Design Guidelines for Special Needs Housing

Developed for

Commonwealth of Massachusetts
Executive Office of Health and Human Services
Department of Mental Retardation

Developed By

Massachusetts Department of
Housing and Community Development

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Chapter 1 SPECIAL NEEDS HOUSING

INTRODUCTION

Chapter 689 Housing for People with Special Needs

Chapter 689 is a housing program for people with special needs. Among the people it serves are residents with mental retardation and developmental disabilities. Chapter 689 funds are used to construct apartments that are staffed and operated by the Department of Mental Retardation (DMR) within the Executive Office of Health and Human Services.

Housing constructed by DHCD for people with mental retardation usually consists of duplex apartments, each of which accommodates four or five adults. Typically staff is present 24 hours a day to oversee the household and assist residents in developing basic living skills. Residents are encouraged to take responsibility for themselves as much as possible.

These residences provide a setting for learning basic living skills and provide the physical supports necessary for residents with physical disabilities to live as independently as possible. Life skills are taught within the context of everyday living: residents learn to cook by working in the kitchen and learn to live in a group household by interacting with their housemates. Because people with mental retardation often have physical disabilities, these residences must be adaptable or fully adaptable. It is important that the design is suitable for a household in which any or all of the resident members are in wheelchairs.

Description of Residents. In special needs housing, residents with mental retardation and developmental disabilities usually live with people who have relatively similar capabilities, although this may vary.

A typical resident shares household spaces and interacts with other residents in much the same way as any shared living situation. In the morning, residents leave for work or other day programs. Staff is available to help residents prepare themselves for the day. When the residents return home in the afternoon, they relax, share experiences with each other and staff, talk about their day, and make plans for dinner. Usually one resident works with a staff member to prepare dinner. Another resident may set the dining room table, while the others may spend time in the family area or doing household chores. After dinner, one or more of the residents clean up the meal and the household begins to wind down for the evening. Residents may watch television, pursue hobbies, or spend time with a staff person.

Some or all of the residents may have physical disabilities and may require wheelchair access to all parts of the unit, house, and site. Some are prone to incontinence, behavioral outbursts, and may take their feelings out on the physical environment. The house needs to be able to withstand intense use, yet retain a homelike character. Residents' abilities to learn to do things for themselves often depends on how easily the environment can be adapted to fit their individual needs.

Residents of this housing have varying levels of cognitive impairments that make it difficult for them to assimilate information. For those with the most profound

limitation learning simple tasks may take years. The environment can assist residents in learning basic living skills by providing opportunities for accomplishment: a coat hook in the foyer makes the step of teaching a resident to hang up a coat easier than managing a coat closet with hangers. When residents can use the environment to meet their individual needs, be it closing a door for privacy or displaying a favorite poster in the bedroom, they gain a sense of control over their lives and greater self-awareness and self-esteem.

PROGRAM SCOPE

Dwelling Units

Unit Mix. A typical development houses eight to ten residents in two four-person or five-person apartments. Each apartment has four or five private bedrooms – one for each resident. The residents much like a family unit share all other rooms in the apartment, including the kitchen and bathrooms.

Dwelling area. These four bedroom apartments are larger than conventional four bedroom units for families because of the additional spatial requirements for wheelchair accessibility, the provision of a staff office, and living spaces which double as program spaces for training residents in daily living skills. Based on current requirements, use the following square footage to establish project budgets and apartment envelope:

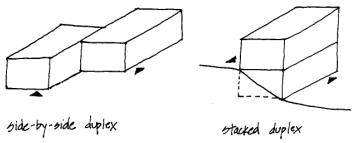
- Four bedroom unit: 2,350 gross square feet
- Five bedroom unit: 2,750 gross square feet

Livability requirements described in this chapter can be met within this gross unit area through careful planning of each room and efficient layout of spaces. Efficient hallway design is particularly important because of the many rooms that must be connected and the need to provide turn-around space for wheelchair users.

Room Size Recommendations (in net square feet)

Entry foyer (includes closets)	30-50
Living room/parlor	150
Kitchen	120
Pantry	40-50
Dining area	150
Family area	120
Staff space (not a separate room)	~120
Full bathroom with tub	80-100
Full bathroom with shower	80-100
Bedrooms (4 or 5) (includes closets)	130-160
Laundry (may be within a bathroom)	60-70
Bulk storage, interior (attic or basement)	40
Bulk storage, exterior (basement)	~50
Mechanical (basement)	40-50
Screened Porch (rear)	~120

The Department of Mental Retardation (DMR) is interested in modular building construction for new facilities. The DMR needs maximum flexibility in resident placement so prefers that these residences be built in compliance with Category A of Section 638 of the Massachusetts State Building Code. This means that all bedrooms must be located at grade level. This facilitates evacuation of residents who require physical assistance from staff to exit the facility.



The buildings organized with both apartments in a one-story building or by stacked on a sloped site to allow grade access at both levels meet these requirements. Group residences may also be combined with other types of housing such as elderly or family units. In any case, it is important that each apartment have its own separate entrance.

UNIT DESIGN

Goals

In developing a functional unit layout for residents with mental retardation, the following design issues must be addressed:

- **Integrate the House Within the Surrounding Neighborhood.** Normalization of all aspects of a resident's life is the foundation of the community-based residential programs. It is important that the house not stand out as special or unique. Because all parts of the unit are on a single level, these residences have a large footprint and require careful design to fit comfortable and unobtrusively into a residential neighborhood.

- **Create a Home Environment.** It is important that the interior and exterior of the residence foster the image of home rather than institution. Certain requirements in the design program can result in a building with an institutional feeling if not carefully detailed. These include such items as features for people with disabilities, life safety systems, the staff office, parking requirements, and the necessity for durable and easily maintainable surfaces.

- **Accommodate a Variety of Users and Activities.** Residents may have a range of developmental and physical abilities. In addition to spaces, which support group and social activities, residents need spaces that foster quiet time and personal time. A barrier-free physical environment can be an important factor in a resident's sense of independence. Houses may need to be adapted over the years for people who are or who become hearing impaired and sight impaired as well as mobility limited.

- **Provide a Supportive Learning Environment.** Apartments should support opportunities for independence and the acquisition of daily living skills such as personal hygiene, housekeeping, and food preparation. A common goal of the residents is to gain new skills through day-to-day functional tasks and social interactions. Education is a central value to the operation of the house. Residents are at different stages of learning. The apartment environment must allow them to start at an elementary level whether it's finding their way around the house, operating appliances, opening doors, or cleaning up after themselves.

■ **Zone the Apartment for Frontstage and Backstage Activities.** Similar to family housing, these residences need a clear distinction between frontstage and backstage areas. Every house has spaces for individuals' personal use as well as spaces for the group to use together. Keeping these backstage personal spaces and frontstage group areas distinct from each other is essential so that group functions do not intrude upon an individual resident's privacy.

Entries and Foyer

A private front and back entrance for each apartment reinforces the feeling of a private home. These entries serve as transition zones between the public outside world and the inside private domain.

Locate the primary entry close to parking, paths, and sidewalks and orient toward the street. Provide a front porch at the front door if compatible with the surrounding context. A porch also provides a weather-protected transition between outside and inside.

Frontstage/backstage. The front door serves as the formal frontstage entry point for residents, guests, family, and friends. It is the welcoming portal for the home. The informal back entrance is used primarily by residents and typically provides direct access from the outside to the backstage area of the unit.

Neighboring. When two apartments are grouped together in a building, visiting between the two is likely to occur. The relationship of entrances to each other has important implications for how residents may interact. Keep the entrances separate enough to reinforce that each apartment is a private home. But make sure either the front or back entrances are convenient enough to each other to accommodate daily visits between apartments by residents or staff.

Location of front entrance. Locate the front entrance adjacent to the living room/parlor but avoid having the door open directly into this formal room. Provide a vestibule or foyer so that residents can use the front door without interrupting activities in the living room. To maintain the front entrance as a formal frontstage area, avoid views of backstage areas such as kitchen sinks and bathrooms from the foyer.

Location of rear and side entrances. Provide a rear or side entrance for access between the kitchen/dining/family area and the back patio. A third entrance may be located near the bedrooms and laundry room, providing an additional means of egress. This offers an extra measure of safety in case of emergency, but is not required.

Viewing opportunities at front door. Provide a narrow window or side lite for residents and staff to see who is at the front door without having to open it. Make sure that the window is low enough for people who use wheelchairs to see out. Locate the window on the hinge side of the door for security.

Net area. Provide at least 30 square feel in the foyer at the front door. Be sure there is space for a resident using a wheelchair to maneuver and turn around.

Coat storage. Provide a coat closet at the front entrance of each unit with a minimum of 36 linear inches of hanging space. Locate the door swing so that it does not hinder movement in the entry foyer if it is left open. The staff may add easily accessible coat hooks in the foyer to assist residents in learning to hang up their coats.

Doorbells. Provide an illuminated doorbell at each apartment entrance.

Mailboxes. Consult with the local postmaster to coordinate mailbox location and configuration. Individual mailboxes are usually provided for curbside delivery in front of each unit.

