### THISTLEDOWN Co-Living House

### A Student-Directed Post-Occupancy Evaluation

Prepared by Mikayla Adkins, Brett LaFleur, Hannah Richardson, Sydney Tucker, Lauren Tines, and Migette Kaup

With the support of



## Introduction



Rob Simonetti, AIA Design Director SWBR Architects SAGE President

Since 1999 SAGE has recognized the critical importance of studying occupied environments in order to bring relevant data forward to inform new environments and problem solving. Each year our SAGE POE team visits a senior housing community to reflect on both the successes and potential failures of the built environment to support the building occupants and intended program.

This year we were incredibly excited to sponsor our first studentdirected POE. Kansas State University Interior design students from the College of Health and Human Sciences were led and trained by Dr. Migette Kaup. These students have been diligent in their research, process, evaluation, and reporting of their findings which Garden Spot Village will use to inform its next phase of Co-Living homes. SAGE is also happy to sponsor the students' travel to Chattanooga, TN where they will present their work at the 2021 Environments for Aging Conference.

On behalf of SAGE I hope you find this document professional, thought-provoking, and applicable to whichever facet of the industry you represent. I would challenge you to consider assessing your own ongoing work with the same rigor displayed in this paper. Only through continuous reflection, improvement, and evidenced-based design will we collectively provide innovative and appropriate environments for older adults.

Enjoy the work of these great minds. They are the future!

### A Student-Directed Post Occupancy Evaluation of Thistledown Co-Living House

Garden Spot Village, New Holland, Pennsylvania

by: Mikayla Adkins, Brett LaFleur, Hannah Richardson, Sydney Tucker, Lauren Tines, and Migette Kaup

#### Introduction

Completed in April of 2018, Thistledown Co-Living House is a revolutionary model for low-income senior housing. It is the first of five houses planned for a neighborhood located on the Garden Spot Village campus in New Holland, Pennsylvania. Prior to the construction of the four other co-living houses, Garden Spot Village administration agreed to conduct a post occupancy evaluation (POE) to assess how future iterations of the house could be adjusted to better suit the needs of the end users. A team of interior design students from the College of Health and Human Sciences at Kansas State University, led by Dr. Migette Kaup, were trained to conduct the evaluation. Student members of this team include Mikayla Adkins, Brett LaFleur, Hannah Richardson, and Sydney Tucker. The team was also joined by Lauren Tines, interior designer and coordinator for research and development for StudioSIX5 in Austin, Texas.

The team's first objective was to analyze the house based on both physical evidence and resident testimonies to provide feedback on existing conditions that either work well or fall short of expectations. Following that feedback, the second objective was to provide a series of improvements that could be implemented in the future co-living houses. These objectives ultimately contribute to the over-arching goal of this evaluation: to create a universal environment that positively impacts the end users, and aids in the development of a community for five unrelated individuals.

#### **Preparation for the Site Visit**

The student team met once a week from September through December 2019 to review materials related to the project and prepare for the site visit. This included meeting with the administrator of Garden Spot Village, Steve Lindsey, and the project architect from SFCS Architects, Dave McGill, via video conference, where they shared the unique history of the project and outlined the design goals that were established throughout the process. The student team also attended webinars hosted by the Society for the Advancement of Gerontological Environments (SAGE) that discussed the process for designing and building the house. During this time, the existing floor plan was also reviewed and analyzed to recognize features of the space that might be critical to accessible design. These areas were organized into categories and questions for the residents were developed.

**IRB Research Training Protocols and Project Compliance:** All POE team members completed Collaborative Institutional Training Initiative (CITI) certification for full compliance with Federal Guidelines for Research and the use of Human Subjects in Research. An IRB application for this research POE titled "A Student-Directed POE of a Co-Living Project," was submitted to the Kansas State University Office of Research Compliance and approved January 21, 2020. The project number is #9998.

**The Setting:** Garden Spot Village's Thistledown House is a pioneer for low-income, senior co-living housing. The model addresses two large issues in senior living today: limited options for affordable housing and combatting isolation. The project has been recognized by the 2018 Senior Housing News Architecture & Design Awards, in the Affordable Housing category, and by LeadingAge in 2018 for the Innovation Award. This model was ideated and developed by a design team of Garden Spot Village leaders in collaboration with SFCS Architects and community volunteers. During the research and planning process, the integrated design team established goals for a safe, high-quality housing model that is fully independent from government funding and operates self-sustainably.

Overall, the total building area is 3,973 gross square feet, with a total construction cost of \$389,354. The strong community engagement in New Holland contributed to extensive volunteering and donations, which reduced the overall construction cost. This engagement was essential to maintain the project's independence from government funding and was another way to enhance the Garden Spot Village community's culture.

The site for the co-living neighborhood is located in close proximity to the Garden Spot Village campus. Because of its proximity to the village hub, the residents of this co-living neighborhood have easy, walking-distance access to main campus amenities. Thistledown House is the first of five proposed houses to be connected by sidewalks through a central courtyard. The front entries of the houses will all face the courtyard to enhance the sense of connection within the neighborhood (See **Image 1**).

This co-living model is a residential structure with five, unrelated individuals living together and is categorized as independent living housing. Each resident has a private bedroom with an adjacent private bathroom; the shared spaces include an open kitchen, dining, and living area, den, laundry room, garage, a second floor living area, and two outdoor porches. Each resident is also provided options for private and shared storage throughout the house.



Thistledown House is the first of five homes to be located on this site. Currently the interior walkways are not yet in place, but in the near future, the site will be modified to incoporate sidewalks that lead to the front of the house.

Image 1. Site Plan of Thistledown Co-Living Community.

#### **Design Objectives**

The descriptions in the awards submission provided by SFCS Architects and Garden Spot Village identified several functional and behavioral objectives for the project. These design objectives were summarized into the four goals shown below:

**Goal 1:** Provide safe, high-quality affordable housing for low-income seniors.

**Goal 2:** Offer an environment that supports a sense of community and a rich and rewarding life for five non-related individuals who reside under one roof.

**Goal 3:** Create a balance of shared spaces that support community along with private areas that support natural residential sense of territorial control over one's possessions.

**Goal 4:** Utilize a process of community engagement and participation through volunteer hours to realize the project's completion.

**IRB Research Protocols:** Project debriefing information was sent to Garden Spot Village one month in advance of the site visit and distributed to residents of the house to provide notification about the student team's visit. The Garden Spot Village administrator also shared information with key staff members who might be interested in participating in interviews and/ or the design charrette. Upon arrival, all residents provided their own consent to participate in interviews (see **Appendix A** for typical questions used in guided interviews and focus groups). Staff also signed informed consent on the day of the site visit.

#### **Evaluation Strategies**

**POE Process:** The team first met with Garden Spot Village's administrator, Steve Lindsey. After an initial overview and discussion about the coliving project, the team was then transported to the Thistledown House, where the residents welcomed the team and introductions were made. Team members then met with the residents in a single focus group; residents who contributed to the discussion included Ruth Kolb, Esther Courtney, Ruth Dunlap, Vida Beiler, and Rose Sheaffer. The POE team led a focus group discussion with the prepared questions. Over the course of the two and a half hour discussion the team gathered insights and observations from the residents. All five of the residents participated and gave feedback on the key design features that they experienced within the house.

After the focus group concluded, the team broke off into pairs to analyze specific spaces within the house. During the tour of the house, photodocumentation of the spaces and observations were recorded. Team members took detailed notes and used a copy of the base floor plan to record the presence or absence of design features and operational issues that impacted patterns of use.

Discussions continued over lunch as the POE team asked additional clarifying questions about features of the home they had been able to document. The conversations focused on the daily activities as well as general patterns of use during different times of the year and on special occasions.

At the end of the day, the POE team reviewed the information they had collected and then prepared an initial set of observations. Additionally, the team developed a couple of quick design alternatives for key areas of the home that were of particular note.

**A Design Charrette:** The next day, the POE team conducted an open design charrette. Three of the residents from Thistledown attended along with members of Garden Spot Community who had been involved in the construction of the home as well as architects from SFCS, the architectural firm who developed the initial plan.

During this session, major observations were shared and discussed with the group. It was the goal of the POE team to confirm their interpretations of the use of the house and gain further insight into the original planning process. Multiple design ideas were generated during this discussion and a list of future cost-saving strategies proposed that would not reduce the comfort and function of the house.

