privacy as desired.

10. Controlling air temperature and humidity.

*Potential Hazards

1. Slipping and falling

2. Scalding

3. Eye irritation

D. Washing Hands and Face

1. Adjusting a directed stream of water to the desired temperature and rate of flow.
2. Putting a cleaning agent on the hands.
3. Immersing both hands in the stream of water while in a comfortable standing position.
4. Massaging the hands freely at a location outside the stream of water and also under the stream of water.
5. Forming a pool of water at desired temperature in container.
6. Immersing hands in the pool of water and massaging the hands.
7. Drying the hands.
8. Scooping water with the hands and applying to the face.
9. Massaging the face with the hands.
10. Wetting a cloth with water at desired temperature and massaging the face with it.
11. Drying the face.
12. Controlling air temperature and humidity.

*Potential Hazards

1. Scalding

E. Oral Hygiene

1. Retrieving toothbrush and tooth cleansing agent.
2. Filling dental irrigator with water at desired temperature.
3. Adjusting stream of water to desired temperature and rate of flow.
4. Brushing teeth with toothbrush, rinsing brush under stream of water.
5. Massaging gums and teeth with water-vibrator, letting excess of water flow from mouth into sink.
6. Expectorating water and cleansing agent into sink.
7. Rinsing mouth with clear water.
8. Inspecting teeth in mirror during and after activity.
9. Cleaning false teeth

*Potential Hazards

1. Electric shock and electrocution

F. Elimination of Body Wastes

1. Defecting and urinating while in a seated position.
2. Male urinating while in a standing position.
3. Placing child in seated position over waste container.
4. Cleansing the body of the residue from defecting and urinating.
5. Disposing of the eliminated wastes.
6. Having privacy as desired.
7. Rinsing diapers.
8. Reading, listening to radio-phonograph, watching TV, etc.
9. Communicating over the telephone.

*Potential Hazards

1. Bacterial contamination

G. Shaving

1. Moving electric razor over face and neck.
2. Washing face and neck and applying shaving cream to face and neck.
3. Putting razor blade into or adjusting razor.
4. Moving razor over face and neck and washing razor off under stream of water of desired temperature and rate of flow.
5. Verifying the effectiveness by looking into a mirror.
6. Applying various lotions to the face.
7. Moving electric razor over legs, arms, etc.
8. Moving razor over legs, under arms, etc. and washing razor off under stream of water of desired temperature and rate of flow.
9. Trimming mustache and beard with scissors and razor.
10. Controlling illumination
11. Controlling air temperature and humidity.

*Potential Hazards

1. Scalding
2. Skin lacerations
3. Electric shock or electrocution

H. Minor Medical Care

1. Retrieving required medicine.

2. Locating area on body requiring attention - if in location not directly viewed - using mirrors to view.

3. Applying cleaning agent and/or medication.

4. Dispensing proper amount of medicine and taking it orally - with or without water.

5. Washing wound under stream of water of desired temperature and rate of flow.

6. Drying wounded area.

7. Applying bandages.

8. Gargling and expectorating.

9. Vomiting (kneeling or standing).

10. Soaking specific parts of the body in container of water of specified temperature.

11. Douching - standing or sitting - directing a liquid solution of specified temperature into the vagina and allowing the liquid to drain for disposal.

12. Using an enema - lying down - directing a liquid solution into the anal canal.

13. Applying or inserting contraceptive devices, tampons, sanitary napkins, etc.

14. Disposing of used tampons, sanitary napkins and bandages, etc.

15. Having privacy as desired.

16. Having help as desired.

*Potential Hazards

1. Taking wrong medicine, e.g., misreading label.
2. Scalding
3. Bacterial contamination
4. Falling due to weakened physical condition.

I. Cosmetic Grooming

1. Applying to and removing cosmetics from various parts of the body.
2. Applying and removing beauty aids, e.g., false eyelashes, wigs, etc.
3. Verifying the effectiveness by looking into a mirror.
4. Manicuring hands.
5. Pedicuring feet.

J. Hair Cleaning

1. Wetting the hair with a stream of water of desired temperature.
2. Wetting the hair with water from a container such as a sink or bathtub.
3. Applying cleansing agents to the hair.
4. Massaging the hair.
5. Rinsing the hair.
6. Changing the temperature of the water while keeping eyes closed.
7. Applying tinting and dyeing agents to the hair.

*Potential Hazards

1. Scalding
2. Slipping and falling
3. Eye irritation

K. Arranging Hair

1. Combing, brushing and pinning the hair using a mirror for determining adequacy of performance.

2. Applying various lotions, sprays, etc. to the hair.

3. Applying electric or steam rollers.

4. Curling hair.

5. Drying hair.

6. Cutting and triming hair.

L. Hand Laundry

1. Storing articles to be washed in a convenient location for washing.
2. Filling basin with water of desired temperature.
3. Adding cleansing agents.
4. Putting articles in basin and scrubbing.
5. Rinsing articles in clear water.
6. Hanging articles up to dry.