Lighting and street number. Use lighting and numbers that are residential in character. For more detail, see Site Development.

Living Room/Parlor

Residents use the living room/parlor for a wide range of activities: formal visiting with family and friends and informal group activities such as watching television, listening to music, and conversation. The living room also serves as a place for a resident and staff person to meet privately away from the rest of the group.

Location. Locate the living room/parlor in the more formal frontstage part of the unit so that visitors have easy access without having to walk through other parts of the house. Residents may use this room to watch activities on the street and approaching visitors. Locate the living room away from the noisier areas of the unit such as the kitchen and dining/family room so that both quiet and noisy activities can occur simultaneously without conflict.

Privacy. Entrance traffic should be directed by, not through, the living room so that this room can be used for private or quiet activities. Provide a door that can be left open or closed if greater privacy is desired.

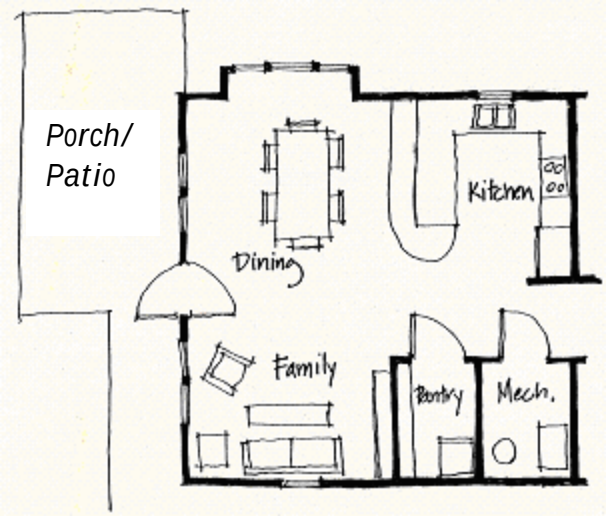
Net area. The living room should be large enough to accommodate up to four people, some of whom may use wheelchairs. Provide a minimum of 150 net square feet. A minimum width of at least 11 feet 6 inches accommodates furnishings within a comfortable conversation distance.

Furnishability. Maximize furnishability by designing a cul-de-sac layout with as many corners and as much uninterrupted wall space as practical. Provide at least one long wall, uninterrupted by windows, to accommodate a seven-foot long couch and two end tables. Provide space for the following furniture:

- Couch
- Two end tables
- Coffee table
- Two large chairs
- Television/entertainment center
- Space for household members in wheelchairs to be part of a conversation.

Cable television. While the TV may or may not be located in the living room, provide a cable hook-up so that the option is available. Locate across from longest wall where the sofa is typically placed.

Overhead Lift. An overhead lift on tracks may be installed to assist moving a resident between a chair or sofa into a wheelchair. Therefore, the ceilings should be reinforced for straight track installation.



Illustrative Plan Diagram

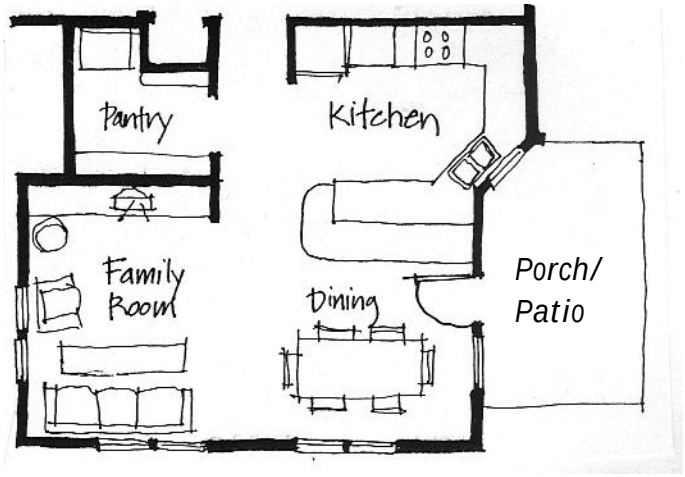
Kitchen/Dining/Family Area as Hub

The kitchen/dining/family area is the main activity hub and social center of the house. The spaces need to be usable for several separate activities and also be visually connected.

This area comes alive as the residents return home from the day's activities. It is an important time of day for the residents because it gives them a chance to touch base with each other and with staff. If frustrations about an incident at work need to be vented it will happen here. Staff also use this time and space to acknowledge an important accomplishment like taking public transportation alone for the first time.

As residents settle in for the evening attention focuses on preparation of the evening meal. Decisions are made about what to eat and how it will be prepared.

Responsibilities are assigned: one person is responsible for preparing the food and another for setting the dining room table. The resident who is responsible for clean-up after the meal may hang out in the family room until dinner is ready. Residents also use this time to do chores around the house or for one-on-one interaction with staff.



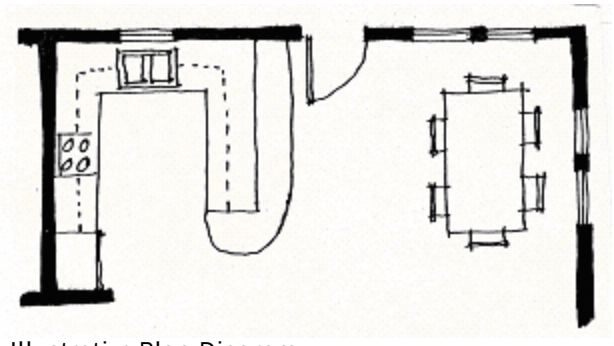
Illustrative Plan Diagram

Family Room

The family room functions as an all-purpose lounging space and is used by residents for such activities as game playing, hobbies, conversations, reading magazines, and watching television.

Net area. Design the family room to be large enough for TV watching and conversation. To accommodate wheelchair users, provide approximately 120 net square feet.

Connection to kitchen/dining area. Visually connect the family room to the kitchen and dining area to allow those involved in other activities to also feel a part of the goings on in the kitchen and dining area. At the same time provide enough physical separation so that people lounging in the family room do not distract someone with a short attention span who is concentrating on an activity in the kitchen.



Illustrative Plan Diagram

Connection to outdoors. Where possible, physically connect this room to the Three Season/Screened Porch, an adjacent outdoor patio or deck area so that activities may be extended outdoors. Try to locate the family room so that it receives winter sunlight. Large windows and skylights may help to give the space a bright, open, spacious feel. Consider cross-ventilation in locating windows.

Furnishings. Design the family room large enough to accommodate the following furniture:

- Table
- Small couch
- Two large chairs
- TV/stereo/entertainment center
- Coffee table
- Space for household members in wheelchairs to participate in activities and conversation.

If possible, include wall shelving and cabinets for the TV, stereo, books, and games.

Cable television. Provide a cable television hook-up in the family room area. Locate across from the longest wall where the couch is typically placed.

An overhead lift on tracks may be installed to assist moving a resident between a chair or sofa into a wheelchair. Therefore, the ceilings should be reinforced for straight track installation.

Kitchen/Dining

The kitchen/dining area is the social focal point for the house, especially during meal preparation. Design this space to accommodate cooking and eating activities as well as to encourage the teaching and practice of basic living skills elated to meal preparation and clean-up. Two to three persons may be preparing food at one time in the kitchen.

The residents generally learn by doing, not by formal instruction. Staff interact with the residents on a one-on-one basis and work through tasks in a step-by-step manner. The process can be very painstaking, require intense concentration, and may take some residents years to learn simple tasks.

Forgiving surfaces. For residents with mental retardation or developmental disabilities, the kitchen can foster learning if it is designed to make difficult tasks easier and to be durable enough to be forgiving. If a resident is learning to cut vegetables with a knife, the task can be made easier if the cutting can be done directly on the countertop rather than adding the complexity of getting out a cutting board. A resident who is learning to cook on a hot stove may inadvertently place a hot pan on the countertop. The countertop material must be durable enough to withstand the heat without incurring a burn mark. Learning to pour juice from a pitcher into a glass may result in accidental spills. The flowing material must be easy to wipe up and resistant to staining.

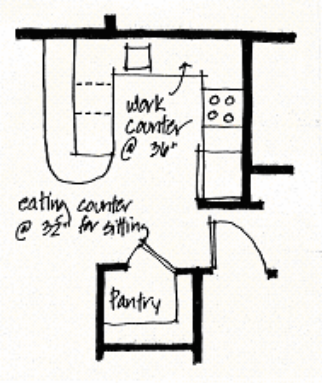
Simple appliances. Fixtures and appliances must be easy to operate for residents with either physical or cognitive impairments. Specify simple controls at the sink that will make it easy to learn how to regulate the water temperature. Consider the simplicity of controls and settings when selecting appliances so that it is easier for residents to learn to use them. The kitchen sink should have flexibility for wheelchair residents who are doing dishes.

Kitchen net area. Provide approximately 120 square feet for the kitchen work area to accommodate the necessary appliances and counter space associated with several people cooking and teaching at the same time.

Dining net area and furnishability. The dining area should be large enough to seat six people, including four or five in wheelchairs, and also be able to include eight for special occasions. Provide approximately 150 net square feet for dining area furnishings and activities.