(See **Page 32** for a full listing of charrette participants).

#### **Observations and Analysis of Universal Design Features**

A more thorough analysis of the Thistledown House was conducted following the site visit; the team built off of the information gained from the focus group, house analysis, and design charrette. Using the primary design objectives as well as the principles of universal design (UD), the POE team identified particular features that positively or negatively impact the house's functionality (see **Table 1**). Each area of the house was analyzed individually and then summarized accordingly in the following section of this report. These summaries are supported by matrices that outline the team's observations.

The UD principles support the primary deisgn objectives for Thistledown to create a safe, functional, and supportive environment. The POE team would like to state that their overall impressions and oberservations of the design of the house were extremely positive. Resident feedback reveals that the occupants of the house are very satisfied with their accomodations and are grateful to have such a lovely environment to call their home. The evaluations and comments contained in this report are intended to provide objective assessment of the finer details of the space which could contribute to the further enhancement of future designs and promote aging in place.

Universal Design is the design and composition of an environment so that it can be accessed, understood and used to the greatest extent possible by all people regardless of their age, size, ability or disability. An environment (or any building, product, or service in that environment) should be designed to meet the needs of all people who wish to use it. This is not a special requirement, for the benefit of only a minority of the population. It is a fundamental condition of good design. If an environment is accessible, usable, convenient and a pleasure to use, everyone benefits.

(Center for Excellence in Universal Design, 2020).

**UD 1 - Equitable Use:** *The design is useful and marketable to people with diverse abilities.* 

**UD 2 - Flexibility in Use:** *The design accommodates a wide range of individual preferences and abilities.* 

**UD 3 - Simple and Intuitive:** Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

**UD 4 - Perceptible Information:** *The design communicates necessary information effectively to the user, regardless of conditions or the user's sensory abilities.* 

**UD 5 - Tolerance for Error:** *The design minimizes hazards and the adverse consequences of accidental or unintended actions.* 

**UD 6 - Low Physical Effort:** *The design can be used efficiently and comfortably and with a minimum of fatigue.* 

**UD 7 - Size and Space for Approach and Use:** *Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.* 

**Table 1.** Seven Principles of Universal Design. Definition of Universal Design Retrieved from Center forExcellence in Universal Design: http://universaldesign.ie/What-is-Universal-Design/.

#### **Entries**

There are four separate entries into the house: the front door and secondary porch door at the front of the house, a back door accessible from the driveway, and a door from the garage. A summary of the entry features compared to the UD principles is provided in **Table 2**. Thistledown is the first of five houses that are intended for the site which was not fully developed at the time of the POE.

Currently, the front of the house faces an open field without sidewalks leading to the front entry, which makes this approach confusing for those unfamiliar with the house. Once the site is complete, the sidewalks will provide environmental cues to assist in a more natural approach to the house (see **Image 2**).

As a result, residents and their guests currently use the back door next to the driveway or the garage as the main source of entry. The residents noted that the back entry sequence could be difficult to navigate. The doors have an outward swing, but the width of the hallway can constrain passage with mobility devices (see **Image 3**).



Image 2. The current front facade of Thistledown House.

At the front of the house, the entry area is defined by a decorative wooden screen that creates a slight separation between the entry and the dining space, and buffers the passage to the living space (see **Image 4**). A coat closet is present within the entry area and is a shared space for residents and their guests.

Security is maintained through a key system and careful consideration of visual sightlines to the outside of the house. After initial occupancy, the residents noticed a lack of security at the back door. Since it serves as the primary point of arrival and entry, a peephole was added to allow residents the opportunity to identify visitors.



**Image 3.** *Back entry with two doors; one from the driveway and one from the garage.* 



**Image 4.** Front entry area with a coat closet and a decorative screen to define the space.

Description of Entry Features	UD1	UD2	UD3	UD4	UD5	UD6	UD7
Each resident is provided a key to access each of the four entries to the house.	+		+				
Individuals who use mobility devices may have difficulty traversing the thresholds at the doors on the front facade. The difference between the floor level and the threshold is estimated at 1" and is not sloped or ADA compliant.	-				-	-	
The addition of a peephole on the back door allows residents to safely identify visitors. The doors on the front facade have glass sections that permit full viewing of people approaching the door.			+		+		
The back door is being utilized as the front door for visitors, so they enter immediately into a private hallway space that passes resident bedrooms to get to the main area of the house.			-		-		
Having two front doors on the front facade could be confusing for visitors to know which one to use.			-				
The decorative wooden screen at the front entry provides a sense of privacy for visitors entering the house by defining a designated entry space.				+			+
The back door serves as the main entry of the house for the residents, but the configuration of the doors to hallway results in an awkward entry space. This creates difficulties for individuals trying to carry items or individuals using a mobility device.	-	-			-	-	-
The distance from the back door to the primary social areas is a long way to carry items without a place to land them, resulting in resident fatigue.						-	

#### **Table 2.** Analysis of the Entry Features based on the seven Principles of Universal Design.

One prevailing issue throughout the house is the height variation of door thresholds which can be difficult to maneuver over if someone is using a walker, three-wheeler, or wheelchair. For example, the sloped threshold at the back door has an overall rise of approximately 1.5" (see **Image 5**). The thresholds of the doors on the front façade do not have a slope, but have an overall rise of nearly 1/2" which would be difficult to maneuver for users with or without mobility devices (**Image 6**).



**Image 5.** *Threshold at the back door is sloped, but the rise is not smooth.* 



**Image 6.** Non-sloped threshold at doors on the front facade.

#### Porches

There are two distinct porches located on the south side of the house. One smaller porch is located off the intended front entrance and will look out on the shared community courtyard upon completion of the neighborhood. The other, larger porch is accessible from the kitchen/dining area on the front façade and wraps around the west side of the house. This porch is used as a seating area for socialization among residents and visitors (see **Plan 1**). One of the residents noted that she likes to take her coffee out onto the small porch in the morning because it was a quiet space.

Both porches are covered by an overhang that provides sun and weather protection allowing for comfortable resident use throughout the day. The depth of the two porches allows for comfortable seating options, but circulation around the furniture may be constrained, especially for those with mobility devices (see **Image 7**). A summary of the porch features compared to the UD principles is provided in **Table 3**.



Image 7. Wrap-around porch.



Plan 1. Front porches of Thistledown House.

Description of Porch Features	UD1	UD2	UD3	UD4	UD5	UD6	UD7
There are two front porches: one smaller and one larger, which provide various seating opportunities.		+					
The width of the porches does not allow for comfortable circulation around furniture for those with mobility devices.						-	-
The porches have an overhang sufficient for sun and weather protection, allowing use throughout different times of the day and seasons.		+					
There is no accessible storage for items that may be used on the porches. (e.g. watering can, gardening tools, etc.)		-				-	

**Table 3.** Analysis of the Porch Features based on the seven Principles of Universal Design.

#### **Dining Space**

Off the front entry, the dining area is located adjacent to the open living and kitchen areas. The dining area's close proximity to the kitchen reduces the distance residents must carry items. It also accommodates residents' unique schedules as their dining habits vary each day; this includes dining individually, dining altogether, or dining with guests.

The space is furnished with a large, expandable table that allows for additional seating and place settings. However, the existing dining chairs create a functional limitation as the arms conflict with the apron of the table, resulting in a gap between the user and their place setting (see **Image 8**). This limitation can result in poor posture and increases potential for spills.



Image 9. Window in the dining area.

This area features a large window that floods the space with natural light (see **Image 9**). The residents noted that this feature had both positive and negative qualities depending on the time of the day and the season.

The current window treatments do not cover the entire window area to provide enough control of the daylighting. This results in problems with direct glare.

A summary of the dining room features compared to the UD principles is provided in **Table 4**.



**Image 8.** Height of the dining chair arms and the apron detail on the table conflict. This prevents the seated user from being able to move closer to the table surface without having to lean forward.