*Potential Hazards

1. Scalding
2. Slipping and falling

M. Heat Treatment

1. Relaxing and/or drying under concentrated heat source.
2. Having privacy as desired.

*Potential Hazards

1. Excessive heat.

N. Artificial Sun Treatment

1. Relaxing under artificial sun source for specified period of time.
2. Having privacy as desired.

*Potential Hazards

1. Sunburn
2. Damage to eyes

O. Steam Treatment

1. Relaxing in steam of specified temperature for specified period of time.

2. Having privacy as desired.

*Potential Hazards

1. Excessive heat

2. Damage to circulatory system

V. ENVIRONMENTAL ATTRIBUTES RELEVANT TO ACCOMPLISHING SPECIFIED PERFORMANCE

The builder of a house is faced with the awesome task of creating a total environment in which people can effectively carry out desired activities commensurate with their particular life styles. Ideally, this environment should be healthful, safe and comfortable, and contribute positively to intellectual and emotional development. In the past, a great deal of attention has been focused on the health and safety aspects of this environment, particularly those factors relating to accidents and physiological well being. The lack of attention focused on psychological and sociological aspects of the built environment was due largely to the lack of available data on the psychological and sociological correlates of the environment. However, the recent development of the disciplines of human factors and human engineering, and architectural psychology, has focused added attention on problems associated with making the environment more compatible with the psychological and sociological needs of the user. Thus, it appears appropriate to attempt to broaden the performance criteria for housing to include factors of comfort and psychological well being. Where data are not available, methods and procedures should be established for obtaining them.

A. Health and Safety

Situations which are conducive to poor health and safety might be considered as having resulted from an extreme mismatching of environmental attributes with user requirements.

Some attributes seem more critical in terms of health and safety than others; for example a poorly designed electrical system might cause a fire

and lead ultimately to the serious injury or death of the building's occupants. Other attributes, which seem on the surface to be less critical in terms of health and safety, may - if poorly designed - contribute merely to an uncomfortable situation, e.g., poor illumination or insufficient facilities. However, the long-term effects of an uncomfortable environment with its daily irritations, headaches, fatigue, and conflict that results from competition for facilities, should not be overlooked as a major health and safety problem. The health problem would most likely be one of mental health.

No attempt has been made in this report to set priorities for environmental attributes or to categorize them in terms of health, safety, comfort, etc., since, as is indicated above, the measure of severity to one's health and safety may be a function of the duration and degree of mismatching of an attribute with the user's needs, rather than the attribute itself.

B. Problems in Deriving Environmental Attributes

In attempting to develop a comprehensive arrary of environmental attributes related to user activities, the following became evident:

1. Some aspects of the environment have been intensively studied with a consequent development of highly quantitative measuring instruments.
2. These aspects deal mostly with phenomena that directly impact on the basic human senses of hearing, seeing, smelling, temperature sensing, etc., i.e., the innate physiological response modes.

3. These response modes are stimulated by environmental sound, illumination, temperature, and humidity, for which measuring techniques are quite precise.
4. Aspects of the environment that relate to perceptions and the general learned behaviors that are a product of sociocultural influences, while having also been studied, have not been developed to as high a state of quantification as those relating to physiological behavior. This is due partly to the greater variability present in learned behavior and partly to the lack of interest of sociologists and psychologists in environmental issues.
5. Concepts like comfort, privacy, informality, feelings of security, etc. still require extensive research and development before they can serve as useful concepts for environmental design.

One might view the development of Environmental Attributes as a continuing process of quantifying and integrating the various aspects of the environment in an attempt to derive a seriesof measures that are relevant to user activities.

One might view Environmental Attributes as a series of definitions of the environment that become integrated at higher and higher levels as measurement techniques and research results become available. In such a case, some of the Environmental Attributes that eventually might be used for evaluation are the following:

1. Physical Safety
2. Security

3. Privacy
4. Comfort
5. Circulation through dwelling
6. Adaptability
7. Maintainability
8. Move-in-ability
9. Sociopetality - sociofrugality
10. Informality
11. Diversity

These attributes have been conceptualized at high levels of integration that are meaningful and potentially measurable in terms of the performance desired by the user. This allows for the greatest degree of innovation in design. Thus, in situations where an array of specific built elements might have an impact on the environmental attribute, only the overall desired attribute of the total environment is specified. For example, there are many potential solutions for achieving a quiet acoustical environment and it is this ultimate measure (sound in the environment) that satisfies performance. While it is understood that wall structures, size of fixtures, shape of structures, etc. all contribute to noise, by allowing these elements to vary, the designer has a greater potential for innovation. As measuring techniques become more precise, it may be possible to integrate noise, illumination and design of structures, etc, into a higher concept of "comfort." As an illustration, the specific items that might be integrated into the following attributes are such factors as follows:

1. Physical Safety

   a. Electrical circuitry
   b. Slipperiness of surfaces
   c. Potential falls from heights
   d. Potential access to windows and falling through them
   e. Glass door hazards
   f. Sharp edges
   g. Accessibility of harmful items to children
   h. etc.

2. Security

   a. Locks on doors
   b. Surveillance capability
   c. Window accessibility
   d. Night lighting
   e. etc.

3. Privacy

   a. Capability for visual isolation
   b. Capability for sound isolation
   c. Capability for physical isolation and security from entrance by others
   d. Pathways required for various activities in dwelling
   e. etc.

4. Comfort

   a. Anthropometric fit of structure
   b. Adaptability and location of illumination
   c. Acoustic conditions
   d. Temperature, humidity and odor conditions
   e. etc.