Relationship to rear door and yard. Provide an operable window or exterior door so that individuals in the kitchen can communicate with others who may be barbecuing or engaging in other outdoor activities. Provide convenient access to the rear door so that the patio or deck can be easily used for meals.

Location. Locate the kitchen so that it is out of view of front stage entry and living room/parlor spaces. Separate the kitchen/dining area from the living room and bedrooms so that loud activity does not disturb residents in other parts of the house.



Illustrative Plan Diagram

Layout. When designing the kitchen:

- Locate refrigerator and snack storage at one edge of food preparation areas so that residents can help themselves to snacks and drinks without disrupting others who are preparing meals.
- Install a peninsula counter so that residents can gather round for both discussing meal preparation and socializing.
- Provide at least five feet between counters for wheelchair maneuver ability in the food preparation area.

Counters. Organize the counter work area to allow several people to be working and observing at once. At a minimum, provide the following counter lengths even if they are combined or overlapped.

- 18 inch set down space on either side of sink
- 9 inch set down space on either side of range
- 9 inch set down space on one side of refrigerator
- 30 inch working space between range and sink for food preparation and clean up

Specify a countertop material that is durable enough for cutting and is heat resistant.

Counter height. Design counters at 36 inches except the counter peninsula along an edge of the kitchen, at 32 inches high. This allows regular chairs to be used.

Cabinets. Basic cabinet guidelines include:

- Provide at least one base cabinet with drawers, 18 inches wide or more.
- Mount bottom of overhead cabinets no higher than 54 inches above floor so that shorter residents are able to reach at least the bottom shelf.
- Consider carousels in corner base units to increase accessible storage space.

- Select cabinet hardware that is operable with a closed fist. Wire staple handles work well for most people.

Fixtures and appliances. Refer to the following inventory and dimensional information for space planning purposes.

- Range or cook top: 30 inches wide
- Refrigerator: 36 inches wide
- Sink: double bowl
- No garbage disposer for safety and maintenance reasons
- Dishwasher: 24 inches wide
- Wall oven (if a cook top is used)

Central Information. A small area off o the kitchen/dining area should be planned with a desk for books, phone books, etc.

Telephone. Pre-wire telephone to a wall location convenient to the activity areas in the kitchen/dining area.

Staff Space

Each apartment includes a desk and chair within one of the backstage public rooms for staff members to perform administrative duties, write progress reports. The staff space is not a separate room. Staff may use the den or parlor may to hold small meetings, and counsel residents. Individual resident counseling may also occur within the resident's bedroom. Confidential records are stored in file cabinets. Residents' medications may need to be stored in a small refrigerator located in a lockable closet.

Pantry

Some households take advantage of being able to purchase food in large quantities and need space to store it. Adjacent to the kitchen provide 40 to 50 net square feet of bulk storage with shelving for household supplies, canned goods, and paper products.

This space may also accommodate a freezer (not included in construction contract) and requires ventilation to avoid heat build-up. Consider providing a separate broom closet for storage of cleaning supplies including a large vacuum cleaner.

Three Seasons/ Screened Porch

The three-season porch or a screened porch located off the Kitchen/Dining/Family Area extends the backstage public rooms. Where possible connect the porch to an adjacent outdoor patio or deck area to link indoor and outdoor activities. Try to locate the porch so that it receives winter sunlight without blocking sunlight to the Kitchen/Dining/Family Area.

The porch space is an important shared living space where the residents are protected from the elements while being in close proximity to the outdoors.

This porch may also be used for the waiting area for residents who are loading into the van.

Bathrooms

Bathrooms are used for bathing, washing up, and other personal hygiene. Two bathrooms are generally provided, one with a tub and one with a shower because residents often have a strong preference for one or the other. Staff, visitors, and residents use the same toilet facilities. Toiletries and towels may be kept in residents' bedrooms, and the bathrooms should a drawer and/or shelf for each resident.

The bathrooms are also teaching settings for residents to learn personal hygiene skills. Some residents are able to take care of their personal hygiene, while others need staff attention and care. Residents with physical disabilities may require physical assistance from staff to use the bathroom in addition to physical features such as grab bars. Design the bathrooms to simplify personal hygiene tasks and to be durable enough to withstand intensive use.

- Use plumbing fixtures that make it easy to turn water on and off and simple to regulate water temperature.
- Provide counter surfaces that are durable and easy to keep clean.
- Provide enough room for an individual in a wheelchair and two attendants in the shower area.
- Provide a floor drain in all bathrooms near the toilet and lavatory to deal with accidental overflows. Locate the drain inconspicuously to minimize institutional appearance.

Bathrooms near bedrooms. Locate the bathrooms in the backstage area near the bedrooms. Residents should be able to get from their bedrooms to the bathroom without passing through the more public parts of the house.

Lavatory. Install a one-piece countertop and basin. The countertop area provides storage for personal articles residents need within easy reach. Provide storage for toilet and cleaning supplies.

Bathing Options. To provide bathing options for wheelchair users, one of the bathrooms should have a whirlpool tub located with space around three sides and mounted at waist height with a toe space under the tub. Two staff may be assisting one person bathing. To lift the bather from a wheelchair into the tub, an overhead lift on tracks may be installed. Therefore, the ceilings should be reinforced for straight track installation. The other bathroom should contain a full sized roll in shower. Bathroom floors must be non-slip material and provided with a floor drain. The walls near the tub and shower should be waterproof. Provide adequate blocking within the walls for installations of grab bars and towel bars that take the same weight as grab bars. Residents who use wheelchairs may either transfer to a chair or wheelchair to shower or use the tub for bathing or showering in a portable seat. Provide a second valve and showerhead at the sidewall of the tub to assist in bathing.

Toilet. Provide standard height toilets. It is easier to adapt a toilet for a resident who needs a higher seat than to make it lower. Locate the toilet away from tight corners where they are easily accessed for use and cleaning.

Accessibility. Swinging the bathroom door inward makes it is easier for wheelchair users to close it behind them. Be sure that the door swing does not impede wheelchair maneuverability.

Bathroom accessories. Provide the following accessories in full bathrooms. Use ceramic accessories only in tiled areas.

- Soap holder at tub: surface-mounted, without hand grip
- Towel/grab bars: one 24 inch bar per resident; do not locate above toilet, provide the same reinforcing as for grab bars
- Robe hook
- Mirror: fixed, not adjustable; bottom at top of backsplash
- Shower curtain rod, provide the same reinforcing as for grab bars

Soap holders at the lavatory and medicine cabinets may not need to be provided.

Corners. Exposed corners, such as shower surrounds are vulnerable to damage from wheelchairs and should be eliminated from the bathroom plan.

Bedrooms

Provide a private bedroom for each resident. These rooms are the only completely private space that residents have and it is critical that they be able to furnish and decorate them as they wish. Being able to retreat to their own bedrooms to listen to music, read, watch television, or use the computer is critical to the residents' sense of privacy and sense of control. By furnishing their bedrooms with prized personal possessions such as their own furniture, stereo and television, and pictures of family and friends, residents can express their individuality, self-awareness, and self-esteem.

Residents' responsibility extends to taking care of their bedrooms. Therefore, maintenance of the space should be easy. For example, making the bed is easier if the room can be furnished with adequate access around the bed.

An overhead lift on tracks may be installed to assist moving the resident from the bed into a wheelchair. Therefore, the ceilings should be reinforced for straight track installation.

Net area. Design all rooms for single occupancy. Rooms may range in size from 130-160 net square feet, depending on the shape of the room and its furnishability. A minimum dimension of 11 feet provides space to place a dresser at the foot of the bed and allows for access to the drawers.

Location. Cluster the bedrooms and bathrooms in the backstage area of the unit to provide privacy. Providing access to bedrooms from the entry without passing through other living areas gives residents the option of joining in or bypassing group activities, and helps ensure that entering and leaving does not interrupt activities in these areas.

Furnishability. All bedrooms must accommodate the following furniture:

- A twin or full size bed
- Side table
- Dresser

- Desk or other work space
- Television/stereo
- Wheelchair
- Extra wheelchair or other ambulatory equipment

The shape of the room and the location of doors and windows should permit alternate furniture arrangements. Provide at least 18 inches at closet and window returns for furnishability. Allow three-sided access to the bed in all ground floor bedrooms. Be sure that the furniture listed above can be arranged and still allow for a five-foot diameter turnaround space for wheelchairs.

Closets. Residents use their closets to store a variety of personal belongings including clothing on shelves and on hangers, personal possessions, spare equipment for those using wheelchairs, and bed linens and towels.

A 6-foot long, standard 24" deep clothes closet with a pair of doors and outfitted with vinyl coated wire shelving provides adequate, handy, and accessible personal storage. The shelving should allow for variations in storing personal items and allow people of all heights and in wheelchairs to use it.

Telephone and cable TV. Provide wiring in all bedrooms for a telephone and cable television outlet.

Acoustics. Provide acoustic treatment in party walls between bedrooms.