Description of Dining Room Features	UD1	UD2	UD3	UD4	UD5	UD6	UD7
The dining table has a leaf available for additional place settings. The dining area, itself, is large enough to accommodate the expansion of additional seating.		+					+
The dining area is equipped with a chandelier above the table as a supplemental lighting option for use at different times of the day.		+		+			
Large windows in the dining area provide desirable natural light, but lack control features to manage the level of daylighting coming into the space.		+/-		+/-	-		
The arm height on the dining chairs conflicts with the apron of the dining table, creating a potential hazard for pinched fingers.					-		
The inability to scoot the chair under the table creates an awkward distance between the user and the table surface.					-		
The weight of the chair may be difficult for some users to move or adjust independently.						-	

**Table 4.** Analysis of the Dining Room Features based on the seven Principles of Universal Design.

#### Kitchen

The kitchen's overall configuration is a "U-shape," with a central island; this layout creates opportunities for collaboration and a variety of storage options. Within this configuration, however, there are issues regarding reach, appliance placement and size, lighting, and equitable storage. Observations revealed many areas where UD principles could be improved. Improvements would reduce potential hazards and increase functionality, overall (see **Table 5**).

Description of Kitchen Features	UD1	UD2	UD3	UD4	UD5	UD6	UD7
A significant portion of the upper cabinets are beyond standard anthropometric reach for the residents. The policies of the house also discourage the use of step stools to prevent accidents.		-			-	-	-
One microwave is placed above the cooktop at a height that is difficult for users to safely reach; and is inaccessible to those with with reach limitations.		-			-	-	
An additional microwave was added to the kitchen and is located on the countertop. This provides an accessible reach for all users, as well as a convenient landing zone for items coming directly out of the microwave.		+			+	+	
Residents are able to label their designated shelves and drawers in the kitchen cabinets and refrigerator to distinguish their personal items.			+	+			
The island is designed to have accessible storage on all sides, however, some storage is fairly shallow and underutilized.		+/-					
The countertops and cabinetry hardware are distinguishable from the casework due to their high contrast, which increases visual clarity for functional use.			+	+	+		
General lighting options provide a variety of light levels, however, shadows and low light levels persist underneath the upper cabinetry.				+/-	+/-		
The distance between the island and the refrigerator creates a circulation obstruction when the freezer drawer of the refrigerator is fully opened.					-		-
The kitchen cabinets and drawers have soft-close hinge mechanisms to decrease physical effort and mitigate noise.					+	+	
Some kitchen cabinets are equipped with pullout shelving to reduce the need to reach deep into the base cabinets.	+	+			+	+	
The refrigerator's space capacity does not support five residents.	-						-

**Table 5.** Analysis of the Kitchen Features based on the seven Principles of Universal Design.



**Image 10.** *Microwave located above a cook top creates hazards.* 



**Image 11.** An additional microwave was placed on the countertop for accessible reach.



Image 12. Labeled shelves.

Residents noted that the location of the microwave above the stove resulted in limited use by some members of the home (see **Image 10**). This placement is unsafe for users with limited visibility and range of reach or grip, especially as they retrieve items above a hot surface. These limitations resulted in the residents aquiring another microwave and placing it at counter-height. This placement, however, occupies valuable workspace and can be subject to harsh under-cabinet shadows (see **Image 11**).

The kitchen is equipped with a variety of lighting fixtures that provide different levels and renditions of light. Ideal light levels for a kitchen area is 30 foot-candles of illumination. **Table 6** demonstrates that there are distinct inconsistencies with lighting levels which contributes to potential errors when activities are performed in the space.

Kitchen Location	fc Levels Lights On	fc Levels Lights Off			
Under Upper-Cabinets	14 fc	3 fc			
Island Work Surface	25 fc	10 fc			

**Table 6.** Foot-candle (fc) readings for light levels in the kitchen.

During the day, when the lights are off, there are noticeable dark spots in the kitchen with measurements of 3 foot-candles in area around the microwave. When all lighting is in use, this area registers 14 footcandles which is better but still not ideal. On the island, without any artificial lighting, the lighting level measures 10 foot-candles. When all lights are on there is an increase to 25 foot-candles which is still below the recommended 30 foot-candles considered sufficient for activities being performed in the kitchen.

The current system for determining where items are stored involves labeling shelves and drawers with name tags (see **Image 12**).

There was sufficient storage for dry food items, but the configuration of the cabinets was distributed unequally. Some residents had to store some kitchen items in cabinets located in the living room.

The amount of storage in the kitchen for perishable food items was insufficent for the number of residents living in the home. To remedy this, a second refrigerator and an additional freezer, brought by one of the residents from their previous dwelling, was placed in the garage (see **Image 13**).



**Image 13.** Additional refrigerator and freezer located in the garage to provide enough food storage for residents.

#### Living Room

The living area is configured to create a layout that enhances conversation and interaction between the adjacent, open kitchen and dining areas. This area features four lounge chairs, a sofa, and built-in storage with an incorporated fireplace (see **Image 14**). A summary of the living room features compared to the UD principles is provided in **Table 7**.

The furniture, which is centralized around the fireplace, offers a variety of seating options to promote resident independence and choice. The furniture dimensions do not, however, always support ease of use or equitability for residents. All upholstered seating in the living room had a minimum seat height of 18" and minimum seat depth of 19.5". These dimensions may not provide enough range to accommodate the needs of a majority of adults over the age of 65.



**Image 14.** Seating arrangement in the living room is centralized around the fireplace.

Description of Living Room Features	UD1	UD2	UD3	UD4	UD5	UD6	UD7
The living room is equipped with four base cabinet areas for all users to store their belongings, and, there are six sections of open shelves above for resident personalization.	+	+					
Rooms 3 and 4 have less visual privacy than rooms 1, 2, and 5 due to direct views and sightlines from the living area into the bedrooms. This reduces residents' flexibility if they desire to keep their doors open. (See Plan 2, page 12)	-	-					
Multiple seating options are provided for users, but the seating is generally too deep and/or too high for ease of use and to rise safely and independently.	-	-				-	
Built-in, open shelving in the living area provides storage options within comfortable anthropometric reach ranges for women.		+				+	+
There is an unequal distribution and variations in color rendition of lighting throughout the open living, dining, and kitchen area, creating problems with both glare and shadows.				-	-		
The open layout/plan encourages conversation and social interactions between the living area and adjacent dining and kitchen areas.							+
The lack of space between the furniture pieces can constrain movement for residents who use mobility devices.							-
The lack of overhead lighting results in insufficient levels of general illumination, forcing the users to use less efficient accent lighting for reading and other functional activities.		-		-	-		

**Table 7.** Analysis of the Living Room Features based on the seven Principles of Universal Design.

Lighting within the living room is limited to ambient overhead cove lighting and two table lamps (see **Images 15** and **16**). The level of light within this space fails to reach the 30 foot-candles of illumination recommended. In the center of the living area, the level of light reaches 4 foot-candles. Directly under the table lamps, the level of light reaches 64 foot-candles, but when sitting directly adjacent to the lamp, the level of light decreases to 8 foot-candles. These levels are insufficient for reading or performing handwork without eye fatigue for any period of time.

The layout of the two hallways of the house branching from the social living area creates an issue of unequal privacy for two of the resident bedrooms. Rooms 3 and 4 have direct visual sightlines from the living area if the doors of the rooms are left open (see **Floor Plan 2**).

These direct sightlines were a concern for one resident who stated she had to remember to close the door upon using the bathroom or changing because someone in the living area could potentially view into her bathroom/closet space. Whereas residents of the other three bedrooms of the home didn't have this concern because their bedrooms are located farther back on the hallways and out of sight from the social spaces of the home. The lack of a visual, as well as acoustical barrier, from Rooms 3 and 4 to the living area, makes them less private and reduces equitable use of all the bedrooms.



**Floor Plan 2.** First floor of Thistledown House showing the resident bedroom locations.



**Image 15.** *Living room ceiling with cove lighting detail.* 



**Image 16.** *Table lamp provides limited range of task lighting.* 

#### Den

The den is utilized as a supplementary area for residents to relax, socialize, or perform activities privately. Residents particularly appreciate this space because they enjoy looking out the windows. The abundance of natural light the windows provide, however, is difficult to manage.

Similar to the dining room window, the current window treatments do not effectively regulate the daylighting entering the space, specifically from the clerestory windows (**Image 17**). The residents noted that it would be nice to be able to have the view while also managing the glare that could result from the various angles of the sun.

Another functional issue within the den is the space planning for furniture placement. The existing items are configured in a way that results in a side table encroaching upon the circulation at the door. This creates a possible hazard when entering the space (**Image 18**).