C. Criteria for Environmental Attributes

To be useful, attributes require operational definitions that can be measured. However, upon further analysis, it seems appropriate to specify other desirable features for environmental attributes, such as that they:

1. Should be relevant to the satisfaction of the user activity specified.

2. Should be capable of being reliably measured at a "reasonable cost."
3. Should have a measuring process associated with them that has "face validity" as representing the performance of the intended attribute.
4. Should be capable of being differentiated along a scale of effectiveness that can be correlated with the effectiveness of user performance specifications.
5. Should not cause damage to the facility being measured.
6. Should be capable of being manipulated in a predictive fashion relative to the satisfaction of user performance specifications.
7. Should be specified in concepts that are meaningful to the user.
8. Should integrate as many sub-elements of the environment as possible. Thus, if adequate measurement techniques were available, it would be desirable to have an overall attribute of "comfort" rather than several attributes which each contribute to comfort.

D. Special Consideration

Ideally, to encourage innovation, requirements should be written without regard to the specific means to be employed in achieving the results. However, much as it is desired to encourage innovation in the design of facilities, the building designer cannot completely ignore many of the "entrenched" (economically and psychologically) procedures currently in use. For example, there are methods for disposing of the waste products

of elimination other than flush toilets using water (e.g., chemicals, vacuum system). While performance criteria do not rule out the use of innovative techniques that may be more appropriate from an economic or user satisfaction point of view, the fact that water and plumbing systems are currently used in the vast majority of personal sanitation facilities in the U.S. necessitates special consideration regarding the relationship of water plumbing systems to the personal sanitation behavioral setting.

If one examines the elements of the built environment for personal sanitation behavior settings, it is apparent that the settings are location specific. This is because the basic procedure currently used for personal hygiene is washing with water and carrying waste products away with water. Thus, there is a necessity for plumbing and special permanent fixtures and equipment related to the use of the water.

In developing requirements for personal sanitation facilities, the emphasis has been placed upon those attributes of built elements that are unique to personal sanitation. The more general attributes involving structural integrity of walls, doors, floors, ceilings, etc., have been covered elsewhere[10] and will be dealt with in this document only when the attributes appear to be particularly relevant to personal sanitation.

E. Attributes

The attributes enumerated in the following section do not all meet the ideal criteria for environmental attributes. However, they were selected as a best approximation in terms of the current state of the art.

---

[10] Pfrang, E.O. Op. Cit.

1. FIRE SAFETY

(See BREAKTHROUGH Guide Criteria)

1.1 Users in the process of showering or performing other activities which tend to isolate them from normal sounds in the environment, should be provided with a capability of being warned about a fire condition.

2. WATER ENVIRONMENT

2.1 Water Safety

2.1.1 Fixtures that contain water at all times should have a capability of being secured so that children and pets cannot gain access to the water.

2.1.2 Non-overflow features should be standard for all water fixtures.

2.1.2 Hot water plumbing systems which leak at the outlet should not present a scalding problem to the user.

2.1.4 Hot water plumbing should not be exposed in any manner that can allow scalding by contact.

2.2 Water Potability (See Guide Criteria H.3.6)

2.2.1 No material, form of construction, fixture, device, appurtenance or item of equipment should be employed that could introduce toxic substances, impurities, bacteria or chemicals into a potable water system in quantities sufficient to cause disease or harmful physiological effects.

2.3 Resistance to Entry of Vermin (See Guide Criteria H.3.7)

2.3.1 Plumbing systems including piping, fixtures, appliances and other plumbing equipment should not contribute to the entry or growth of vermin or rodents.

2.4 Improper Emission of Gases or Liquids (See Guide Criteria H.3.8)

2.4.1 The sanitary DWV system should function under normal conditions of use so as to avoid the emission of sewer gases or foul air, or the ejection of suds or liquids inside the building through combined hydraulic and pneumatic action.

2.5 Water Temperature

2.5.1 A hot water supply adequate for the family size and the types of activities using hot water (bathing, showering, washing clothes, etc.) should be provided (See Guide Criteria H.3.3).

2.5.2 Once the temperature conditions of the water streams have been set, by a person to do a particular task these temperatures should not fluctuate during that task - i.e., as a function of concurrent activities that use water in other parts of the house.

2.5.3 Means should be provided for regulating the temperature of hot water delivered to the user so that scalding does not take place. (See Guide Criteria L.3.4.10)

2.6 Water Quantity (See Guide Criteria H.3.5)

2.6.1 Plumbing systems should consume the minimum quantities of water consistent with the health and sanitation needs of the user with proper functioning and cleaning of plumbing fixtures, appliances, and equipment; and with the maintenance of adequate self-cleaning, but not excessive, flow velocities in drainage piping causing noise, etc.

2.7 Water Quality

2.7.1 In locations where the water supply is hard, provisions should be made for water softeners.

2.7.2 Provision should be made to remove perceptible odors from the water supply.

2.7.3 Provision should be made to remove perceptible colors from the water supply

2.8 Water Flow Rate (See Guide Criteria H.3.10)

2.8.1 Water should be supplied in sufficient volume and flow rates and with adequate (but not excessive) pressures to meet the performance requirements of the user.

2.8.2 Once the conditions of the water stream have been set with regard to rate of flow, this rate should not vary over time.

3. ELECTRICAL ENVIRONMENT

3.1 Electrical Safety

3.1.1 Electrical input/output connections for fixtures should be designed so that children cannot hurt themselves whether the outlet is in use or not.