Hallways

Hallways should generally be 48 inches wide to provide adequate maneuvering space for people who use wheelchairs. This width may not be adequate where people in wheelchairs need to turn into bedrooms, bathrooms, and laundry. Strategically locate wider segments of hallway to provide five-foot diameter turnarounds for wheelchair users and break up the tunnel-like appearance of the hallway. Avoid wider hallways of greater length because they have an institutional appearance and the circulation space becomes very costly.

Lighting. When all residents have their bedroom doors closed, the hallway may be very dark. Provide adequate, non-institutional lighting and try to introduce natural light wherever possible. Consider wall-mounted fixtures instead of ceiling fixtures to give a residential look but ensure that they are mounted at a height to avoid injury to residents.

Laundry Area

Provide washer and dryer hook-ups in each unit to accommodate heavy-duty machines purchased by DMR. The laundry area should be large enough for use by a resident in a wheelchair, for the training of residents in the use of machines, and for storage of laundered goods.

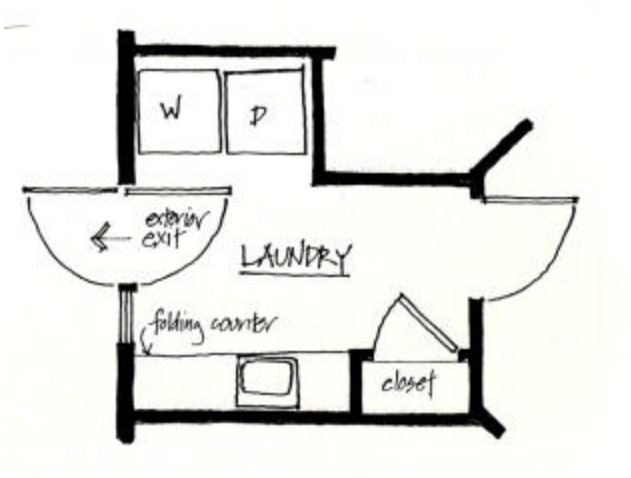
Net area. Provide a room large enough to accommodate one washer and dryer, a laundry folding counter, space to set up an ironing board, and adequate floor space for a five foot diameter turn around.

Sink. Provide a small but deep sink at the folding counter suitable for filling a pail or hand washing clothes.

Location. Locate the laundry area near the bedrooms and bathroom, where most dirty laundry is generated. This room may also be a convenient place to locate an exterior door for an additional means of egress from the unit and for ventilation and light into the bedroom wing. The laundry may be included within one of the bathrooms or combined with hall space.

Storage. Provide wall cabinets and/or shelving above the machines or a closet for storing detergent, cleaning supplies, and linens.

Gas. If gas is available, provide a connection for gas dryers because they are more cost efficient machines.



Illustrative Plan Diagram

Bulk Storage

Outdoor Storage
Storage of outdoor equipment can be accommodated within a basement storage room that is convenient to outdoors or in outdoor sheds or storage rooms accessed from the outside. A partial basement accessed by a bulkhead would be ideal. Provide space for bulky outdoor items such as barbecue utensils, gardening tools, and outdoor furniture. Consider resident convenience, local code requirements, security, upkeep, and cost in making this decision.

Interior storage is needed to store the resident's seasonal items including: clothing, suitcases, and household holiday decorations. An attic space accessed by a steep stair would be ideal.

Net area. For each apartment provide a minimum of 40 net square feet of space for interior bulk storage and 50 net square feet with a minimum dimension of 6 feet 6 inches for outdoor items.

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SITE DESIGN

Goals

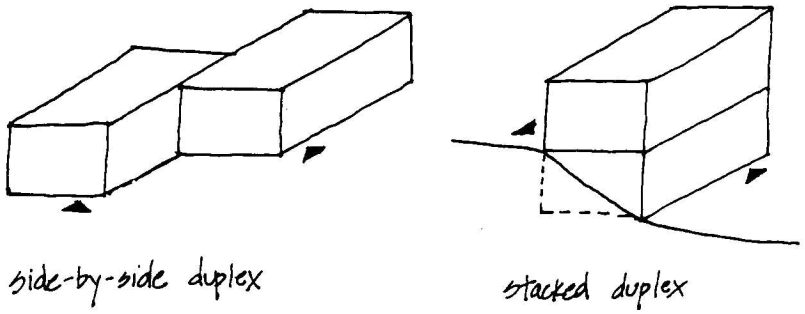
■ **Design the site to be compatible with the existing neighborhood.** It is important that the house not stand out or be unique. By designing the site layout to be compatible with the surrounding neighborhood, the house is less likely to be viewed as a "project" and the residents more likely to be accepted into the social fabric of the community. Site design characteristics contributing to overall compatibility include: the organization of the building(s) on the site, the quality of the landscaping, how parking is accommodated, and how site circulation connects to neighborhood streets.

■ The site design needs to be environmentally sensitive and take advantage of site characteristics to minimize impact on the environment and to minimize site development costs. Site design should respond to sun, wind, and views. Environmentally sensitive site design minimizes impact on wetlands, watershed and natural vegetation.

SITE ORGANIZATION

The site organization should be similar to other homes nearby at the same time meeting the needs of the residents balancing the need for community and the need for privacy. The layout of the site helps residents develop a sense of community as well as maintain their individual privacy. Clear boundaries in the form of plantings, fences, and changes in grade can define public and private areas and at the same time, encourage the interaction between residents and neighbors by making it as easy to come and go by car, bicycle, or on foot.

Develop a site plan that is responsive to site features. The site design needs to take advantage of site characteristics to minimize negative impact on the environment and to minimize site development costs. Site design that responds to sun, wind, and views enables residents to enjoy their surroundings. Environmentally sensitive site design minimizes impact on wetlands, watershed, and natural vegetation.



A successful site design balances cost issues, environmental concerns, neighborhood impact, management and maintenance capacity, and quality of resident life. The following site design issues need to be addressed during concept design.

Defining Open Space

The site design can foster a sense of ownership, control, and security if it clearly

distinguishes between public and private zones. All outdoor spaces should be planned to fit into one of the following zones:

- **public:** areas where non-residents are welcome, such as public streets and sidewalks;
- **semi-public:** space associated with a cluster of units and possibly visitors, such as a parking lot or a recreation area used by residents from one part of the site;
- **semi-private:** space shared by a few neighbors, such as a sitting area directly outside the shared entrance to a few units; and
- **private:** space associated with the unit, such as a private yard.

Maintenance Responsibility

The site will be maintained by the Housing Authority and/or the providers for the residents, assisted by residents to the extent they are interested and able. Design for low maintenance and durability, in conjunction with fitting in to the neighborhood character in the area. Allow adequate area for piling snow in winter months.

Establishing Front and Back

In laying out buildings on the site, it is important to clearly define the formal, front side of the unit or building from the more private back side. Fronts typically face streets so that a clear addressing system can be established which helps visitors and delivery persons easily find their destination. This public side of the unit or building is often used by residents for display purposes. Backyards are used as utility areas for eating outdoors, etc.

When a backyard is exposed to public areas, its residents are less likely to use the backyard as a private extension of unit living space. Similarly, front yards that are adjacent to other residents' backyards are less likely to be kept tidy and to be used for formal display. When the fronts of some units face the backs of other units, it is also unclear to residents and visitors which door to use when calling on neighbors.

- Locate front doors facing visitor parking and, if possible, pathways or roadways on and off the site.
- When a development has multiple clusters, organize the units so they have a consistent front/back relationship to roadways, parking, and open space so that residents can understand where the front doors are.
- Discrete parking for the resident's van and for staff may be located either on the side or rear yard or screened from view with landscaping.

Utilizing Site Features

A typical site has unique opportunities and constraints in the form of natural features, micr6climate, former use, and relationship to surrounding land. The challenge of placing housing on the site is to take advantage of the positive features and manage the negative features so they have a minimal impact on the housing and the development cost.

- Organize apartments to maximize the benefit from solar orientation wherever possible.

- Retain as much natural vegetation as possible, especially mature trees.
- Take advantage of natural topography to minimize the need for ramps.
- Locate the housing on the site to avoid alterations to natural features such as ledge and wetlands and to minimize disruption of existing grades.

Circulation and Access

Emergency vehicle access. In providing emergency vehicle access onto the site, consider design strategies that meet the needs of the local fire department, are cost-effective, and minimize water run-off. In most developments, a loop road, a turn-around, or an unpaved exit pathway typically can accommodate emergency vehicles.

- A turn-around or cul-de-sac at the end of a roadway needs to be large enough to meet emergency vehicle turning radius requirements.
- An unpaved exit pathway or turnaround can be a gravel and stone dust surface or a hardened base with a grass covering because it is used so seldom.

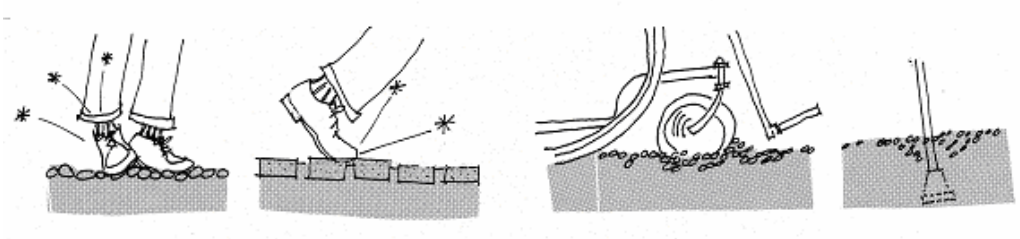
Maintenance

Plan for space to pile plowed snow along roadways or at the end of parking areas. Provide adequate open area adjacent to the roadway so that piled snow does not block traffic or damage fences or landscaping.
Curbs. Because curbs are costly, include them only when necessary to control water on steeper grades or to separate a sidewalk from the street. An alternative to curbs, "Cape Cod" berms, can be a cost-effective way to control water.