Other details of the space that are of note inlcuded the sliding barn door that separates the den from the primary living area. The POE team members experienced difficulty using the hardware to pull the door shut. The dark color makes the flush-style finger pull difficult to perceive, and the scale of the pull is hard to grasp comfortably (**Image 19**).

A summary of the den features compared to the UD principles is provided in **Table 8**.



Image 17. The Den has abundant natural light.





**Image 18.** *Furniture impedes the opening.* 

**Image 19.** Door controls are difficult to grasp.

Description of Den Features	UD1	UD2	UD3	UD4	UD5	UD6	UD7
The pull for the handle on the barn-style door to the den is a very dark material, which is hard to distinguish how to use or grasp.	-			-			
The distance between the door and side table upon entry is 32", which is barely sufficient for clear passage. The furniture configuration in this room needs to be reconsidered so it is not blocking the entrance.					-		-
Curtain rods are hung at a height that prevents users the ability to control daylighting from the clerestory windows.	-	-				-	

**Table 8.** Analysis of the Den Features based on the seven Principles of Universal Design.



Image 20. Window seat storage.



Image 21. Ruth D's Room.



Image 22. Vida's Room.

#### **Resident Bedrooms & Bathrooms**

All of the resident bedrooms and bathrooms are equal in size and configuration (See **Plan 2**, page 12). Each bedroom is adequately sized to accommodate a twin or full-sized bed with room for circultion. Clearances are dependent upon the amount of other furniture the residents bring to the space. In the bedroom area, there is a window bench seat with accessible storage underneath (see **Image 20**). Residents are allowed to customize their own space with personal furniture pieces and wall color selection, enhancing resident control and choice (see **Images 21** and **22**).

Within the bedrooms, residents can adjust their thermostats to suit individual temperature preference in the space. It was noted, however, that the preset temperature range may be too limited to satisfy the thermal comfort of all users.

Each resident bathroom has two distinct areas. One is a private walk-in shower and toilet area enclosed by a pocket door. Accessible features within this space include slip-resistant flooring, shower controls, and lighting/fan controls.

The other area is a vanity and closet space open to the rest of the bedroom. The closet, accessible by bi-fold doors, poses two evident challenges for resident use. First, there is a significant area of the closet that is inaccessible for users because it lacks a forward approach (**Image 23**). Second, the single shelf above the hanging rod within the closet causes residents to stack items, which creates an inefficient storage solution. Stacking items on top of each other also increases the potential for items to fall, which could be a hazard (**Image 24**). This challenge also conflicts with a policy at Thistledown which discourages residents to use step stools or any other aiding device that could result in a fall.

A summary of the resident room features compared to the UD principles is provided in **Table 9**.



**Image 23.** *Inaccessible blind-corner of the closet.* 



**Image 24.** *Stacking on closet shelf.* 

Description of Resident Room/ Bathroom Features	UD1	UD2	UD3	UD4	UD5	UD6	UD7
Every resident has a bedroom and bathroom of equal size and configuration.	+						+
Every resident room has built-in storage under their window seat with two accessible sides.	+						
The window seat serves as the lid to storage below, however, the lids are heavy and lifting may be difficult for some users. In addition, the hinge may not bear the weight sufficiently to lock in place and can close abruptly, posing a safety hazard for users.	-				-	-	
Each resident bathroom is equipped with a panel for controlling the lights, fan, and temperature. The residents report that the controls are easy to use and identify.	+	+	+	+			
Each resident bedroom has an individual thermostat to adjust the temperature and suit individual preferences in the space. However, the preset range of temperatures available may be too limited to sufficiently accommodate the range of user preferences.	+	+/-					
A slip-resistant flooring material has been used in resident bathrooms, which minimizes falling risks in a wet area.					+		
The shower controls are accessible without reaching across the spray area, reducing the chance of burns from hot water.					+		
Wire shelving above the clothes rod in the closet cannot withstand heavy loads and current use; (in some situations) creating a potential hazard. Additionally, the height of bulk storage is predominantly overhead, and policy does not allow for use of stepstools.	-				-	-	-
The resident rooms are appropriately sized for either a twin-size or full-size bed with adequate circulation.		+					+
The closet configuration creates a blind spot in the corner area that is inaccessible and not functional for resident use.	-					-	-
The wand for operating the blinds on the windows is out of reach for some residents, resulting in either a lack of personal control of daylighting and views or requiring a resident to get on a step stool to adjust the treatments.					-	-	-

**Table 9.** Analysis of the Resident Room / Bathroom Features based on the seven Principles of Universal Design.

#### Hallways

Circulation throughout the first floor of the house is defined by two hallways (see **Plan 2** page 12). One hallway extends from the back door and garage entries to the primary living area. Along this circulation path there are three resident bedrooms, the laundry room, and stairway to the second floor. The other hallway branches off the living room area. Along this circulation path there is access to the two remaining resident rooms, a guest bathroom, and a mechanical closet.

As the team spoke with the residents, the width and configuration of these hallways became a concern because they limit the ability of emergency services to navigate in and out of resident rooms with a gurney. In particular, the hallway from the back door has a jog which complicates both circulation and emergency service access (See **Image 25**).

The hallway width also constrains the ability to support two passing residents with mobility devices (See **Image 26**). Another concern is the travel distance from the back door to the kitchen and other areas of the house. Although the house is intimately scaled, this length can cause fatigue for some residents, especially when carrying in groceries or other everyday items without a central intermediary landing zone along the path.

A summary of the hallway features compared to the UD principles is provided in **Table 10**.



**Image 25.** *Jog in the hallway is difficult for emergency serivces.* 



**Image 26.** Hallway witdh may limit two person circulation.

Description of Hallway Features	UD1	UD2	UD3	UD4	UD5	UD6	UD7
The hallway width is not able to support two residents who might be using mobility devices at the same time.	-						-
The width and configuration (e.g. the jog) of the hallways prevents rapid access for emergency services to enter the bedroom spaces.					-		-
The long distance between the garage and back entry and the furthest resident room could cause fatigue for some users.						-	
At the intersection of the back hallway and the information center cabinet, the opening is reduced to less than 36", limiting circulation clearance for users with mobility devices.							-

**Table 10.** Analysis of the Hallway Features based on the seven Principles of Universal Design.

#### Laundry Room

With a convenient, centralized location on the first floor, a shared laundry room is accessible to all residents. There is adequate space for a 5' wheelchair turning radius which allows for comfortable movement in the room. It is equipped with a washer, dryer, shelving, and mop sink. The mop sink that was included in the design is a more commercial janitorial feature. The residents do not use it, even as a utility sink, because it is too low for safe and comfortable reach (**Image 27**).

Since this room serves as a "catch-all" utilility and laundry area, there could be more shelving and storage options incorporated to increase the usability of the space. There is one shelf provided above the washer and dryer, but it is too high to comfortably reach without the use of a step stool (**Image 28**).

Residents then incorporated their own shelving solutions to store personal laundry items, labeled by the same tag system utilized in the kitchen. Likewise, there is no designated storage space for larger cleaning supplies, such as mops or vacuums. As a result, items have been placed behind the door, limiting the full range of the door swing. Solutions intended to address the lack of accessible storage encroach upon the otherwise well-designed space.

A summary of the laundry room features compared to the UD principles is provided in **Table 11**.



**Image 27.** Mop sink in laundry room is too low for easy access.



**Image 28.** Shelving above the laundry equipment is too high for easy reach.

Description of Laundry Room Features	UD1	UD2	UD3	UD4	UD5	UD6	UD7
The sink provided in this space is a floor-based mop sink that is relatively inaccessible for resident use. Some residents cannot bend down and use it in a safe and functional manner.	-				-	-	
The room's size successfully allows for an adequate wheelchair turn radius and the ability for multiple users to use the space at once.	+						+
The shelving above the washer and dryer is out of the anthropometric standard reach for women.	-				-	-	-
The storage options provided do not accommodate larger cleaning appliances, such as a mop or vacuum, forcing them to be placed behind the door, creating a potential hazard.					-		-

**Table 11.** Analysis of the Laundry Room Features based on the seven Principles of Universal Design.

#### Second Floor

The second floor of Thistledown provides residents with another living area and storage for larger items, such as holiday décor. The staircase leading up to the second floor is equipped with two handrails on either side and has a sufficient width that aids in the safe ascension of two residents at the same time (see **Image 29**).