3.1.2 Electrical input-output connections should be water proofed and designed sothat users operating in a water environment will be safe.

3.1.3 Electrical equipment should be protected from coming in contact with water from the various water sources in the facility.

3.2 Electrical Distribution (See Guide Criteria J.8.2)

3.2.1 Adequate and safe distribution of electric power to and throughout each living unit should be provided, including a system of wiring, equipment and appurtenances properly installed to safely supply electrical energy for adequate illumination and for efficient operation of essential and appropriate appliances and equipment.

3.2.1.1 The simultaneous use of several items requiring electricity should not degrade performance of any one item below that expected if the item was the only one being used, e.g., radio and TV reception should not be degraded by electric razors.

3.2.2 The maximum load capabilities of all electrical circuits should be indicated in terms suitable for the types of common appliances used at these outlets, and in terms meaningful to the user.

3.2.3 A sufficient number of electric outlets, conveniently located, should be provided to take care of the variety of electrical equipment currently used, with provision for expansion of locations and the capacity of the electrical system.

4. ATMOSPHERIC ENVIRONMENT

4.1 Ventilation (See Guide Criteria L.7.1)

4.1.1 Ventilation should be sufficient to create a healthful and relatively odor-free environment within the living units and public spaces and to provide enough circulation of air to prevent conditions conductive to deterioration within the structure.

4.1.2 Air removed from the personal sanitation area by an exhaust system should either be exhausted directly to the outdoors or be reconditioned in regard to temperature, humidity and odor.

4.2 Intake Air Conditioning (See Guide Criteria L.7.3)

4.2.1 Provision should be made for the conditioning of intake air with regard to temperature humiditiy and odor

4.3 Humidity (See Guide Criteria I.7.3)

4.3.1 The humidity level in areas containing high humidity sources should be controlled.

4.3.2 Proper air humidity should be automatically regulated with seasonal variations in temperature.

4.4 Condensation (See Guide Criteria H.7.1)

4.4.1 Formation of condensation on built element surfaces, such as mirrors, counter tops, piping, etc. should be prevented.

4.5 Temperature (See Guide Criteria I.7.1)

4.5.1 Adequate air-conditioning for temperature and humidity control for the range of existing environmental conditions should be provided.

4.5.2 A supplementary quick acting source of heat (in addition to the normal heating unit) should be considered for the situation in which the user moves into the atmosphere from a hot water environment.

4.5.3 Air temperature gradients within any specified temperature controlled area should not be percepitble to users.

4.5.4 Air temperature in the general area where the user is performing an activity should be capable of being controlled by the user.

4.6 Air Movement

4.6.1 The sources for inputting and outputting air used in temperature regulation and odor control should not be located so as to cause discomfort to individuals.

4.6.2 The movement of air within the performing facility should not be felt by people.

5. ILLUMINATED ENVIRONMENT

5.1 Amount

5.1.1 The amount of light should be sufficient for people with normal vision to accurately identify and correctly read instructions on medicine containers and to comfortably read newspapers and magazines.

5.1.2 The amount of light should be capable of being varied and selectively controlled for different locations within the personal sanitation facility.

5.1.3 "Night-lighting" should be provided to assure the safety of people moving about and locating personal sanitation fixtures without awakening others.

5.1.4 Illumination should be sufficient to accomodate the needs of the visually impaired.

5.2 Location

5.2.1 The location of illumination should be such that it provides good lighting (regarding shadows, glare, and intensity) on all parts of the head and neck when used in conjunction with mirrors for purpose of shaving and general grooming.

5.2.2 Care must be taken to avoid glare, strong shadows, or source reflections in the mirror.

5.2.3 The location of illumination should be such that it provides good lighting for reading while bathing and while eliminating bodily wastes.

5.3 Quality (See Guide Criteria L.6)

5.3.1 If feasible, provision should be made for admission of natural light without compromising the privacy of the facility. Materials that allow the passage of ultraviolet rays from the sun should be used in windows for allowing natural sunlight to enter.

5.4 Emergency

5.4.1 Stand by lighting should be available in case of an electrical power outage.

5.5 Noise Generated by Lighting Elements (See Guide Criteria K.5.1)

5.5.1 Lighting elements should perform their intended function without excessive noise generation and without compromising the acoustical performance of other building elements.

6. ACOUSTIC ENVIRONMENT (See Guide Criteria A.5.1, C.5.1, H.5.1, I.5.1, L.5.1)

6.1 Sounds resulting from the process of elimination, contact of wastes with the disposal unit, and the process of disposal itself, should not be audible outside the personal sanitation facility.

6.2 The acoustic environment within the personal sanitation facility should be quiet. The level of noise generated by fixtures and the operation of various hydro-mechanical systems should be kept to a minimum.

6.3 The acoustic environment should be suitable for listening to radio, phonograph and TV.

7. SPATIAL ENVIRONMENT (See Guide Criteria L.9.1)

7.1 The criteria for the amount of space provided should be based on the types of activities contemplated by the users, the number of simultaneous users, fixtures, hardware and storage space.

7.2 When the facility is used for relaxing, sufficient space should be provided so the user does not feel confined and can view objects such as Tv screens, etc., at an appropriate distance.

7.3 Sufficient space should be provided so that the user can comfortably carry out his intended performance without interference from built elements or other users' performing simultaneously in the same facility.