When curbs are necessary, either granite or precast concrete are acceptable. Granite is more expensive. Avoid bituminous curbs because they are easily damaged by snowplows.

Walkways

At a minimum, provide walkways from parking to the front door. When an apartment has its own driveway, the driveway may be widened to also serve as the walkway to the front door.



Walkway materials

Select walkway materials that ensure safety, wheelchair movement, as well as to minimize construction cost and long-term maintenance. Asphalt paving is used in most developments. Concrete paving, typically more expensive, is primarily used to match existing neighborhood walkways. Unit pavers are more costly to install and they may require resetting because they tend to move as the ground freezes

and thaws. Brick is generally not used unless it is required to respond to historical surroundings.

When selecting walkway materials bear in mind use by older people and people with disabilities.

Parking and Drop Off

The amount of parking on the site impacts the quality of life for residents and management. Too few parking spaces leads to resident disagreements and management headaches; too much parking may limit other outdoor uses of the site, generates additional run-off, and creates areas for abandoned cars.

- Provide only as much parking as is minimally needed. Large parking areas contribute to institutional appearance. Typically, provide two automobile spaces per unit for staff, with at least one accessible space per site, one space for the resident's van, and one visitor space. (Specific requirements to be determined in consultation with the DMR and/or the service provider and in consideration of local zoning requirements.)

- Avoid striping parking spaces or drop-off areas to avoid institutional appearance.

- Provide a designated parking space near the front or back door for a van to park and unload residents with disabilities.

- Breaking parking up into several short driveways reinforces the residential scale.

- Some level of protection from the elements is desirable for residents who are waiting to be loaded into the van; therefore the design should include a covered outdoor "staging area" and an adjacent level parking area for this purpose.

Design issues. When designing parking:

- Provide adequate slope in parking lots to avoid ponding. The maximum slope should be no greater than 1:20, with a continuous unbroken surface so that people in wheelchairs can use it.

- Provide hose bibs for car washing.

LANDSCAPING AND SITE IMPROVEMENTS

Landscaping and site amenities should not be considered expendable when the construction budget needs trimming. It is imperative that these site features be integral to the design of the development and not deleted as non-essential items in later stages.

Landscaping and site improvements are more than window dressing. They help establish the visual and social character of the building or development. Attractive landscaping improves a development's "curb appeal"; developments with well-planned site features are likely to be seen by the residents and the public as well-managed and desirable places in which to live.

In addition to visual appeal, landscaping must be functional by providing shade from the sun and protection from the wind, creating places for small groups to gather, defining open space for games and group activities, delineating public and private zones, and being maintainable.

Private Yards

Provide both front and backyards where the front and back doors of a unit are at grade level.

- Reserve attractive and natural portions of the site as unmaintained, open space.
- Provide shade with trees or trellises to protect users from the sun.
- If the site has some unused open space with attractive natural features, consider locating a bench at some distance from the building to give residents a destination for walks.
- For residents who want to garden, identify appropriate areas on site with convenient access to tool storage and running water. Locate them within view of the building so other residents can also benefit from this activity. Consider providing a raised garden bed for people who have limited mobility.
- Avoid creating hazards such as steep slopes, high retaining walls, and poisonous or thorny plants.

Private front yards

Front yards are a place for socializing, a vantage point from which to observe neighborhood activities, and the most likely space for residents to personalize with decorations and plantings. Clearly define front yards so they are easily identified as belonging to individual apartments.

Private backyards And sideyards

Backyards are usually an informal extension of interior living spaces, providing additional space for activities such as eating, gardening, relaxing outside, and play. Backyards are also where outdoor equipment such as grilles, gardening tools, and play equipment are kept.

- Locate outdoor areas as extensions of interior common spaces. For example, provide a patio for cookouts near the kitchen or porch. Provide wheelchair access directly from the interior to adjacent outdoor areas.

Plantings

Plan planting and select plant materials that are in keeping with the neighborhood and enhance the public image of the development.

Minimizing initial as well as maintenance costs. Provide landscaping to accomplish major site tasks: provide shade, control wind, stabilize slopes, and define public and private zones and areas of maintenance responsibility. Retain existing mature trees on the site whenever possible. Provide mulching beds around foundations and other places where planting is desired. Give residents planting guidelines, to encourage additional landscaping. Another strategy to minimize landscaping costs is to purchase small plant materials directly from a nursery for installation by LHA staff. Another benefit of local purchase of pant material is to take advantage of local knowledge of hearty and indigenous plants that will flourish with little maintenance.

Include large jobs, such as planting trees and shrubs, as part of the construction contract. Landscaping that is part of the general contractor's work is guaranteed for a specified warranty period. To ensure proper care and treatment of plantings after substantial completion, consider purchasing a maintenance contract directly from the landscape supplier.

Planting materials. When selecting plant materials, consider the following:

- Select only hardy, mature trees with minimum 3 to 3-1/2 inch diameter trunks so that they will have the best chance of survival, be able to withstand children's play, and function immediately for shading, privacy screening, and blocking wind.

- Specify locally successful tree species that require a minimum amount of maintenance and do not drop messy pods or fruits. Tree species with small compound leaves, such as locusts, minimize the need to rake in autumn and are less likely to block catch basins.

- When deciduous trees are used to control solar heat gain, select species with leaf growth and drop cycles that are appropriate for their shading function. For example, oaks and other species that sprout early and drop late are appropriate for shading western exposures from early spring until early winter. Other species, such as ash and honey locust, sprout late and drop early and are appropriate for solar gain from mid-fall to mid-spring.

- Evergreens, although they block views and winter sun, are effective windbreaks throughout the year.

- Near roadways avoid shallow root trees and species that are susceptible to salt poisoning.

- Select hardy, low maintenance shrubs and plants. Avoid species that require frequent trimming.

Because sod is expensive, use it instead of seed only for lawn areas that are susceptible to erosion such as slopes and drainage swales, for regraded areas which may erode if they are not well compacted, and in areas where appearance is very important.

Fencing

Wood. Simple wood fencing, such as post and rail or stockade, is preferred because it is easy to build, maintain, and repair. Keep maintenance to a minimum by using sealed or stained wood and cedar or pressure treated posts.

Metal. Chain link fencing is acceptable. Use a vinyl-coated mesh for durability and appearance. Climbing vines are useful for softening the appearance of chain link. Wrought iron may be used when needed to respond to an historical context, if the budget allows it.

Exterior Lighting

- Match lighting levels to those of the surrounding neighborhood so that the development does not stand out. Be sure that lighting does not intrude on surrounding property.
- Avoid pole-mounted lighting.
- Mount adjustable fixtures on buildings to light driveways, entries, patios and walkways.
- Provide exterior entry lights at the front and back doors controlled by the residents with an interior switch.

Maintenance

Specify timers for exterior fixtures to turn them on and off automatically. Timers must be easily accessible for periodic adjustments. Avoid photoelectric cells because they are unreliable and difficult to maintain.

Signage

Provide building identification that matches the types used in the neighborhood. In some neighborhoods the street address is imbedded in the pavement, or on the building over the door, etc.

Grading and Drainage

Minimum slopes for adequate drainage and maximum slopes for the safe movement of pedestrians and vehicles are summarized in the table below. Some communities may have their own local subdivision or DPW regulations that may be more stringent than the following.

	Minimum slope	Maximum slope
Roadways: centerline grade	1%	10% (up to 6 within 20 feet of an intersection); 5% if roadway might be used by someone in a wheelchair
Roadways: cross slope	1.5%	3%
Parking lots	1-2%	5%
Walkways	0.5%	5%
Ramps with handrails	5%	8%
Landscaped areas	2%	33 % Avoid steep slopes in open lawn areas due to difficulty of mowing
Grades abutting foundations, Draining first 10 feet away from building	5%	Depends on planting treatment for soil erosion

SITE UTILITIES

Water Detention Areas

If water detention areas are required to control storm run-off try to combine them with other site features, such as an unpaved turnaround for emergency vehicles.

Utility Services

Plan utilities to optimize initial costs, reduce long-term maintenance requirements, and minimize the visual impact of meters, tanks, and transformers on the site and buildings. Consider strategies to reduce the cost of installation and long-term maintenance of site utilities, such as:

• organizing the site to limit length of utility lines;

• avoiding duplication of water and sewage runs;

• minimizing the number of manholes and catch basins; and

• using quality materials.

Water

Even if municipal water is not immediately available at the site, it may be more cost-effective and less trouble to extend a municipal water main to the site than to dig a well.
On-site water. If an on-site water supply is required, quality and flow tests must be performed for licensing. On-site wells may require filtration equipment that must be maintained regularly.