One primary issue with the second floor is the location of "bulk" storage, which creates a hazard as residents maneuver up and down the stairs to transport these items. While it is not necessarily an issue for current residents, we recognize that residents in future iterations of the house may experience difficulty.



**Image 30.** *Furniture arrangement on the second floor.* 

Within the living area, there are a variety of seating types that support different users and activities performed in the space (see **Image 30**). However, the task lighting on the second floor does not support the level of light needed to carry out certain activities that require fine motor skills and detailed visual taks (e.g. quilting, puzzles, etc.).



**Image 29.** *Staircase to the second floor.* 

Description of Second Floor Features	UD1	UD2	UD3	UD4	UD5	UD6	UD7
The stairs, in general, create barriers for use by some residents and their visitors, but, the rise/ run configuration of the stairs is more inclusive to those who experience challenges with gate and mobility.	+/-				+	+	
Handrails are provided on both sides of the stair for left- or right-hand accessibility.	+	+			+		
Furniture arrangements on the second level can be adjusted to suit different users, preferences, and functions.		+					+
Ambient lighting provided through fluorescent fixtures may not support the level of light needed for the activities being performed.				-			
The stairs are wide enough for two users to ascend/descend and pass at one time.							+
Bulk storage for large items is located on the 2nd floor, which creates a potential hazard when transporting these items up and down the stairs.		-			-	-	

**Table 12.** Analysis of the Second Floor Features based on the seven Principles of Universal Design.

#### **Summary of Key Design Recommendations**

The goal of this post-occupancy evaluation was to assess the current patterns of use of the pilot coliving house to determine if there were areas of improvement that can be implemented in the next phase of constructing additional homes. As previously noted, the POE team was able to confirm through observations and feedback from the residents that the outcomes of the first house are very positive and achieve the stated goals of the project in many ways. The recommendations that follow are based on strategies that could further enhance the universal design features of the home and contribute to successful aging in place for the residents.

To demonstrate these improvements, a proposed "second generation" floor plan is presented with the improvements keyed to the areas around the house. Recommendations presearented in three tiers: high (A), medium (B), and low (C) priority improvements (see Floor Plan 3, page 20).

All recommendations focus on improving resident health, safety and well-being to various degrees; the highest priority having the biggest impact and the lowest priority having the smallest impact, respectively.

**High Priority:** High priority improvements specifically address design features that would significantly improve universal design and have a direct, positive impact on resident health, safety, and well-being. We highly recommend the incorporation of as many of these improvements as possible in the next iteration of the co-living house plan to achieve a more cohesive, universally designed solution. As the highest priority of changes, these features are recommended, regardless of cost.

Α

В

С

**Medium Priority:** The criteria for medium priority improvements were those that seemed to support other priorities of the residents and also had direct links to UD principles. Indicated design features would improve resident health, safety, and wellbeing to a degree. These improvements are recommended, as they would contribute to a more universally designed solution. At this priority level, the more expensive improvements could be excluded if it they are obstacles to the affordability of overall construction cost.

**Low Priority:** Low priority improvements involve other design features that were noticed as designers but may not necessarily have been of concern to the residents. These features include subtle changes that would address improvements in overall comfort and universal design. Because they are not crucial to resident health, safety, and wellbeing, higher cost items are recommended only if budget allows. Following the A, B, or C representing the priority level are numbers that refer to the room where the recommendation is designated. Following are the codes by room. Recommendations are then subsequently numbered. Some items have sub-items that provide further explanation for the suggested design change.

#### Code Room

- 1 Kitchen
- 2 Bedrooms/Bathrooms
- 3 Living Room
- 4 Entries
- 5 Hallways
- 6 Second Floor
- 7 Porch
- 8 Dining Room
- 9 Den
- 10 Laundry
- 11 Miscellaneous







#### Keyed Improved to Proposed Next-Generation of Co-Living House

#### Kitchen

- A1.1: Change Kitchen Configuration
  - A1.1.1: Change Island Layout
  - A1.1.2: Avoid Appliance Overlap
- A1.2: Increase Circulation Allowances
- A1.3: Microwave Placement at Safe and Accessible Reach Range
- A1.4: Address Refrigerator Size or Quantity
- B1.5: Add Under-Cabinetry Lighting
- B1.6: Design Cabinetry for Five Users
- C1.7: Select a Kitchen Counter Material that Reduces Impact Noise
- C1.8: Add Cart Under Island

#### **Bedrooms/Bathrooms**

- A2.1: Change Closet Configuration A2.1.1: Address the "Blind Corner" A2.1.2: Increase Vertical Shelving Opportunities to Reduce Stacking
- A2.2: Add Easily Accessible Window Controls
- B2.3: Change Bathroom Configuration B2.3.1: Add a Pocket Door to Entrance

#### Living Room

- A3.1: Increase Acoustical Properties of the Wall Construction
- A3.2: Furniture Layouts to Accommodate Mobility Devices
- A3.3: Increase Lighting Options
- B3.4: Select Ergonomic Furniture to Accommodate Aging Populations
- B3.5: Address Sightline to Resident Bedrooms
- C3.6: Design Cabinetry for Five Users

#### Entries

- A4.1: Designate One Main Entrance on the Front Facade
- A4.2: Change Door Swing Orientation of the Back Door
- A4.3: Implement Low-Profile Thresholds
- B4.4: Add Sidewalk to Front Entrance
- C4.5: Add Storage to Back Entry Area
- C4.6: Provide Landing Zone at Back Entry

#### Hallways

- A5.1: Increase Hallway Width
- A5.2: Reconfigure Hallway Jog

#### Second Floor

- A6.1: Move Bulk Storage Area to Main Floor
- B6.2: Add Half Bathroom
- B6.3: Incorporate Murphy Bed with Storage
- C6.4: Increase Lighting Options + Quality

#### Porch

A7.1: Widen Porch for Circulation C7.2: Add Storage

#### **Dining Rooms**

- A8.1: Add Easily Accessible Window Controls
- B8.2: Select Dining Chairs that Clear Table Apron B8.2.1 – Select Lighter Weight Chairs
- B8.3: Create Easily Accessible Bench Storage

#### Den

- A9.1: Select Perceptible Door Hardware that Supports Ease of Grip.
- B9.2: Add Easily Accessible Window Controls
- B9.3: Adjust Furniture Layout

#### Laundry

- A10.1: Provide Counter-Level Sink
- A10.2: Provide Accessible Storage for Tall Cleaning Equipment
- A10.3: Provide Lower-Height Shelving Options

#### Miscellaneous

- A11.1: Select Flooring Material in Open Kitchen, Living, Dining Area to Reduce Level Changes
- 11.2: Reconfigure Cage Storage Shelving to Reduce Stacking
- C11.3: Add Grab Bars at Toilet in Guest Bathroom
- C11.4: Modify Information Center C11.4.1 – Add Sorting/Storage Space Specifically for Mail C11.4.2 – Implement Standard-Depth Upper Cabinets

#### Space Planning Strategies for the Next Co-Living House

**Floor Plan 4** presents the proposed layout with room labels. Revisions are detailed according to four zones; primary social areas, private areas, support spaces, and secondary social areas. Additionally, detailed recommendations for all areas are articulated in individual tables with references to the UD principles that would be enhanced by the change.



Floor Plan 4. Proposed First and Second Floor for Next-Generation Co-Living House.

#### Front of House/ Primary Social Areas:

The location of the primary social areas at the front of the house is maintained. The revised version of the plan demonstrates two fundamental adjustments for this area; changes to the kitchen and access to the wrap-around porch.

The proposed kitchen layout enhances users' functionality in multiple ways. First, the central island was enlarged for additional storage and counterspace. It also incorporates counter-height seating for residents to use when prepping meals, taking a break, or collaborating with others working in the kitchen. Second, kitchen appliances were carefully considered and placed within zones that do not overlap, thus reducing congestion in a multi-user space. In particular, a larger refrigerator was accommodated to adequately serve five adults, and, a microwave was placed within a desired reach range to improve resident safety and reduce tolerance for error.

Third, the tall cabinetry along the north wall accommodates for each of the five residents to have their own equal section of storage space; allocating whose items go where is simplified and located within one zone. Lastly, the door to access the wrap-around porch was relocated from the front façade to the west side. This not only eliminates the perception of two front doors to create a designated front entry, it also allows for a stronger relationship between the kitchen and adjacent dining room (see **Image 31**). More specific details for the primary social spaces can be found in **Tables 13 - 16**.