7.4 Sufficient access space should be provided around all built elements for ease in cleaning and maintenance (See 19.5)

8. STRENGTH OF BUILT ELEMENTS (See Guide Criteria for Structural Serviceability and Structural Safety)

8.1 Built elements should be constructed and secured so as to preclude the possibility of their falling or toppling under normal conditions of use.

8.2 Shelves should be strong enough to withstand the loads expected.

8.3 Hand grips should be strong enough to allow for their use as a major assist in changing body positions. (See Guide Criteria L.3.4.9)

8.4 Waste disposal units should have sufficient strength to support users in a seated position.

8.5 Hanging rods should have sufficient strength to withstand not only the loads of items expected to be hung on them, but also the loads of users using them as hand grips.

8.6 Transparent or translusent materials in doorways and bath or shower enclosures should be shatter-resistant.

9. SHAPE OF BUILT ELEMENTS

9.1 Built elements requiring user interaction should be designed to conform with the shape and movement characteristics of the human body and be free from sharp edges or pointed projections.

9.2 Waste disposal units used when seated should be comfortable, and their design should take into account the body position required for performance of physiological processes desired.

9.3 If one facility is used for urinating while standing and for defecating while sitting, surfaces with which the body will come into contact (while operating equipment, making adjustments to equipment, or while performining the process of elimination) should not be capable of being contaminated by a residue of waste products.

9.4 During the process of washing, the shape of the container used should be such that as little water as possible comes into contact with surfaces outside the immediate container into which the water flows.

9.5 Once waste products are eliminated, they should not come in contact with the user again or with any surfaces outside the intended disposal container.

9.6 To provide comfort while fully reclining in a bathtub or on a table, complete support should be provided for all parts of the body, particularly the back and the head.

9.7 Hand grips should be shaped so as to provide a sure grip for users with wet soapy hands and so they can be grabbed by a quick, reflex action.

10. SURFACE OF BUILT ELEMENTS

10.1 Slipperiness (See Guide Criteria L.3.2.1)

10.1.1 The user should feel assured that he will not slip or fall while within the shower or bathtub or while moving into and out of them. Thus, surfaces should be highly slip resistant when wet.

10.1.2 Floor surfaces should be highly slip resistant when wet.

10.2 Biological Inertness

10.2.1 Surfaces should be biologically inert and mildew resistant, i.e., they should not support the growth of bacteria or the retention of bacteria in a live state.

10.3 Chemical Inertness

10.3.1 Surfaces should be inert to the various chemicals used in the performance of activities by the user, e.g., lotions, sprays, cleaning agents, etc.

10.4 Texture

10.4.1 Surfaces on which there is direct body contact for extended periods of time, e.g., during bathing or defecating, should be pleasant to touch.

10.4.2 Surfaces of hand grips should have a texture that provides a sure grip.

10.5 Reflectivity

10.5.1 Reflection from surface should not interfere with visual tasks.

10.6 Humidity

10.6.1 Surfaces should be resistance to deterioration caused by humidity.

10.7 Condensation

10.7.1 Visible condensation on all surfaces, particularly mirrors and hand grips, should be kept to a minimum.

10.8 Washability

10.8.1 Surfaces receiving the chemical and biological residues resulting from user performances should be easily cleanable.

10.9 Static Electricity

10.9.1 Surfaces should not produce a buildup of electrostatic charges in users during their normal activities.

10.10 Scratch and Scrub Resistance

10.10.1 Scrubbing and cleaning surfaces should not result in their being scratched or marred.

10.11 Color

10.11.1 Colors of surfaces should take into account the mood and feeling tone they create.

11. SIZE OF BUILT ELEMENTS (See Guide Criteria L.9.1 through L.9.9)

11.1 The height of the ceiling and the width of the walls should be such that users can move about comfortably in carrying out their intended activities.

11.2 Built elements requiring user interaction should be designed to conform with the size attributes of the human body; they should be operable with normal reach and movements of the intended users.

11.2.1 When a wide range of body sizes are involved (e.g., infants and adults) in user interaction with built elements consideration should be given to providing seperate facilities to conform with the size attributes of the different users.

11.3 During the process of washing, the size of the container used should be such that as little water as possible comes in contact with surfaces outside the immediate container into which the water flows.

11.4 Racks and rods should be sufficiently long to hold the equipment required for the total number of anticipated users of the facility. Equipment in a personal sanitation facility is highly individualized and each user requires storage for his own items (See 16).

11.5 Hand grips should be appropriately dimensioned for holding and should be sufficiently long to allow use from a variety of locations and to assist while moving about.

11.6 The dimensions of entrance passages should be sufficient to allow easy access by the user and to permit remodeling, should it be desired.

11.7 Waste disposal containers, such as urinals and toilets, should be of sufficient size to contain the waste products normally delivered to them without any resultant spillover.

11.8 Counters and shelves should be of sufficient size to allow for the temporary and/or permanent storage of items required in various user activities. (See 16)

11.9 Cabinets should be of sufficient size to hold the variety of items used by the users in performing the various activities. (See 14.2 and 16)

12. FORCES REQUIRED TO MANIPULATE BUILT ELEMENTS

12.1 All controls for built elements should allow for their operation with the normal muscular force attributes of the intended users.

12.2 The muscular strength and ability to apply various forces is reduced in the elderly and infirm and control devices should be so adjusted.

12.3 Built elements requiring movement should be designed so that the user can obtain the required change without physical strain.