Municipal water. Municipal water should be tested for mineral content, flow, and pressure to ensure that appropriate equipment and piping is specified.

Meters. Locate meters at the side or rear of buildings if possible, not in front. Remote meter readers permit flexibility in placement. Provide a separate water meter for each apartment.

Waste Water Systems

It is generally advantageous to connect to a municipal sewer system rather than provide an on-site septic system. Tying into a municipal system requires less land and long-term maintenance. Some municipal systems are not able to handle pumped sewage so determine whether pumping will be required to connect into the municipal system.

Municipal wastewater.
When tying into a municipal sewer system, avoid pumps if possible because they make the system more complicated. Consider raising the finish floor elevation to allow for a gravity system. If necessary to pump, provide two pumps and a tank with two day holding capacity so that there will be ample time for repair in case the system breaks down.

On-site wastewater.
Subject to state and local requirements.
In addition, some individuals and programs are very large consumers of water, requiring frequent linen changes, multiple bathing or showers, hydrotherapy units, etc. Where there will be on-site waste water discharge, provide waste water discharge planning with respect to the location, size and capacity of septic systems in the early stages of design. Water consumption may be greater than design flows indicated in Title V and could be as much as 150 to 175 gallons per day. The specific needs for each project must be reviewed with DMR.

Electrical

Wiring. Underground wiring is recommended for electrical, cable television, telephone, and fire alarm service. For safety, keep wiring away from areas where residents may dig gardens.

Transformer. Check with the local utility whether pole- or pad-mounted transformers are appropriate.

Metering. Provide an individual electrical meter for each apartment.

Fuel

Natural gas is the preferred fuel for both heat and domestic hot water, and should be used wherever service is available.

If propane gas is selected as the fuel source, include tanks in the construction contract. Consider burying propane tanks to shield them from view and to protect them from vandalism.

Meters. Provide separate gas meters for each apartment.

Oil tanks. Locate oil tanks where they can be easily serviced, above grade or in a basement. Provide one for each apartment.

TRASH DISPOSAL

Plan for trash disposal early in the design process because it is expensive and affects both the design and management of the development. Trash disposal services vary from municipality to municipality. Determine local procedures for trash disposal since this will affect whether trash cans, dumpsters, or trash compactors are required. Local recycling efforts may also have an impact on resident responsibilities for sorting trash and the types of containers required.

Also consider the availability and frequency of municipal pick-up. If municipal service is infrequent, consider contracting for supplemental service. If no pick-up service is available, DMR vendors perform trash disposal.

Trash cans. Trash is best kept outdoors in trash containers that are the responsibility of DMR vendors until they put the trash out on the designated pick-up day.

When planning for trash can pick-up:

- Assume each apartment will fill two to three forty gallon trash cans per week; additional containers may be necessary if pick-up is less frequent or recycling is required.

- Locate trash cans behind the dwelling unit on a paved surface. The trash storage area should be located with convenient access from the apartments as well as the pick up point if the containers need to be moved from the building to the street for pick-up. Provide a screened enclosure if visual impact is an issue.

Dumpsters are undesirable because they have a negative visual impact on the site, abutters tend to complain about odors, insects, and vermin that accompany loose garbage, and children and people with disabilities often cannot reach the opening.

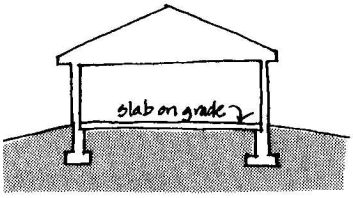
Chapter 3 TECHNICAL GUIDELINES

Table of Contents

BUILDING ENVELOPE

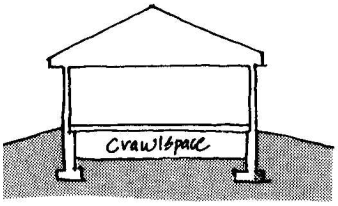
Technical design decisions must address the goals of optimization of costs, environmental sensitivity and resident quality of life. In addition, technical decisions should take into consideration the pitfalls of publicly bid construction. This chapter covers a range of design and construction issues from building envelope and enclosure to building systems and equipment about which the A/E and LHA make decisions. These technical guidelines are most useful during the early stages of design.

Foundation Alternatives



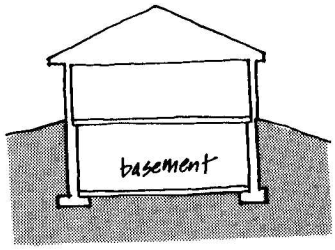
Slab-on-Grade – for "stick built" construction

- Usually requires least amount of excavation and materials, therefore, economical from the standpoint of initial construction.
- Requires careful coordination of mechanical and architectural plans during design for construction and limits future maintenance access.
- Concrete slab floor is less comfortable than a wood frame floor.



Crawlspace / Partial Basement – for Modular Construction

- Suitable for sites with steep slopes or poor soil bearing.
- Provides space below the building for piping and ductwork that can be accessed through panels in the floor.
- Can be designed strategically above rock outcroppings to minimize rock removal.



Basement

- Suitable for sites with steep slopes or poor soil bearing capacity.
- Not practical for sites with poor drainage, high water table or extensive ledge.
- Higher initial cost, roughly five percent of total construction, but provides relatively inexpensive space for mechanical equipment, laundry machines and storage, and economies due to increased ease of construction.

Simple building footprint. To minimize construction costs, design a simple building footprint. Changes in direction of footings and foundation walls require more materials and labor for constructing formwork, setting reinforcement, and pouring concrete. Jigs and jogs also result in more extensive wall framing, siding and finish work, and more complex roof forms. A cost-effective way to add visual interest to the building without complicated building plans is to use bay windows, dormers, overhangs, and recessed or covered entryways.

Roof and Attic

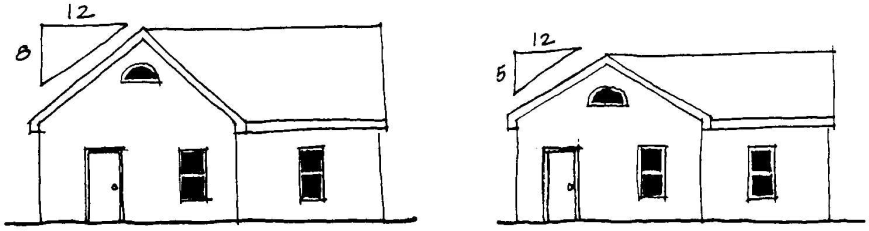
In designing the roof take into account the cost and ease of construction, future maintenance and repair, and the neighborhood context.

Roof form. When designing the roof, consider the following general guidelines:

- Simple roof forms that can be constructed with prefabricated trusses are recommended to reduce the cost of materials and labor during construction.
- Limit the number of valleys and penetrations to minimize the number of places where leaks can occur.
- Overhangs are useful to shade windows from solar gain and protect entries, walkways, and building walls from rain. Overhangs also accommodate soffit vents for attic ventilation and exhaust vents (see below).

Roof Slope. A roof slope or pitch of between 5 in 12 and 8 in 12 is recommended for typical developments. A steeper roof pitch may be appropriate to match existing buildings. A minimum roof slope of 5 in 12 is recommended to ensure adequate drainage and run-off for shingled roofs. Flat roofs are generally used for mid-rise buildings only.

In general, the cost of the roof increases with its steepness because of the greater size and length of the structural members and the greater amount of material to cover the surface. Steeper pitches require staging for roofers to install shingles. The additional cost of materials and labor affects the construction budget and the cost of future repair and shingle replacement.

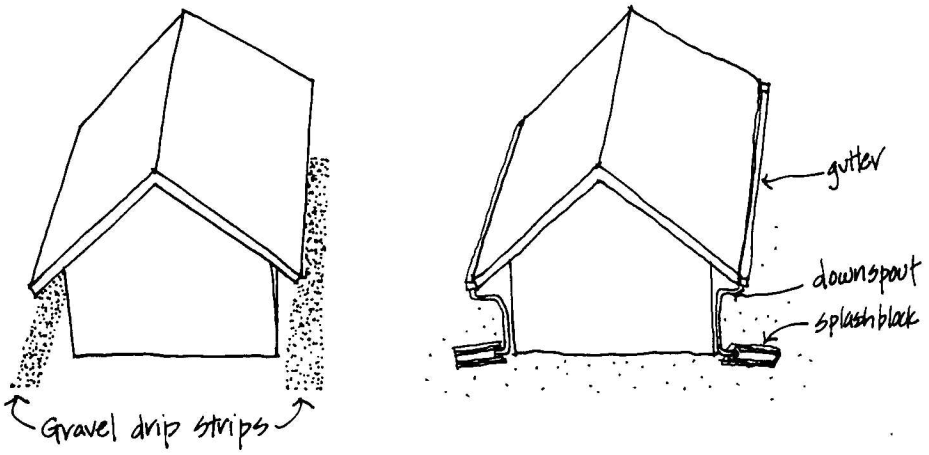


Attic ventilation. Adequate attic ventilation is necessary to prevent ice dams in winter, to provide resident comfort, to extend the life of roof shingles, and, especially, to vent moist air from the attic. Ridge vents in combination with soffit vents are recommended. Gable vents alone do not ensure adequate ventilation and when used in conjunction with ridge vents can short-circuit the flow of air. The ridge vent tends to suck outside air from the gable vents, not the moist attic air. Soffit vents are preferred over vented drip edges because rain can blow into the latter.