Recommendations for Entries	UD1	UD2	UD3	UD4	UD5	UD6	UD7		
Provide low-tech security features at both back doors (e.g. peep holes at standing and sitting height) to allow residents to confirm who is on the other side of the door.	+			+	+				
Use an accessible, low-profile threshold at all entry doors for smooth rollling transitions for mobility devices and to reduce tripping hazards.	+				+	+			
Provide more clearance at the back door by reversing the swing so the door opens towards the garage. This will aid residents who are entering the space with items in their hands and allow mobility devices to navigate freely.					+	+	+		
Consider providing a landing zone at the back entry so that groceries or other items may be set down, if needed, upon entry for relief.		+			+	+			
Since the back door is the primary entry for residents, consider providing storage for personal coats, boots, etc.						+			
Make the front door to the home more distinguishable for guests by eliminating two doors on the front façade.			+		+				
Create a distinguishable sidewalk path from the parking area to the front entry.			+				+		
JD1: Equitable Use, UD2: Flexbility in Use, UD3: Simple and Intuitive, UD4 Perceptiable Information,									

UD5: Tolerance for Error, UD6: Low Physical Effort, UD7: Size and Space for Approach and Use.

**Table 13.** Detailed recommendations for the Entries that address the seven Principles of Universal Design.

Hood located above the cooktop with a window to provide view to shared courtyard.

Undercounter lighting to support visual tasks.

Microwave and oven located at more accessible reach ranges.



Image 31. Proposed kitchen layout.

Tall storage designed in 5 sections to accommodate house occupancy.

Larger refrigerator located at the end to reduce overlaps in workzones and circulation.

*Relocate door to wrap-around porch.* 

Space beneath island for mobile cart to transport items to the dining area.

Recommendations for Kitchen	UD1	UD2	UD3	UD4	UD5	UD6	UD7	
Place the microwave at a reach range of 36"-42" A.F.F. (within wall cabinetry) to create more flexible use and easier reach range for users.	+				+	+	+	
Design cabinetry so division of space can be intuitively allocated by the number of residents living in the home.	+		+				+	
Provide a larger refrigerator (e.g. 48" built-in, or, two - smaller 30" refrigerators) so there is more space for each resident to store cold food goods of their choice.	+	+					+	
Design the island to provide for multiple functions; accomodate resident seating, and create space underneath to store a cart. The cart could be used to transport items to and from the dining room and/or back entry.	+	+				+	+	
Select a countertop material that has a "softer" finish to reduce sharp sounds that could trasmit to resident bedrooms (e.g. Paperstone).				+				
Provide a range of ambient and task lighting options to suit a variety of preferences and visual needs.		+		+	+	+		
Carefully consider appliance locations to avoid overlaps when doors are open (e.g. refrigerator door overlaping dishwasher drawer).					+	+	+	
Alter location or eliminate the circular window to allow for more opportunities for upper cabinet storage.							+	
Incorporate under-cabinet lighting to create a more functional work area and reduce the potential risk of injury due to insufficient lighting.				+	+			
Select cabinetry with sufficient depths for items being stored.		+						
UD1: Equitable Use, UD2: Flexbility in Use, UD3: Simple and Intuitive, UD4 Perceptiable Information, UD5: Tolerance for Error, UD6: Low Physical Effort, UD7: Size and Space for Approach and Use								

**Table 14.** Detailed recommendations for the Kitchen that address the seven Principles of Universal Design.

Recommendations for Dining Area	UD1	UD2	UD3	UD4	UD5	UD6	UD7		
Select dining chairs that can fit underneath the apron of the table so residents can reduce the distance between themselves and their meal.	+	+			+		+		
Select lighter weight dining chairs that are easier for residents to move independently.	+					+			
Consider window treatments for the dining room windows, including the clerestory windows, that allow for greater control of the level of natural light in the space at different times of day.		+		+					
At the bench seat, create a more easily accessible storage area that is not exposed to the potential of water damage. This community storage space should be designed to consider low physical effort as well as bending and reach ranges.					+	+			
UD1: Equitable Use, UD2: Flexbility in Use, UD3: Simple and Intuitive, UD4 Perceptiable Information, UD5: Tolerance for Error, UD6: Low Physical Effort, UD7: Size and Space for Approach and Use.									

**Table 15.** Detailed recommendations for the Dining Area that address the seven Principles of Universal Design.

Recommendations for Living Room	UD1	UD2	UD3	UD4	UD5	UD6	UD7		
Design shelving and cabinetry so space can be intuitively allocated by the number of residents living in the home.	+		+				+		
Consider acoustic wall construction or additional insulation for walls separating the living room and the individual resident bedrooms to reduce sound transmission and increase privacy.				+					
Select more seating options that have a maximum seat height of 17-19" A.F.F. and a maximum depth of 20" to reduce effort in rising from chairs and sofas independently.		+				+			
Consider space planning the furniture to provide appropriate clearances between items for circulation of mobility devices.							+		
Provide central, overhead, ambient lighting and more effective task-lighting options that allow for easier visual perception. Lighting should also be a consistent color rendition as the surrounding dining and kitchen areas.				+					
UD1: Equitable Use, UD2: Flexbility in Use, UD3: Simple and Intuitive, UD4 Perceptiable Information, UD5: Tolerance for Error, UD6: Low Physical Effort, UD7: Size and Space for Approach and Use									

**Table 16.** Detailed recommendations for the Living Room that address the seven Principles of Universal Design.

#### Private Areas for Resident Bedrooms/ Bathrooms:

Within the improvement plan, five different bedroom and bathroom configurations are presented (see **Floor Plan 4**, page 22). Each layout seeks to address various storage opportunities, privacy considerations, and proper adjacencies amongst bathroom features. Without significantly altering the footprint, these configurations successfully provide an equitable amount of space to suit resident preferences, personalization, and various furniture arrangements. In fact, all possible configurations were designed with the ability to be repeated throughout the plan, so each resident would be granted the same general layout and equal amount of space.

Recommendations for Resident Bedrooms and Bathrooms	UD1	UD2	UD3	UD4	UD5	UD6	UD7	
At the bench seat, create a more easily accessible storage area that is not exposed to the potential of water damage. The design should reduce physical effort and chance of injury.	+				+	+	+	
Design a closet configuration that maximizes vertical storage opportunities without compromsing the safety of the residents due to heavy shelving loads at higher reaches.	+				+	+	+	
Consider repositioning the door to bedrooms 3 and 4 to decrease or eliminate direct sightlines into the residents' private rooms from the living area.	+	+					+	
Configure the closet in relation to the bathroom to eliminate the blind corner created from the direct adjacency of the vanity to the closet.							+	
Consider utilizing window controls that are easily accessible to all residents and allow them the ability to personally control the daylighting entering the space.	+	+				+		
Consider relocating the pocket door to close off the bathroom space to provide visual privacy and create two distinct areas.		+						
UD1: Equitable Use, UD2: Flexbility in Use, UD3: Simple and Intuitive, UD4 Perceptiable Information,								

UD5: Tolerance for Error, UD6: Low Physical Effort, UD7: Size and Space for Approach and Use

**Table 17.** Detailed recommendations for the Resident Bedrooms and Bathrooms that address the sevenPrinciples of Universal Design.

#### **Options for Resident Room Configurations**

The configuration designated as "**the Original**" represents how the bedroom and bathroom are currently laid out in the house, with the addition of a shelving solution that addresses the blind corner.

Bedroom and bathroom configuration **Option 1** maintains the original layout with the additional shelving to address the blind corner, and relocates the pocket door to enclose the entire bathroom – creating one space and eliminating visual access from the bedroom.

Bedroom and bathroom configuration **Option 2** provides a new, walk-in closet solution that maximizes functional and accessible storage space. The bathroom fixtures then are enclosed within one space via a pocket door. All fixtures were kept the same size as the original, but the room itself was made slightly larger to provide proper clearances.

Bedroom and bathroom configuration **Option 3** also provides a walk-in closet solution. The closet itself is smaller than Option 2 and has a wider opening, so there is a greater amount of visual access from the bedroom. The smaller closet space, however, allows for a larger bathroom that, again, holds all three fixtures in one enclosed space, but both the shower and the vanity are larger than the original.