13. DESIGN OF CONTROLS

13.1 All controls for built elements should allow for their operation with the normal muscular force attributes of the intended users (See 12)

13.2 Controls should be located in the volume of the functional work space if they will usually be operated from the same position.

13.3 Controls should be simple to understand and to operate. What a given control actually controls should be obvious to the user.

13.3.1 A capability should exist for controlling water temperature and arriving at specified temperatures of water without requiring a continual sampling of the water temperature.

13.4 Control design should take into account the expected relationship between the direction of movement of the control device and the direction of the item being controlled.

13.5 Pointer knobs which are used to select a position on a dial should be clearly pointed one way, and the pointer should not obscure the dial readings or scale.

13.6 The various states of control that result from manipulation of a control device should be displayed so as to be obvious to the user.

13.6.1 For door locks having the locking mechanism in the knobs, it should be obvious from observation whether or not the door is locked.

13.6.2 For water controls, it should be obvious to the user from the position of the controls what the expected temperature of the water will be.

13.7 All controls on equipment, such as faucets, drains, shower heads, etc., should be placed so as not to be inadvertently moved while carrying out activities unrelated to the actual adjustment of the controls.

13.8 Operation of water controls should allow variation in temperature and rate of flow to be able to be effectively manipulated with the user's eyes closed.

13.9 Operation of water controls for showers and for sinks used for washing hands and face should be able to be effectively manipulated with the users' eyes closed.

13.10 Controls for the shower water should be located such that the user is not required to stand in the spray to make control adjustments.

13.11 Controls for electrical equipment should be safe for operation in a water environment.

13.12 A timing mechanism should be part of the control for artificial sunlight energy sources.

13.13 Bathroom doors should have the capability of being locked from inside the bathroom but also have a safety release mechanism from the outside as a protection against children's locking themselves in.

13.14 Cabinet space secured to prevent use by children should not require key or combination, but should be child-proof.

14. LOCATION AND ARRANGEMENT OF BUILT ELEMENTS

14.1 General

14.1.1 Consideration should be given to arrangement of equipment so that more than one member of the family may use its facilities at the same time.

14.1.1.1 Consideration should be given to partitioning the seperate functional areas for bathing, washing, and elimination.

14.1.2 All Equipment and fixtures should allow for their operation with normal reach and maneuverability attributes of the intended users.

14.1.3 Location of built elements should not interfere with the normal performance of activities.

14.1.4 If more than one bathroom is provided and children are users, the height and general anthropometric fit of bathroom fixtures should be adjustable for children in at least one bathroom.

14.1.5 Different elements used in the performance of the same general activity should be located in proper relationship to each other to allow sequential use.

14.1.6 Water basins used for washing hands should provide a stream of water so located that both hands can easily be moved about in the washing process within the stream of water.

14.1.7 Arrangement for fixtures should permit at least a 90 degree door swing unless sliding doors are used.

14.1.8 Electrical outlets should be located convenient to the anticipated varieties of equipment that use electricity, taking cognizance of safety requirements. (See 3)

14.1.9 TV sets should be located at the proper viewing distance for screen size and in the proper relation to the anticipated position of the viewer.

14.1.10 Grab bars should be located at all locations where the body is in an unstable position due to moving in and out of equipment, changing body position, e.g., sitting, lying down, or for standing or moving along a surface that is potentially slippery.

14.1.10.1 Grab bars should be located within showers and adjacent to bathtubs and toilets.

14.2 Storage

14.2.1 Storage of items should be located adjacent to the activity area in which their use will be required.

14.2.2 Storage elements should not protrude and interfere with performance.

14.2.2.1 Receptacles for soap should not protrude into the area around the bathtub.

14.2.3 Shelves in cabinets and closets should be at a level and of a depth not requiring the use of height extenders such as ladders, stools, or chairs; (if standard cabinets are provided, the area of shelves reachable without aid

should be sufficient for the occupant's needs). In providing storage space, consideration should be given to the reduction in reach caused by the protrusion of counters or fixtures beneath the space. (See Guide Criteria L.3.4.13)

14.3 Controls (See 13)

14.3.1 Controls should be located in the volume of the functional work space if they usually will be operated from the same position.

14.3.2 Fixtures controlling the input of water into a bathtub should not protrude into the area of the tub itself.

14.3.3 Controls should be placed so as to not be inadvertently moved while carrying out activities unrelated to the actual adjustment of the controls.

14.3.4 Controls for adjusting the water for showering and bathing should be located so that adjustments can be easily made before one enters the washing facility as well as during the process of washing.

14.3.5 The location of water controls for washing hands and face and showering should be such that they can be easily located and correctly operated with the user's eyes closed.

14.3.6 Controls for illumination should be located so that it is never necessary to move from any door through a darkened room.

15. CONTROL OVER BUILT ELEMENTS

15.1 Water

15.1.1 A capability should exist for the control of water temperature and pressure at all water outlets used for washing or cleansing the body. (See 2)

15.2 Atmosphere

15.2.1 A capability should exist for the control of air temperature and humidity within the facility. (See 4)

15.2.2 A capability should exist for the control of air conditioning with regard to purity and odor.

15.3 Illumination

15.3.1 A capability should exist for the control of the amount of illumination at various locations within the facility so that different illumination conditions may exist simultaneously. (See 5)

15.4 Structures

15.4.1 Physical entry into the facility should be under the control of the occupant. Windows and doors should have locks. (See 13)

15.4.2 Access to specified stored items should be under control. Some storage cabinets should have a capability of being locked. (See 13)

15.4.3 Visual observation by others should be under the control of the occupant of the facility. Shades or partitions should be considered for obtaining visual privacy during bathing and elimination of body wastes.