Access to attics. Provide access to attic spaces as required by code. When interior access hatches are used they must be well sealed and insulated. A finished attic

room accessed by a minimal stair would be an excellent location for bulk storage of the residents' seasonal clothing and decorations.

The main concern with attic access is the potential for moisture migration from the unit into the attic compromising energy efficiency and indoor air quality.



Gutters. Gutters add to initial construction cost and require routine inspection for damage and routine maintenance to keep them free of leaves and debris. Gutters are necessary to protect doorways, walkways, landscaping, and other areas from the splash of rainwater but may not be required where deep roof eaves carry water away from the building. Provide screens on gutters to prevent them from getting clogged.

Exterior Siding

Choose exterior siding materials based on initial costs, durability and ease of repair, how the material fits the surrounding context, and especially, long-term maintenance requirements. Acceptable materials include:

- Fiber-cement siding
- Wood clapboards or shingles
- Brick
- Vinyl siding

Because some materials, such as wood clapboards, require more routine maintenance than others, the cost of maintaining the siding over the life of the building must be carefully considered. Before deciding on a high maintenance material, make sure that there will be adequate funding and staffing resources for routine tasks such as painting and staining.

Use of siding materials must be carefully considered with respect to local needs and conditions such as the surrounding context and the housing authority's ability to maintain the siding over time. The following chart summarizes the advantages and tradeoffs of various acceptable siding materials.

Exterior Siding Materials

Fiber-cement siding
- High initial cost, but highly durable.
- Closely resembles wood clapboards.
- Requires very little routine maintenance.
- Appropriate for high impact settings where other types of siding would be damaged.

Wood clapboards or shingles
- Relatively high initial cost, but easily installed, durable, and long lasting if maintained properly; finger-jointed clapboards or shingle panel systems are recommended.
- Requires costly periodic maintenance: clapboards require painting or staining every five years; staining can reduce, but not eliminate maintenance requirement.
- Neglect can lead to serious deterioration, high repair costs, and eventually complete replacement.
- Shingles are acceptable when matching the dominant character of the surrounding environment is critical.

Brick
- High initial cost, roughly three times the cost of vinyl siding.
- Highly durable and requires very little long-term maintenance.
- Acceptable when blending with the dominant character of the surrounding environment, such as urban areas or historic districts, is a high priority.

Vinyl siding
- Relatively high initial cost, but long lasting, weather-resistant, and requires virtually no routine maintenance except for occasional washing.
- Blends well in neighborhoods with clapboard houses when well detailed and installed.
- May not be the most appropriate materials in high-impact or vandal-prone areas because it may dent or work loose.
- Easily repaired, although color matching may be a problem if sections need to be replaced.
- Carcinogenic.

Synthetic (hard coat) stucco
- High initial cost, roughly two or three times the cost of vinyl siding.
- Durable and relatively easy to maintain.

Unacceptable materials. Materials that are unacceptable because of a history of poor performance and lack of durability include: aluminum, hardboard, textured plywood, and soft coat synthetic stucco.

Insulation

The cost of heating buildings has long term implications because it impacts the housing authority operating budget, the pocketbooks of family residents, and taxpayers via fuel assistance subsidies. Insulation is very important in controlling heating costs. Tight construction methods and materials and careful insulating of the whole house ensure the best insulation value. It is important that the design of the building envelope takes into account the overall energy conservation strategy for the building as well as the need to maintain indoor air quality.

R-values. The following R-values (R means resistance to heat flow) are the minimum that must be provided in new construction:

- Ceilings: R-40
- Walls: R-19
- Foundation walls: R-8

Recommended wall section. DHCD's construction experience suggests that the dual concerns of reducing heat loss and minimizing air infiltration can best be met by combining batt insulation between studs with a layer of rigid insulation. Rigid insulation seals the building against air infiltration, increases the effective R-value of the batt insulation by reducing the temperature differential between it and the outside air, reduces heat loss through the studs, and keeps the wall warmer thus lessening the chance of condensation forming in the stud cavity.

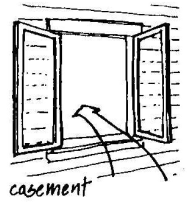
Attic insulation. Both blown-in cellulose and fiberglass batts are acceptable insulation materials, however, blown-in cellulose results in fewer voids when installed around roof trusses.

Windows

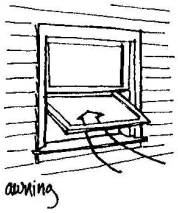
Select window types and manufacturers based on:
- Ease of operation
- Durability and ease of repair
- Energy efficiency (see Thermal Performance below)
- Maintenance requirements (primarily painting)

Windows

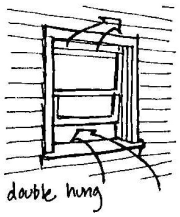
Types. Refer to the following guidelines when closing window types:



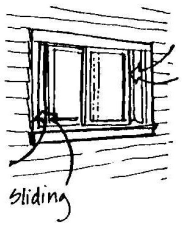
Double hung windows are highly recommended because they are easy to operate and maintain and can easily be filled with an air conditioner.



Awning and casement windows are an acceptable alternative; they are convenient for hard-to-reach areas such as over a kitchen sink. Awning windows do a better job of keeping out the rain than casements. For barrier-free units, awning and casements may be desirable so that residents can supply their own motorized window operators. Be sure that ground floor windows that swing out are located out of the way of footpaths.



Avoid sliders because they are the least energy efficient, difficult to maintain, and not secure. The tracks tend to fill with debris and make the window hard to operate.



Materials. Vinyl- or aluminum-clad wood windows are ideal for ease of maintenance. Wood windows require a high level of maintenance (periodic painting) and are only acceptable when required for historic preservation projects. Avoid using unprotected aluminum near salt water. Consider fiberglass windows.

Operation features. Some window features are especially important to residents:
- Double hung windows must be operable with no more than 15 pounds force.
- Double hung windows with a tilt-in sash feature are preferred because they allow residents to wash their own windows, and make the task easier for maintenance staff who would otherwise have to climb ladders to upper floors.

Be sure to show residents how to use this feature in order to get the most out of the investment.

Thermal performance. Windows should have a minimum thermal rating of R-4, and must carry a minimum 10-year warranty for long-term thermal performance. Gas-filled, low "e" double-glazing is strongly recommended.

Glazing.

Tempered window glass is may be recommended for the safety of the residents.

Hardware. For double hung windows, provide the locking hardware at the meeting rail as well as an adjustable sash lock or other mechanism to prevent forced entry when the window is ajar for ventilation.

Maintenance considerations. Maintaining consistency of window types and manufacturers across the housing authority's housing stock makes replacement of components easier. Keeping replacement stock on hand takes up lots of space. It is usually more practical to purchase replacement components when needed.

Doors

The following chart summarizes door and frame types and design considerations for exterior and interior doors.

Door Guidelines

Exterior unit entries

- Use insulated steel doors in wood frames; hollow metal doors and frames are not acceptable.
- Vinyl-coated doors are not recommended because they cannot be easily repaired if damaged.
- If side lites are used at unit entries, locate them on the hinge side of doors.
- Provide highly durable aluminum frame screen doors with solid bottom panels and screen guards to keep the screens from being pushed in. Combination storm/screen doors do not stand up well over time.
- Patio doors may be used to connect living spaces with outdoor decks and patios. Avoid their use in areas with potential security problems. Shelter patio doors from driving rains to avoid leaking.

Interior unit doors

- Solid core wood doors are appropriate. Solid core wood provides greater noise attenuation and privacy.
- To minimize wear and tear, install kick plates on the push side of doors. The top of the plate should be about 16 inches above the floor. Kick plates look better when installed on flush face rather than panel doors.
- Solid core wood doors: flush face, prefinished hardboard or field finished wood veneer. Prefinished hardboard is more durable. Field finished wood

veneer is easier to refinish if damaged. Use wood frames for interior solid core wood doors to achieve quieter operation and a more residential appearance.

Closet doors

- Use swing doors whenever possible for closets because they operate reliably and require the least maintenance over time.
- Avoid bifold and accordion doors because they do not wear well over time.
- For wide openings: use two leaf doors with magnetic catches for openings up to 60 inches. Sliding doors are acceptable for openings wider than 60 inches.

BUILDING SYSTEMS

Heating and Air Conditioning

Heating and Central air conditioning systems. Heating systems must provide resident comfort while achieving energy conservation. Central air conditioning is needed for the comfort of residents and to filter indoor air pollution. A forced air system providing both heat and air conditioning is recommended. Some residents with physical disabilities experience discomfort with temperature extremes. Provide two separate zones for each apartment, one for the bedroom area and one for the living spaces. Locate the mechanical room(s) on an exterior wall for direct ventilation/venting.

Fuel. Natural gas is the preferred fuel for both heat and domestic hot water because it is usually least expensive and easiest to install. When natural gas is not available, consider either propane gas or oil depending upon availability and cost. If propane needs to be metered each dwelling unit must have its own storage tank. Avoid electricity for heating because it is the most expensive fuel. If used, the building(s) must be more energy efficient to offset the higher heating costs. Generally, this requires insulation greater that the R-values specified under Insulation.

Mechanical space location. Locate the mechanical room where the noise generated by the equipment will not disturb residents. For ease of access by maintenance staff and future replacement of equipment, consider locating in a partial basement or within each unit or in a common mechanical room. Do not locate boilers and furnaces in uninsulated spaces.

Mechanical space layout. The layout of the mechanical space must allow clear access to all equipment for maintenance and repair. Carefully coordinate in three dimensions the location of major components so that each can be repaired in place or removed without having to remove another component, including supply lines and exhaust vents.

As a general planning rule of thumb, plan the shape of a mechanical as square as possible, with a length to width ratio of no more than 2:1.

Ventilation

Kitchen ventilation. Provide an exhaust hood for all stoves and cook tops and vent it to the outside.

Bathroom ventilation. In order to minimize the risk of moisture damage, mechanically ventilate all bathrooms by providing a reliable, quiet, exhaust fan. Vent the fan to the outside and direct wire it so that it cannot be unplugged. If possible locate the fan unit out of residents' reach. Wire the fan to a timer switch so that the fan can be activated after bathing, to avoid chilling the bather, and turns off automatically. Provide a heat lamp on a timer in combination with the exhaust fan.

Electrical

Circuit breaker panel. Locate the circuit breaker panel in an inconspicuous location in the staff space, such as the pantry.

Metering. Provide individual meters for each apartment.

Outlets. In locating outlets, consider where residents use electrical equipment. This helps to minimize the use of extension cords that pose a tripping and fire hazard. For example, locate an outlet near windows where an air conditioner or electric fan may be used. Provide an electric outlet in hallways for a vacuum cleaner.

Plumbing

Piping. Avoid locating water supply lines (hot and cold risers) in exterior walls and attic spaces. Even if insulated they are subject to freezing and bursting. All exposed piping in bathrooms and kitchens should be chrome-plated to facilitate cleaning.

Meters. Residents are not billed for water service. Provide a master metering system.

Try to locate meters in inconspicuous locations such as on the side and rear of building unless such a location creates unnecessarily long pipe runs. Remote readers are recommended.

Fire Protection

Sprinklers. Provide residential sprinkler system per NFPA 13D. All proposed fire protection systems including alarm systems need to be reviewed with local officials to ascertain compliance with local requirements.

Fire alarm. The following guidelines apply to fire alarms:

- A fire alarm system with battery back-up is desired. The zone panel should be located in an inconspicuous central location in staff space.
- Connect unit smoke detectors into the building alarm system, but not into the fire department because doing so is costly, is not required by code, and increases the impact of false alarms.

Communication Systems

Telephone and Internet. Provide telephone lines in each bedroom with home runs for separate service. Provide telephone lines in the kitchen, staff area, the family room and parlor.

Cable TV. Provide cable TV hook ups even if cable is not yet available in the community. In the meantime, the wiring can be used for a central antenna system.

BUILDING INTERIORS

Wall Finishes

Drywall and plaster. The following applies to interior walls except those that are fire-rated or provide acoustic separation.

- 5/8 inch gypsum board with veneer plaster on walls and ceilings for added strength and durability to withstand the normal use by people who use wheelchairs.

Paint finishes. Wall surfaces must be easy to clean and durable. Eggshell or satin finish paint is easier to keep clean than a flat finish. Eggshell finish is difficult to touch up. Refer to the following for recommendations for specific spaces:

- kitchens: semi-gloss acrylic latex for walls and trim
- bathrooms: satin or semi-gloss enamel (flat enamel on ceiling)
- other unit spaces: eggshell finish acrylic latex
- common spaces in elderly housing: eggshell or soft sheen acrylic latex

Shower surround. Use ceramic tile for shower surrounds.

Protection from wheelchair damage. Develop a strategy for dealing with potential damage to walls and doorframes. One way to deal with problem is to anticipate the damage that will occur beforehand and install wood trim bumpers and wall guards, or even carpet or heavy vinyl wall covering part way up the wall as a protective wainscoting. The disadvantage of this approach is that damage may still occur where it was never anticipated because wheelchairs come in a variety of shapes and sizes.

Protection above kitchen sink and stove. In the kitchen, treat the wall above the sink and stove with a washable surface, either with sheen finish paint or plastic laminate.

Floors

Flooring material. The following table summarizes recommendations for flooring materials for each unit type by room:

Flooring Material Guidelines

- Entry and hallways: resilient sheet flooring
- Living: resilient tile, resilient sheet flooring
- Bath: slip resistant flooring
- Bedrooms: resilient tile
- Kitchen: resilient sheet flooring
- Dining: resilient sheet flooring
- Family room: resilient tile, resilient sheet flooring or carpet
- Storage and laundry: resilient tile or resilient sheet flooring

In general, although resilient flooring is preferred over carpeting hard surfaces present a danger for people whose bones may be fragile from years of medication.

Resilient flooring. Resilient tile has the advantage of being relatively easy to replace. Use it for all areas other than full bathrooms and laundry rooms where resilient sheet flooring is preferred. Resilient sheet flooring is more difficult to repair, but provides greater protection against moisture damage.

Carpeting. Consider the advantages and disadvantages of carpet before deciding to use it. It improves livability and comfort (floors feel warmer), it has a residential image, and it reduces sound transmission. It is also useful in the entry hall of barrier-free units to clean the wheels of wheelchairs. Daily maintenance is easy with a vacuum cleaner but stains, tears, and worn areas require expensive carpet replacement.

Wood flooring. Oak flooring is discouraged because of the high maintenance. Parquet flooring is not acceptable because it is too vulnerable to damage.

Door Hardware

Coordinate door hardware with that of other LHA managed properties to simplify future replacement and maintenance. The following chart summarizes door hardware requirements.

Door Hardware Guidelines

Exterior shared building entry

- Interconnected cylindrical lock with 1 inch deadbolt or heavy duty mortise lockset (these are not always compatible with steel entry door systems)
- Lever handles

Unit entry

- Interconnected cylindrical lock with 1 inch deadbolt
- Operation should allow latchbolt to remain open when door is closed

- Deadbolt thrown or retracted by key outside or thumbturn inside and turning inside knob for quick release
- Latchbolt retracted by knob from either side
- Lever handle (special needs unit only)

Bathroom Fixtures

Lavatory. Porcelain, acrylic, and cultured marble are acceptable materials. Provide an integral countertop and basin. Single lever faucets are preferred.

Tub. Provide a whirlpool tub located mounted at waist height with a toe space under the tub. Two staff may be assisting one person bathing.

Shower. Provide a full sized roll in shower constructed of tile or synthetic marble base and wall surrounds.

Toilet. Provide additional support around the closet flange.

Kitchen Fixtures

Kitchen sink. Double bowl sinks are preferred. Select sinks that are large enough to wash large pots and pans. Sinks should be stainless steel and faucets equipped with a single lever handle. A spray feature is recommended. Provide wheelchair access.

Kitchen Appliances

Energy efficiency. Select appliances that are most energy efficient, since the cost of operating them is borne by the local housing authority or the residents. Consult the local utility company on the availability of rebates for energy efficient appliances.

Consistent sizes. Providing consistent appliance sizes across units makes it easier to replace a broken appliance with another and reduces the number of spare appliances that have to be stocked.

Refrigerator. Provide two-door, stacked or side-by-side freezer/refrigerator units, meeting AAB requirements. Stacked models generally allow more convenient storage of bulky items. For fully adaptable units, stacked refrigerators are preferred over side-by-side models if the freezer door is at a height of 44 inches or lower. Larger sizes are generally not available in stacked models.

Frost-free refrigerators are recommended even though their energy consumption is higher than cycle frost and manually defrosting models. The cost is generally offset by the damage incurred by cycle and manual models when residents use inappropriate means to defrost them.

Select refrigerators with enough storage capacity for the maximum number of people that may live in the unit. Refer to the table below for recommended storage capacities and width dimensions:

Refrigerator Size Guidelines

Unit Type	Maximum # of residents	Capacity (cu.ft)	Width (in)
4 BR Apartment	4	36	22
5 BR Apartment	5	40	22

Range. To avoid potential indoor air pollution problems associated with gas ranges, use electric ranges only. All ranges must have four burners and front controls. Required width dimensions: 30 inches wide.

Dishwasher. Provide a dishwasher.

Fluorescent fixtures. Whenever possible, provide compact fluorescent or other energy efficient fixtures in order to reduce operating costs.

Light Fixtures

Fixture types. Refer to the following light fixture information for all housing types: Each room needs a ceiling or wall fixture for general lighting.

Fixture locations. In common hallways, entries, and community spaces locate light fixtures where they can be reached for bulb replacement by maintenance staff without special ladders.