Bedroom and bathroom configuration **Option 4** moves the closet from inside the bathroom area to the bedroom area. While moving the closet into the bedroom area will limit wall space for furniture configurations, it does allow the bedroom's size to increase. It also allows for the bedroom entry door to be relocated – eliminating sight lines from the main living spaces. The bathroom is entirely closed off by a pocket door and is configured to create designated shower, toilet, and vanity zones. In comparison to other arrangements, this option allows the toilet to be directly accessible upon entry, which may be desirable in some cases.

#### Secondary Social Areas:

The secondary social areas of the house include the porches, the den, and the living area on the second floor (See **Tables 18 - 20**). The revised plan demonstrates how the wrap-around porch could be slightly enlarged to allow for more clearance to navigate around furniture. The area on the second floor of the house was reconfigured to demonstrate options for more versatile use of the space.

The revised second floor plan shows a murphy bed that could provide sleeping accommodations for overnight guests. With, or without the bed, the wall system serves as a storage opportunity for items that suit various activities such as hobbies and crafts. A half-bath would provide additional convenience for users of the space, so they would not have to go downstairs to use their own bathrooms or the guest bath. Additionally, the mechanical space is relocated to the second floor, and, the bulk storage that was previously on the second floor is now on the main level (see Utility and Support Spaces).

Recommendations for Second Floor	UD1	UD2	UD3	UD4	UD5	UD6	UD7		
Incorporate more ambient and task lighting options that support the level of light needed for various fine-motor and visual activities being performed in the space.		+		+					
Consider the addition of a murphy bed with built- in storage options for residents' guests.		+					+		
Add a half-bath to reduce the physical effort required to go downstairs to use the public toilet, and allow more flexible use of the space for overnight guests.		+				+			
Provide storage needed for items used upstairs, but relocate shared bulk storage for items used on main floor to the main floor. This will reduce physical effort and the potential hazard in transporting items while managing the stairs.					+	+			
UD1: Equitable Use, UD2: Flexbility in Use, UD3: Simple and Intuitive, UD4 Perceptiable Information, UD5: Tolerance for Error, UD6: Low Physical Effort, UD7: Size and Space for Approach and Use									

**Table 18.** Detailed recommendations for the Second Floor that address the seven Principles of Universal Design.

Recommendations for Porches	UD1	UD2	UD3	UD4	UD5	UD6	UD7			
Widen the porch area to allow for increased circulation around furniture, especially for those using a mobility device.	+						+			
Consider storage options for equipment or accessories for outdoor activities. (e.g. watering can for plants)		+								
Consider a different porch configuration to allow for additional space in the kitchen.							+			
Consider widening the porch not only for proper circulation around furniture, but for the addition of a table and chairs for dining purposes. This could become not only another dining option, but a great opportunity for collaboration amongst members of the community in the future. (Ex: Residents eat a meal on the porch and a resident from a different home walks by - this sparks a conversation.)							+			
UD1: Equitable Use, UD2: Flexbility in Use, UD3: Simple and Intuitive, UD4 Perceptiable Information, UD5: Tolerance for Error, UD6: Low Physical Effort, UD7: Size and Space for Approach and Use.										

**Table 19.** Detailed recommendations for the Porches that address the seven Principles of Universal Design.

Recommendations for Den	UD1	UD2	UD3	UD4	UD5	UD6	UD7		
Furniture space plan should provide appropriate circulation clearances and avoid obstructions when entering the space.		+					+		
Select window treatments with controls that are within reach of residents. Also consider placing them in a manner that covers the entirety of the window to maximize the control daylighting.	+					+	+		
Change the hardware on barn-style door to a handle pull rather than a recessed pull to allow better grip and control.	+			+		+			
UD1: Equitable Use, UD2: Flexbility in Use, UD3: Simple and Intuitive, UD4 Perceptiable Information, UD5: Tolerance for Error, UD6: Low Physical Effort, UD7: Size and Space for Approach and Use									

**Table 20.** Detailed recommendations for the Den that address seven Principles of Universal Design.

#### The Utility and Support Spaces:

Observations from the site visit note that the laundry/ utility area was located at the intersection of hallways and the adjacent guest bathroom. The redesign responds to multiple issues identified in the analysis and design charette. First, the hallway leading from the back door was slightly adjusted to increase the area for circulation at critical points (See **Table 21**).

The laundry room and adjacent guest bathroom redesign aimed to use space in a more efficient manner. The wall separating the two spaces was moved to align with the wall separating the stairway and adjacent storage room (formerly the mechanical closet). This was done to simplify structure and reduce costs.

Recommendations for Hallways	UD1	UD2	UD3	UD4	UD5	UD6	UD7		
Increase the hallway width to 60" accomodate the use of mobility devices or circulation both ways, simultaneously.	+	+					+		
Reconfigure the hallway jog to allow for easier access to resident bedrooms in case of emergency.	+				+		+		
Within the reconfiguration of the kitchen, reposition the work space and cabinets for the information center to increase the width of the intersection of the information center and the back hallway to create overall better circulation.	+	+					+		
Consider creating an additional hallway to the other side of the home to eliminate the long distance from the back door to bedrooms.						+	+		
UD1: Equitable Use, UD2: Flexbility in Use, UD3: Simple and Intuitive, UD4 Perceptiable Information, UD5: Tolerance for Error, UD6: Low Physical Effort, UD7: Size and Space for Approach and Use									

**Table 21.** Detailed recommendations for Hallways that address seven Principles of Universal Design.

Then, the jog in the newly designated storage room was eliminated and, as a result, the guest bathroom fixtures were relocated so a shared plumbing wall can be planned with the adjacent laundry room. While this bathroom was reduced in size, it is now entirely accessible.

In the laundry room, the door swing orientation was switched to provide a recessed washer and dryer zone and storage zone. This storage zone incorporates tall cabinetry for brooms and other large cleaning items, and additional storage for other supplies. The unutilized, floor mop sink was replaced with a more desirable utility sink for resident use.

Finally, the mechical area on the first floor was relocated to the second floor so this space could serve as a central, shared storage solution for large items (e.g. the Chrismas tree). This will eliminate the need to carry large or bulky items up and down the staircase.



Plan 5. Service & support spaces on first floor.

Recommendations for Laundry Room	UD1	UD2	UD3	UD4	UD5	UD6	UD7			
Provide a counter-height rinse sink for handwashing items to replace current mop sink.	+					+	+			
Provide accessible storage options for tall equipment such as vacuums and mops.							+			
Provide shelving options at a lower height for more accessible reach at the washer and dryer.	+	+				+	+			
UD1: Equitable Use, UD2: Flexbility in Use, UD3: Simple and Intuitive, UD4 Perceptiable Information, UD5: Tolerance for Error, UD6: Low Physical Effort, UD7: Size and Space for Approach and Use										

**Table 22.** Detailed recommendations for Laundry Room that address seven Principles of Universal Design.

#### Material Considerations:

The material selections for the house all appear to be of good quality and durability for a home with five residents. The residents marveled at their appearance, and mentioned their beauty several times. There were some very interesting observations about some of their properties, however, that might be of interest when considering finish selections for future houses.

**Materials can contribute to noise:** The residents of Thistledown are sensitive to not making too much noise in the kitchen and living room area, especially in the mornings and evenings so they don't bother other residents in their private bedrooms. In particular the ladies observed that the countertops, (which were well liked for their almost luxury appearance) were notably loud when the residents placed their dishes and cups upon them.

The team researched "softer" alternatives that would be comparable in price, appearance, installation, and maintenance. PaperStone® Countertops are a stain resistant, heat-resistant, non-porous surface created from recycled paper and a non-petroleum resin. Due to its content, it is durable, easy to install, more acoustically absorbing, and a more sustainable alternative to the current installed counter surfaces.

**Materials can impact safety:** The hardwood flooring and carpet within the shared social spaces of the house were other materials the residents loved the look of but wondered if there was a softer alternative in case of falls. The elimination of raised transitions between two materials is also desirable. Forbo Marmoleum in the Striato Textura might be an effective alternative to the hardwoods due to its increased slip resistance (R10), softer landing, and sustainability properties. The double embossing on the linoleum effectively replicates the look of hardwood floors, and the maintenance data suggests that it would be easy to take care of.