15.5 Built Elements

15.5.1 Shut-off controls, i.e., valves, switches, etc., should be available and easily operated for all operational fixtures and equipment.

16. STORAGE CAPABILITY

16.1 Storage areas for items should take into account the number of users.

16.1.1 Highly personalized equipment is used in personal sanitation and each user requires space for storage of items such as toothbrushes, towels, shaving equipment, medicine, etc.

16.2 Storage facilities for personal sanitation should take into account the amount and variety of equipment used for various activities.

16.3 Storage space should be provided adjacent to where activities requiring special equipment will be performed (e.g., shaving, washing hair, reading, etc.)

16.4 Storage space should be sufficiently flexible to permit its adjustment to varying sizes, amounts and kinds of personal sanitation supplies.

16.5 Shelves used for storage should be adjustable to meet varying storage needs.

16.6 Space that can be adequately secured against access by children should be provided in the bathroom to contain cleansing agents, drugs, etc. (See 13.14)

16.7 Space and facilities should be provided for the variety of articles commonly used in conjunction with bathing and relaxing in a bath, e.g., soap, sponge, brush, washcloth, shampoo, ash tray, reading materials, water toys, etc.

16.8 Storage facilities provided for bathing should be located so as not to be a hazard while getting into and out of the facility

or while moving about within the facility, but should be readily accessible to the user while reclining, sitting up and washing.

16.9 Storage racks for reading material should be provided near the toilet and bathtub.

16.10 Items used in subsidiary activities such as reading, writing, etc. should be readily available and properly stored to prevent their deterioration in a water environment.

16.11 Space should be provided for the temporary storage of dirty clothes.

16.12 Separate storage space for equipment used to clean waste facilities should be provided.

16.13 Facilities for hanging clean clothes to be used after showering and bathing should be provided.

16.14 Towel storage should be provided within reach of the tub and shower.

16.15 Enough towel storage should be provided so that each user can have a unique location for hanging a towel.

16.16 Consideration should be given to providing a capability for warming and drying towels e.g., a heated towel rack.

16.17 Enough counter space should be provided in performance areas to accommodate the amount of equipment required for carrying out the performance.

16.18 Facilities should be provided for hanging hand washed clothes and for disposing of the dripping water.

16.19 A facility for storing soiled clothes temporarily should be provided.

16.20 Containers should be provided for the temporary storage of waste products such as used tubes, bottles, paper cups, etc.

16.21 Facilities should be provided for the temporary storage of dirty cloth diapers.

17. WASTE DISPOSAL CAPABILITY

17.1 Once bodily waste products are eliminated, they should not come in contact with the user again or with any surfaces outside the intended disposal container.

17.2 Method of disposal of bodily wastes should be such that the user is not contaminated with them if they are disposed of during the process of elimination.

17.3 Waste water and sewage should be removed form the premises and transported to an acceptable point of disposal at the rates normally discharged from the fixtures and other water-connected equipment without overflowing or accumulating within the premises or backing up into idle fixtures, or without inter-fixture flow retardation. (See Guide Criteria H.3.9)

17.4 Facilities should be provided for the disposing of the waste products associated with the variety of performances carried out.

17.4.1 Containers should be provided for the temporary storage of waste products such as used tubes, bottles, paper cups, etc.

17.4.2 Facilities should be provided near the usage area for the safe disposal of dangerous articles such as razor blades.

17.4.3 Facilities should be provided for the temporary storage or disposal of items that have odors associated with them and/or are potentially dangerous in terms of contamination of germs, e.g., used diapers, sanitary supplies, used bandages, etc.

17.5 Disposal units should be so designed that there is no potential danger to the user in the process of disposing of items.

17.6 Water disposal units that carry away waste products from washing should not become easily clogged with the normal types of waste products such as hair and dirt.

18. RELATION TO OTHER ACTIVITY AREAS

18.1 There should be no direct view into the personal sanitation facility from other activity areas of the dwelling.

18.2 A bathroom should be easily accessible to each bedroom without passing through another room.

18.3 A bathroom should not open directly into activity areas associated with the storage and preparation of food.

18.4 Consideration should be given to locating some personal sanitation facilities (i.e., for washing, elimination of body wastes, and cosmetic grooming) near outside entrances as a convenience for guests and for family cleaning up after working outside the dwelling.

19. MAINTAINABILITY AND UPKEEP OF BUILT ELEMENTS

19.1 Instructions and Diagnostic Aids

19.1.1 Detailed instructions for proper maintenance of all built elements should be provided.

19.1.2 Information should be displayed in a manner easily understandable and retrievable. A basic maintenance manual covering all aspects of maintaining the built elements should be provided.

19.1.3 Maintenance instructions for those built elements permanently installed should be fastened in a location readily observable while carrying out the maintenance.

19.1.4 A "fault diagnosis" handbook should be provided for the major components, so that the user can discern from an array of symptoms what the most probable cause of a malfunction is.

19.1.5 Design layouts of major subsystems within the facility (e.g., plumbing, electrical, air) should be provided in a format easily discernible by the user so that problem areas can be isolated.