To prevent the dangerous temptation of placing an area rug on top of resilient or hardwood flooring to define the living area, consider creating an open space in the subfloor to allow for the easy installation of a carpet inset. There are a wide variety of manufacturers who could provide a low-pile option. The team found FLOR (a subsidiary of Interface®) carpet tiles to provide a residential appeal.

Carpet tiles can easily be used in more residential settings to replicate the appearance of an area rug or broadloom carpet but can be replaced in segments when they begin to show wear. The use of TacTiles® as a glue-free adhesive eliminates the mess, odor and drying time of spread adhesives. They can be directly applied to the subfloor, creating an easier installation process and the ability to match material height levels that eliminate the need for thresholds or edges that pose as a tripping hazard.

#### **Furniture Considerations:**

Acknowleding recommended furniture dimensions for older adults becomes increasingly important for safety and comfort. The seated height (the distance needed to place feet comfortably on the floor when sitting) for the majority of females over 65 years of age is approximately 16.5"; for the majority of males, it is 17". Seat depths (the distance needed to reach the seatback and still place feet on the floor) is approximately 17" for females, and 18" for males (see **Images 32** and **33**).

These dimensions are based on research that measures the discrete distance from the buttocks resting on a hard surface (e.g. park bench). When considering soft upholstered seats, compression of the cushion is a factor that will vary based on the height and weight of the individual.

It is not reasonable to select soft seating that has a finished seat height below 17.5" because the compression will result in the hips being too low to rise comfortably, but selecting all lounge seating with 19" high seats is also not sensitive to a range of user needs. Another consideration is selecting furniture with cushions constructed with dense foam to reduce compression. However, the density of the foam can affect the comfort level of the user. Finding a balance between body support and comfort is critical. Seats with depths greater than 18" should be supplemented with bolster pillows so residents can make personal adjustments to suit their comfort levels and individual body types.

# Cushion Depth High tego

**Image 32.** Lounge seating should be selected for a range of user needs. Density of cushions should be considered.



References on Furniture Anthropometrics:

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Image \_. Lounge Chair by Fairfield Chairs. Retrieved from; https:// www.fairfieldchair.com/style\_detail/ff/div/1/id/1459-01/rid/26/cat/41/wc/

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**Image 33.** Schematic of critical chair dimensions.

#### **Charrette Participants:**



**Design Charrette:** Photo courtesy of Garden Spot Communities. David Givens, photographer.

Ruth Dunlap, *Resident,* Thistledown Co-Living House

Esther Courtney, *Resident,* Thistledown Co-Living House

**Vida Beiler**, *Resident*, Thistledown Co-Living House

Jackie Berrios, *Social Worker*, Thistledown Co-Living House

**J. Arthur Johnson**, *Architect, Retired,* Garden Spot Village

Larry Knepper, *Builder*, Garden Spot Village

**Dave McGill**, *Architect*, SFCS Architects

Amy Carpenter, *Principal Architect*, SFCS Architects

Melissa C. Pritchard, *Managing Principal*, SFCS Architects

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Mikayla Adkins, Interior Design Student, Kansas State University

**Brett LaFleur**, *Interior Design Student*, Kansas State University

Hannah Richardson, Interior Design Student, Kansas State University

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Lauren Tines, Interior Designer/ R&D Coordinator, StudioSIX5

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#### POE Team:

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Hannah Richardson, Interior Design Student, Kansas State University

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**Migette Kaup**, *Professor*, *Interior Design & Geronotology*, Kansas State University



*The POE Team and the Women of Thistledown House:* Back (left to right) Brett LaFleur, Lauren Tines, Ruth Dunlap, Migette Kaup, Mikayla Adkins, Sydney Tucker. Front (left to right) Hannah Richardson, Esther Courtney, Vida Beiler, Ruth Kolb.

#### Appendix A

#### Guided Interview/Focus Group Questions for Garden Spot Co-Living POE

#### **Kitchen / Dining**

- 1. Is there enough food storage?
- 2. How's the microwave reach? Would an on-the-counter or below-the-counter option be better?
- 3. Is there sufficient counter space when cooking?
- 4. Is the kitchen layout overall effective? Do you feel like there's enough space in the kitchen?
- 5. How do you feel about the kitchen and dining proximity? Do you appreciate the separation between these spaces or would you prefer more collaboration opportunities?
- 6. What is the niche near the dining used for?
- 7. What are the cooking practices? How many meals are prepared simultaneously?
- 8. How do you store your food? Is it individually or collaboratively?
- 9. Is the under-cabinet lighting effective?
- 10. Is there enough natural lighting in the kitchen? What about task lighting?
- 11. How convenient is it to have the microwave over the cooktop?
- 12. How do you utilize the wrap-around kitchen space?
- 13. How frequently does the oven get used?

#### Social Areas / Daily Rhythms

- 1. In what space(s) do you feel most at home or comfortable?
- 2. In what space do you feel the least?
- 3. Where do you get the mail and what does this process look like for each of you?
- 4. Are two entries to the home necessary? Does this confuse visitors/guests?
- 5. Do family members come to the house often?
- 6. Are there agreements worked out amongst the residents?
- 7. How do holidays work? Are there more people who stay at the house?
- 8. How do you accommodate for each individual's family involvement desires?
- 9. Does the space provide opportunities for family versus individual time? Is there any uncomfortable overlapping?
- 10. How often do you use the outdoor porch spaces? Do you think two are necessary?
- 11. How often do you use the "den" space? Would it be beneficial for it to be multi-purpose?

#### Laundry Area

- 1. How well does the laundry room function?
- 2. Is there enough room to fold and hang clothing here?
- 3. Can you hand wash items if desired?
- 4. Where are laundry detergents stored?

#### Appendix A

#### Guided Interview/Focus Group Questions for Garden Spot Co-Living Project, cont.

#### Bedroom / Bathrooms

- 1. Can you have enough of your desired furniture in your bedroom space to suit your needs?
- 2. How do you utilize the window seat in the bedroom? Is the storage in the window seat easily accessible?
- 3. How do you use the closet in the bathroom? Would it be better for it to be accessible from the bedroom?
- 4. How much clothing storage is optimal?
- 5. Do you like the walk in shower?
- 6. Would a vanity space be desired?
- 7. Is there enough bedroom storage provided?

#### Storage

- 1. In general, do you have enough storage inside the house for your needs?
- 2. Is the coat closet in the "foyer" big enough?
- 3. General Functions / Circulation
- 4. Does this home support your technological needs?
- 5. Should there be a separate workspace?
- 6. Do you have individual control over the temperature in your space?
- 7. How frequently is the door from the kitchen to the porch accessed?
- 8. Would consideration for the door exiting the dining room to access the porch be suitable?
- 9. Is the second floor space used regularly? If so, for what functions?
- 10. Is there a specific space that feels too small and you would benefit from an increase in size?
- 11. Are there proper lines of sight throughout the house?
- 12. Does the window height work for you?
- 13. Where have you noticed shortcomings in material durability?

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**The Society for the Advancement of Gerontological Environments (SAGE)** who invested in this POE project through their commitment to furthering knowledge about environments for older adults. This project carries SAGE's on-going commitment to POE work into classroom and engages our emerging professionals.

**The Women of Thistledown House** who invited us into their home and shared so much of themselves. You taught us what a successful co-living experience looks like.

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To everyone who was involved, thank you for making this project possible and such a wonderful experience.

## Helpful Links

Click below to learn more about the organizations involved in the student-directed POE.





# SFCS





### **About SAGE**

Founded in 1994, the Society for the Advancement of Gerontological Environments (SAGE) is a membership-based organization that represents excellence in all facets of the senior-living industry industry.

To achieve its mission, "To promote collaboration among aging services providers, design professionals, regulators, residents, researchers, manufacturers, educators, students and others interested in providing innovative and appropriate environments for older adults," SAGE:

- Provides a nexus for collaboration among all disciplines involved in the development, operation, and regulation of settings for older adults;
- Offers educational forums that feature current research and best practices for the design of living environments;
- Evaluates senior living environments based on SAGE's design principles and shares results through conferences and publications; and,
- Promotes regulatory change and research that supports resident-directed care.

SAGE members enjoy networking and design-jury opportunities, free AIA-approved monthly webinars, committee participation to advance the SAGE mission and initiatives, exclusive member discounts, and more. To learn more about the benefits of SAGE membership, visit <u>www.sagefederation.org</u>.