19.1.6 Maintenance or changes requiring special permits or inspection should be indicated in a maintenance manual supplied with the house.

19.1.7 The user should be informed as to all outstanding warranties on the built elements and procedures for making claims against them.

19.1.8 The potential problems, in terms of danger or cost, which might result from not carrying out various preventative maintenance procedures should be indicated when possible.

19.1.9 Procedures for starting up and shutting down equipment should be indicated.

19.1.10 Information should be made available regarding the locations for turning off the water supply and the subsequent impact on the water delivery system.

19.1.11 Procedures for operation of shut-off controls, i.e., values, switches, etc., should be available for all operational equipment and fixtures.

19.2 Bookeeping

19.2.1 A checklist format with a time dimension should show what needs to be maintained and how often maintenance is required.

19.3 Skill

19.3.1 Maintenance tasks requiring special skills or training should be indicated with a brief statement of the dangers involved if improperly maintained.

19.4 Equipment and Material

19.4.1 Resources required for maintenance should be included in all maintenance checklists. Indication should be given of the tools required and any special chemicals or lubricants (specified generically).

19.4.2 When the shutdown of an element can result in extreme costs, a provision for spare parts should be made. Resources required for maintenance should have an assured availability for the user.

19.5 Accessibility (See Guide Criteria H.8.4 and I.8.7.7)

19.5.1 All built elements should be designed with space available for periodic cleaning and maintenance.

19.5.2 The design and installation of plumbing systems and equipment should permit practical maintainability and continuity of service, by providing convenience for cleaning, servicing, adjusting, or replacing the various elements or components; by minimizing conditions that can contribute to soiling, deposition,fouling, clogging, or other maintenance problems; and by minimizing condition that can result in interruption of essential function.

19.5.3 Mechanical equipment should be designed and installed in such a manner that maintenance or repair work required during its designed service life can be performed readily and without necessity of removing other equipment for access.

19.5.4 Ceiling light fixtures should be designed so that cleaning and changing of bulbs can be carried out easily and safely.

19.5.5 Windows should be designed so that the exterior of the windows can be easily cleaned from inside the house.

19.6 Other Design Considerations

19.6.1 Surfaces which are used for work purposes should have finishes that minimize maintenance and cleaning.

19.6.2 Sinks and showers and other equipment used for washing should be designed so that during the process of washing, as little water as possible should come in contact with surfaces outside the immediate container into which the water flows.

19.6.3 Provision should be made for the capability of rinsing all portions of bathing and showering facilities with water and for self-draining of the water in a manner which will remove dirt.

19.6.4 (See Guide Criteria H.8.6)

The dangers of premature failure or excessive maintenance relating to corrosion or deposition of carbonates or other matter should be minimized by giving appropriate consideration to the character of the water supply, the soil, the properties of the materials, and other pertinent environmental factors.

19.7 Elderly and Infirm Users

19.7.1 Housing designed specifically for the elderly or those having limited physical capability should require as little maintenance as possible and when maintenance is required it should be easily accomplished by the intended users.

20. Durability/Reliability of Built Elements (See Guide Criteria).

21. QUANTITY OF BUILT ELEMENTS

21.1 The amount of fixtures required for a dwelling should be based on the anticipated number, age range and sex composition of the users.

21.1.1 Privacy is often a requirement for carrying out activities associated with personal sanitation, thus necessitating sufficient facilities for the simultaneous use by different members of a dwelling.

VI. SELECTED BIBILIOGRAPHY

How the Other Half Bathes, Time, March 29, 1971, p. 62.

Hicks, D., David Hicks on Bathrooms, England: Britwell Books Limited, Britwell, Salome, Oxan, 1970.

Sunset Books and Sunset Magazine (ed.) Planning and Remodeling Bathrooms. Lane Magazine and Book Co., Menlo Park, California, 1969.

Goromosov, M.S., The Physiological Basis of Health Standards for Dwellings. Geneva: World Health Organization, Public Health Papers No. 33, 1968.

Hole, W.V. and J.J. Attenburrow. Houses and People: A Review of User Studies of the Building Research Station. England: Garston, Watford, 1966.

Kira, A. The Bathroom: Criteria for Design. Center for Housing and Environmental Studies. Cornell University, Ithaca, N.Y. 1966.

Langford, M. Personal Hygiene Attitudes and Practices in 1,000 Middle-Class Households. Cornell University Agricultural Experiment Station Memoir 393. Cornell University, Ithaca, N.Y. 1965.

Agan, T. and E. Luchsinger. The House: Principles, Resources, and Dynamics. New York; Lippincott Company, 1965.

Morgan, C.T. and J.S. Cook, III, A Chapanis, and M.W. Lund (eds). Human Engineering Guide to Equipment Design, New York: McGraw-Hill, 1963.

Farmhouse Planning Guides: Households Activity Data and Space Needs Related to Design. Cornell University Agricultural Experiment Station and New York State College of Home Economics, with the Cornell University Housing Research Center, 1959.

First Annual Congress on Better Living. New York: McCalls Magazine, 1957.

Bathroom Gets Spotlight at Women's Congress on Housing, Domestic Engineering, Vol. 187, June 1966, pp. 110-111.

39 Ways to Build a Better Bathroom, House and Home, Vol. 111, No. 2, 1953, pp. 92-103.


DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS