Aslı GÖREZ A HOUSING DESIGN ASSESSMENT APPROACH TO IMPROVE THE QUALITY OF LIFE IN OLD AGE AGU 2022

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A THESIS
SUBMITTED TO THE DEPARTMENT OF ARCHITECTURE
AND THE GRADUATE SCHOOL OF ENGINEERING AND
SCIENCE OF ABDULLAH GUL UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
MASTER

By
Aslı GÖREZ
August 2022

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SCIENTIFIC ETHICS COMPLIANCE

I hereby declare that all information in this document has been obtained in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all materials and results that are not original to this work.

Aslı GÖREZ

REGULATORY COMPLIANCE

M.Sc. thesis titled A Housing Design Assessment Approach To Improve The Quality Of Life In Old Age and has been prepared in accordance with the Thesis Writing Guidelines of the Abdullah Gül University, Graduate School of Engineering & Science.

Prepared By	Advisor
Aslı GÖREZ	Asst. Prof. Buket METİN

Head of the Architecture Program

Prof. Burak ASİLİSKENDER

ACCEPTANCE AND APPROVAL

M.Sc. thesis titled A Housing Design Assessment Approach To Improve The Quality Of Life In Old Age and prepared by Aslı Görez has been accepted by the jury in the Architecture Graduate Program at Abdullah Gül University, Graduate School of Engineering & Science.

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JURY:

Advisor : Asst. Prof. Buket METİN

Member : Assoc. Prof. Yasemin AFACAN

Member : Assoc. Prof. Fatih YAZICIOĞLU

APPROVAL:

The acceptance of this M.Sc. thesis has been approved by the decision of the Abdullah Gül University, Graduate School of Engineering & Science, Executive Board dated ….. /….. / …….. and numbered ……..……. .

…….. /…….. / ……..

(Date)

Graduate School Dean

Prof. Dr. İrfan ALAN

ABSTRACT

A HOUSING DESIGN ASSESSMENT APPROACH TO IMPROVE THE QUALITY OF LIFE IN OLD AGE

Aslı Görez

MSc. in Architecture

Advisor: Asst. Prof. Buket Metin

August 2022

The increase in the number of the older living independently due to the demographic transformation and changes in the household structure brings the housing design for older adults to the agenda. Depending on the biological, psychological and social losses brought about by the aging process, the relationship of the elderly with housing also changes. Many older adults need help with daily activities that they used to perform easily. Dysfunctional housing, dysfunctional neighborhoods and even dysfunctional cities negatively affect the quality of life of older adults. Domains affecting quality of life, which is a multi-layered concept, are different from other age groups in old age. This difference is also reflected in the housing design. It indicates a strong relationship between housing and quality of life in old age. For houses that can adapt to the changes brought about by aging, it is necessary to clearly define how the relationship between the design considerations required for housing design and the domains of quality of life is established. This constitutes the main problem and research question of the thesis. This thesis discusses the necessary design issues for housing design that increases the quality of life of older adults whose independence increases with the biological, psychological and social losses caused by aging. The thesis is to propose a housing design assessment approach based on the interrelationship of 223 design considerations derived from the comparative analysis of *Lifetime Homes Design Guide, Livable Housing Design Guidelines, Universal Design Guidelines for Homes in Ireland, Older Persons' Housing Design: A European Good Practice Guide, EVOLVE Tool - Evaluation of Older People's Living Environments, and Accessibility Guide in Turkey*, and 40 domains derived from the comparative analysis of 14 quality of life approaches from pioneers, official institutions and researchers in architecture, gerontology and sociology. This assessment approach includes design considerations to the quality of life of older adults so that they can live independently in their existing or newly designed housing for as long as possible. The

approach, which deals with the housing design process in five scales as housing, building, community, immediate surrounding and urban context, has been applied for two houses in Turkey: Retirement Houses in Nilüfer, Bursa and Small Houses in Çukurova, Adana. As a result of the assessment, applications to negatively affect the quality of life of the elderly at all design scales are identified.

Keywords: housing design for older adults, quality of life in old age, housing design considerations, , quality of life domain.

ÖZET

YAŞLILIKTA YAŞAM KALİTESİNİ ARTIRMAK İÇİN BİR KONUT TASARIMI DEĞERLENDİRME YAKLAŞIMI

Aslı Görez

Mimarlık Anabilim Dalı Yüksek Lisans

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Ağustos 2022

Demografik dönüşüm ve hane yapısındaki değişimlere bağlı olarak bağımsız yaşayan yaşlı sayısının artması, yaşlılara yönelik konut tasarımını gündeme getirmektedir. Yaşlanma sürecinin getirdiği biyolojik, psikolojik ve sosyal kayıplara bağlı olarak yaşlıların barınma ile ilişkisi de değişmektedir. İşlevsiz konutlar, işlevsiz mahalleler ve hatta işlevsiz şehirler, yaşlı yetişkinlerin yaşam kalitesini olumsuz yönde etkilemektedir. Çok katmanlı bir kavram olan yaşam kalitesini etkileyen alanlar, yaşlılıkta diğer yaş gruplarından daha farklıdır. Bu farklılık konut tasarımınıda etkiler. Bu nedenle, yaşlanmanın getirdiği değişimlere uyum sağlayabilen konutlar için, gerekli konut tasarım hususları ile yaşam kalitesi alanları arasındaki ilişkinin nasıl kurulduğunun net olarak tanımlanması gerekmektedir. Bu ilişkiyi kurmak tezin temel problemini ve araştırma sorusunu oluşturmaktadır. Tezde, *Yaşanabilir Konut Tasarım Yönergeleri, İrlanda'daki Evler için Evrensel Tasarım Yönergeleri, Yaşlı Kişilerin Konut Tasarımı: Avrupa İyi Uygulama Kılavuzu, EVOLVE Aracı - Yaşlı İnsanların Yaşam Ortamlarının Değerlendirilmesi ve Erişilebilirlik Kılavuzu* tasarım kılavuzlarının karşılaştırmalı analizinden türetilen 223 tasarım hususu ile mimarlık, gerontoloji ve sosyoloji alanındaki öncüler, resmi kurumlar ve araştırmacılara ait 14 yaşam kalitesi yaklaşımının karşılaştırmalı analizinden elde edilen 40 yaşam kalitesi alanını karşılıklı ilişkisine dayanan bir konut tasarımı değerlendirme yaklaşımı önerilmektedir. Bu değerlendirme yaklaşımı, mevcut veya yeni tasarlanmış konutlarında mümkün olduğunca uzun süre bağımsız yaşayabilmeleri için yaşlı yetişkinlerin yaşam kalitesine yönelik tasarım değerlendirmelerini içerir. Konut tasarım sürecini konut, yapı, topluluk, yakın çevre ve kentsel bağlam olmak üzere beş ölçekte ele alan yaklaşım, Türkiye'de iki konut için uygulanmıştır. Bu konutlar Bursa Nilüfer'de bulunan Emekli Konutları ve Adana Huzurevi arazinde yer alan Küçük Evlerdir. Değerlendirme sonucunda tüm tasarım

ölçeklerinde yaşlıların yaşam kalitesini olumsuz yönde etkileyecek uygulamalar tespit edilmiştir.

Anahtar Kelimeler: yaşlı yetişkinler için konut tasarımı, yaşlılıkta yaşam kalitesi, konut tasarım parametleri, yaşam kalitesi alanları

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LIST OF ABBREVIATIONS

ABA	Architectural Barriers Act
ADA	American Disability Act
ADLs	Activities of Daily Living
FHAA	Fair Housing Amendments Act
IADLs	Instrumental Activities of Daily Living
OADR	Old-Age Dependency Ratio
QOL	Quality of Life
SDG	Sustainable Development Goals
TOKI	Housing Development Administration of Turkey
TUIK	Turkish Statistical Institute
UN	United Nations
UNFPA	United Nations Population Fund
WHO	World Health Organization
WEF	World Economic Forum
WPP	World Population Prospects
WHOQL	World Health Organization Quality of Life Group

Chapter 1

Introduction

The demographic transformation due to the increase in the aging population is one of the critical changes the world is facing in the twenty-first century. According to the United Nations Population Fund (UNFPA) and World Economic Forum (WEF), it is expected that one out of every five people in the world will be 60 years or older, and the share of the older population in the total population will increase to 22% by 2050 (UNPFA, 2022). As to the World Population Prospects (WPP) data, the growth of the older population is projected to be faster in developing regions than in developed regions (UN, 2022). The United Nations (UN) claims that two out of every three older adults will live in developing countries in 2050, and Turkey is expected to be one of them. WPP indicates that the pace of population aging in Turkey is almost twice that of European countries (UNPFA, 2022). The proportion of the older population is expected to reach 20% by 2050, which is 9.5% currently, according to data of the Turkish Statistical Institute (TUIK) reported in 2020. The old-age dependency ratio (OADR) has also increased with the aging population globally. Projections show that the share of older adults in the total ratio of dependents (people younger than 15 and older than 60) will be 36% worldwide in 2050. The situation is not different in Turkey. OADR is expected to reach 30% by 2050. Population aging also affects the household structure, especially in developing countries. Recently, the proportion of older adults living “independently”, which means living alone or with only one spouse, has been increasing. According to the TUİK, the proportion of older adults living independently will be 14.7% in 2050 (TUIK, 2022). According to the issues mentioned above, it can be said that a demographic structure, consisting of individuals of 60 years and older who have an increasing dependency with the losses brought by the aging and tendency to live independently with the change in household structure, will be rapidly formed in Turkey by 2050, as well as in the whole world. It can also be said that the demographic transformation will create new demands on many sectors in Turkey, and the housing sector could be one of them. Econometric estimates for housing demand show that the demographic shift caused by

population aging will significantly impact housing demand than population growth until 2050 in Turkey. The fact that the phrase "housing for older adults" has entered the housing sector also confirms the existence of this demand. The topics covered in the Aging Specialization Commission Report based on the 10th National Development Plan and the decisions made by the Housing Development Administration of Turkey (TOKİ) to build housing for older adults show that the Turkish government has started to get into action towards this demand (Republic of Turkey Ministry of Development , 2014). According to these facts, it can be said that there is a demand for housing for older adults in Turkey, and this demand will increase until 2050. So, housing design for older adults is a relatively new topic for the Turkish housing sector compared to other countries, like the USA and UK, with a high proportion of the aging population. Aging is a period in which the quality of life decreases with biological, psychological, and sociological losses. Moreover, housing is the main living space where the older adults spend most of their time. Therefore, the first goal of housing designed for older adults should improve the residents' quality of life.

1.1 Problem Statement and Research Question

The increase in the number of the elderly living independently due to the demographic transformation and changes in the household structure brings the housing design for older adults to the agenda. Depending on the biological, psychological and social losses brought about by the aging process, the relationship of the elderly with housing also changes. Many older adults need help with daily activities that they used to perform easily. These aids are usually wheelchairs, walking aids or caregivers. This means that the older adult needs almost twice as much space for an activity than before. When the need for extra space that arises in all spaces, especially in corridors, bathrooms and kitchens, is not met, the house becomes dysfunctional. Similar situation is valid for building, neighborhood and city scales. Dysfunctional housing, dysfunctional neighborhoods and even dysfunctional cities negatively affect the quality of life of older adults.

So, what should be the housing design that can adapt to the changes brought by aging? Although there are standards developed for older adults in Turkey, there is no

specific approach to housing design. In the USA, UK and Australia there are standards, regulations and design guidelines that determine the design considerations for a housing's lifetime use. These design considerations offer solutions not only to physical aging but also to the negative effects of psychological and social aging. It shows that housing design affects all domains of quality of life. Domains affecting quality of life, which is a multi-layered concept, are different from other age groups in old age. This difference is also reflected in the housing design. It indicates a strong relationship between housing and quality of life in old age. For houses that can adapt to the changes brought about by aging, it is necessary to clearly define how the relationship between the design considerations required for housing design and the domains of quality of life is established. This constitutes the main problem and research question of the thesis.

1.2 Literature Review

Studies examining the relationship between house design and quality of life in old age are reviewed, as well as studies focused on housing design for older adults. Studies in the literature are explained in chronological order.

Özer (1990) argued that with the changes in the family structure in Turkey, the tradition of taking care of older adults will gradually decrease and the need for housing will gradually increase with the aging of the population. By examining the existing studies in western countries, she made a design proposal that takes the congregate housing type as a model.

Kaya (1994), on the other hand, drew attention to the increasing aging population and the socio-cultural differences of older adults, and emphasized that the physical structure and facilities of the nursing homes are insufficient to meet the needs of older adults, and that alternative housing/facilities for older adults are needed. She proposed alternative spatial solutions to residences and facilities for older adults through the four examples of nursing homes examined.

Gürpınar (2003) revealed the housing shortage for older adults in Turkey and advocated the necessity of building only housing for older adults in the Turkish housing

sector and conducted a feasibility study on this issue. According to the findings of the feasibility study, alternative housing options are put forth for the current aging population in an attempt to assist them preserve their independence and improve the quality of their lives.

Erbaş (2006) examined the example of assisted living housing, which is a type of housing for older adults, and made a design proposal. When deciding on the house's design considerations, the concept used universal design principles. She made the argument that the quality of life will rise when an amicable interaction between older adults and the built environment is developed through design.

Baş (2019) determined the expectations of older adults from housing with a survey study and discussed the spatial needs of housing older adults to be built in the future. She emphasized that the physiological and psychological changes that occur in old age also change the spatial needs. She offered design suggestions that will improve the quality of life in housing design for older adults.

Taşoz (2020) emphasized the importance of accessibility for older adults to be able to carry out their daily living activities independently. She sought a way to design accessible housing for older adults with the analysis method combining aging simulation and persona method. She investigated at the relationship between housing design considerations and quality of life domains in her study.

Kuboshima (2020) claims that the design of the built environment significantly affects the quality of life of older adults. As a result of interviews with 30 older adults living in three different residences designed for the older adults, six domains for quality of life in old age were determined and established their relationship with housing design considerations.

The studies mentioned above all came to the same conclusion: as people age, their relationships with the built environment change. According to these studies, the quality of life in old age declines if a new relationship is not formed between the older adult and the built environment. It is highlighted in every study to identify the housing design considerations for older adults. There are differences between the methods of the studies in determining the housing design considerations. Özer (1990) and Kaya (1994) examine

existing buildings where older adults live and identify design considerations. Gürpınar (2003) and Baş (2019) identify design considerations through surveys for older adults. Nursing homes in Turkey are used as cases in these four studies. While Erbaş (2006) is based on universal design principles, Kuboshima (2020) determines design considerations by comparing existing design guidelines.

Erbaş (2006), Taşoz (2020) and Kuboshima (2020), in contrast to other studies, place a strong emphasis on the significance of the link between concerns with housing design and quality of life domains. But, there are differences between the methods of these studies in determining the quality of life domains. While Erbaş (2006) is based on Maslow's hierarchy of needs, Taşoz (2020) and Kuboshima (2020), determine the domains of quality of life through surveys.

The key weakness in these studies is that they are unable to draw a complete connection between quality of life and housing design considerations. These studies identify the domains of quality of life in old age using subjective data. Most of these studies do not consider laws, rules, or current guidelines when identifying the housing design considerations. Therefore, the majority of the quality of life domains and design considerations highlighted in these studies do not satisfy present demands. The research closes a gap in the literature by establishing a thorough, current relationship between quality of life and house design considerations.

1.3 The Motivation and Objectives

The increase in the demand for housing for older adults and the need for qualified work on this subject constitute the main motivation source of this thesis. The thesis fills a need in the literature by presenting an in-depth, current relationship between quality of life and house design considerations. The main purpose of this thesis is to propose a housing design assessment approach in Turkey to improve the quality of life in old age. The proposed assessment approach is aimed to be thorough enough to account for all design considerations at the housing, building, immediate surroundings community, and urban scales. The assessment approach aims to identify what needs to be done to improve the quality of life in housing for older adults, during the design and use phases. The

assessment approach is intended to be used by architects, researchers, stakeholders in the housing sector and other professionals.

1.4 The Scope and Context

The housing design assessment approach has been established within a specific context, considering the purpose and stages of use. The scope and context of this research are described in turn below.

The general purpose of the research is to define the design considerations required for housing design that improves the quality of life in old age. The scope of the research covers the analysis of objective data, including international and national standards, legislation, laws, and design guidelines used in the housing design for older adults. The research does not include subjective data collected from existing housing for older adults or generated as a consequence of interviews with older adults.

The content of the research consists of certain parameters. The research's target demographic consists of people who are 60 years of age and older. The psychological, sociological, and physical characteristics of the population aged 60 and over are taken into consideration when determining housing design considerations within the context of this research.

The research's target location is housing designed for older adults in Turkey. Cases of housing designed for older adults in Turkey are investigated as part of this research. The assessment approach developed as a result of the research is used in both the design and use stages of the housing designed for older adults in Turkey.

The validity of the research is not limited to a certain time period. The assessment approach is suggested within the confines of the research that maintains its validity at all times by merging the data from the past, the present, and the predicted future.

1.5 Research Design and Methods

The information required for the development of the assessment approach was collected using qualitative methods of data collection.

Along with the literature review, comparative analysis of national and international standards, regulations, and design guidelines utilized in the building of housing for older individuals is done. Two selected housing cases from Turkey are assessed using the methodology outlined in the research. These two housing cases are designed for older adults. The assessment approach developed in the research is used to assess two housing cases from Turkey: Retirement Houses in Nilüfer, Bursa and Small Houses in Çukurova, Adana. The architectural plans of Retirement Houses in Nilüfer, Bursa were obtained from the Housing Development Administration of Turkey (TOKİ). The research of Gürpınar (2003) was used to obtain the architectural drawings for the Small Houses in Çukurova, Adana. Maps and pictures of these two housing cases have been obtained from the web sources.

The research is structured over 7 basic stages. These stages and their contents are explained in order below.

"Aging and Old Age" in Chapter 2 is the first stage of the research. The purpose of this stage is to present a thorough review of aging theories, and psychological, biological, and social aspects of aging, as well as to define a general profile of the older adult. At this stage, qualitative data collection methods are used.

" Quality of Life (QOL) In Old Age" in Chapter 3 is the second stage of the research. The approaches used to identify and categorize quality of life domains are outlined in depth at this stage. Methods for collecting qualitative data are utilized at this stage.

"Housing Design for Older Adults" in Chapter 4 is the third stage of the research. The aim of this stage is to discuss in detail the architectural design approaches that can improve the quality of life in housing design for older adults. Firstly, theories that address

the relationship between older adults and the built environment are explained. Then, architectural polices and guides on housing design for older adults are examined. At this stage, methods for collecting qualitative information are used.

"A Housing Design Assessment Approach to Improve the Quality of Life in Old Age" in Chapter 5 is the fourth stage of the research. The aim of this stage to explain the main structure of the proposed housing design assessment approach. This stage consists of three subsections. The information from Chapter 3 is used to identify the domains of quality of life in old age in the first subsection. The second subsection compares the six design guidelines presented in Chapter 4 to establish the design considerations necessary for housing design for older adults. These design guidelines are *Lifetime Homes Design Guide (LTH), Livable Housing Design Guidelines (LHD), Universal Design Guidelines for Homes in Ireland (UDH), Older Persons' Housing Design: A European Good Practice Guide (OPHD), EVOLVE Tool - Evaluation of Older People's Living Environments (EVOLVE),* and *Accessibility Guide in Turkey (AGT)*. Then, the relationship between housing design considerations and quality of life domains is explained in detail. The third subsection explains how to use the proposed assessment approach.

"Application of The Assessment Approach" in Chapter 6 is the fifth stage of the research. The purpose of this stage is to explain how the proposed assessment approach will be applied through selected housing examples from Turkey. The housing design evaluation approach was applied to two cases of residences designed for older adults, selected from Turkey: Retirement Houses in Bursa, Nilüfer and Small Houses in Adana Çukurova. There is also a subsection in this section where the information obtained from the application is discussed.

"Conclusions and Future Prospects" in Chapter 7 is the last stage of the research. The answers obtained in response to the research questions are summarized and the original value and widespread impact of the proposed assessment approach are discussed. Furthermore, the research's social contribution and which Sustainable Development Goals it supports are described. Suggestions for future studies in this field and innovations to be made in the sector have been put forward.

Chapter 2

Aging and Old Age

The purpose of this chapter is to present a thorough review of aging theories, and psychological, biological, and social aspects of aging, as well as to define a general profile of the older adults.

Old age is the last stage of normal life span and defines a period in which individuals lose their physical, psychological and social independence and become dependent again (Kalınkara, 2016). According to the World Health Organization (WHO), old age also denotes the decrease in the ability to adapt to environmental factors out of one's control (WHO, 2015). Old age is a relative concept by its nature as it differs from person to person according to gender, physical and psychological age, and from society to society according to economic, cultural conditions and historical processes. Therefore, it is very difficult to set an age limit for the beginning of the old age. Although the old age is experienced on a personal level, it can be said that its boundaries are determined by society in large (Wiles, 1987). Old age was first classified chronologically by WHO in 1963 and people over 60 were accepted as older adults. With the increase in life expectancy at birth as a result of developments in health and technology, WHO changed the onset of old age to 65 in 1998 (Bölüktaş & Yıldırım, 2022). According to the United Nations (UN), 60 years and over are considered to be older adults (UN, 1999). Generally, in industrialized countries, the retirement age is used as a limit for the onset of old age. The retirement age varies between 60 and 67 years depending on the development of the countries. While the retirement age is 58 for women and 60 for men in Turkey, it is 66 for both groups in the USA. However, in African and Saharan horse regions where life expectancy is not long, these limits for old age drops to 50 years. Due to the general acceptance of the WHO notion, it can be said that people aged 65 and over chronologically are called **older adults.** WHO classifies the old age period within itself and is named as 65-74 young-old, 75-84 old, 85 and over old-old (Kalınkara, 2016).

Aging is a natural and inevitable process of change that begins in intrauterine life which is the period when the baby is in the uterus and continues until death, and is conceptually different from old age. Old age is a fixed stage whose boundaries are determined by chronological age, while aging is a dynamic process that defines continuity and change in the human life cycle (Wiles, 1987). Aging is a process in which people experience gradual changes in their biological, social and psychological functions over the years as they go through different stages of their lives (Phillips, Ajrouch, & Hillcoat-Nallétamby, 2010). Although the aging process means extinction, the repair and restructuring mechanisms in the human body continue to operate until certain stages of the life cycle. While infancy, childhood, adolescence and adulthood are periods of continuous development, old age is a period of regression that ends with collapse (Öz, 2002). In other words, old age includes an advanced aging process in which physical and mental powers are irreversibly lost due to loss of function and changes in cells, organs and systems. Old age is a period of regression not only physically but also in mental, emotional and social areas. Losses that begin in the biological field cause losses in the psychological and social fields over time. Aging, which is a multidimensional and complex process, is discussed in many scientific publications in three dimensions: biological aging, psychological aging and social aging (Bölüktaş & Yıldırım, 2022; Hooyman & Kiyak, 2018; Phillips, Ajrouch, & Hillcoat-Nallétamby, 2010; Quadagno, 2014; Victor, 2005).

Gerontology is the science that deals with the study of aging to include the study of later life, old age and older adults. Gerontology is generally defined as a science that studies the effects of changes that accompany aging on the individual and society (Victor, 2005). The word gerontology was first used by Elie Metchnikoff, who received the Nobel Prize in medicine in 1903 (Phillips, Ajrouch, & Hillcoat-Nallétamby, 2010). In 1954, the concept of social gerontology entered the literature with the contributions of Clark Tibbits (Tibbitts, 1963). **Social gerontology** is a discipline that advocates the view of examining older adults without isolating them from their social and cultural environments, as distinct from medical gerontology (Kalınkara, 2016). Psychological, biological and social aspects of aging are the subject of social gerontology.

2.1 Biological Aspect of Aging

The biological aspect of aging is related to the changes and functional losses at the level of cells, organs and systems. Biological aging, resulting from the gradual accumulation of a wide variety of molecular and cellular damage, affects an individual's activities of daily living, working life, and communication with the environment (Hooyman & Kiyak, 2018; Hutchison, 2017; Quadagno, 2014; WHO, 2015).

Most of the changes in the aging process are seen in the ***musculoskeletal system*.** With aging, there is a decrease in bone density, resulting in bone weakness, increased fragility and posture disorders. Due to these changes in bone and muscle tissue, shortening in stature, tooth loss, bone fractures, curvature of the legs, hunched posture, decrease in muscle strength and coordination may occur (Yıldırım, Özkahraman, & Ersoy, 2012). As we age, the bones of the spine weaken and collapse under the weight of the upper body, affecting body posture (Quadagno, 2014). In old age, the stature becomes shorter, the head leans forward, the shoulders are low, the spine is bent to the side. It is reported that there is an average of 5 cm stature shortening in the period between the ages of 20 and 70 (Gündüz, 2000). With increasing age, the musculoskeletal system decreases in mass, strength and endurance. As muscle contractions slow down, the older person's hand grip strength, which is a strong predictor of mortality, decreases (WHO, 2015). Since changes in the musculoskeletal system affect movement functions, the mobility and gait speed of older individuals are different from those of young adults. Gait speed, which refers to the time it takes for someone to walk a certain distance, decreases in old age (Ağar, 2020).

Coordinating all body systems, the ***nervous system*** is also responsible for functions such as body balance, sensory, sleep patterns, mood, intelligence and memory. As people age, neuronal losses begin in the nervous system (Hooyman & Kiyak, 2018). The transfer of information from one neuron to another slows down. Due to the loss of these neurons, many older adults experience moderate reductions in memory, planning, and processing speed. However, this decrease is not significant enough to be noticed in daily life. Contrary to popular belief, intellectual and motor functions do not deteriorate significantly with age in the older adults without dementia (Hutchison, 2017). Along with

aging, there are also changes in the sleep pattern directed by the nervous system (Quadagno, 2014). Older adults sleep less each night, wake up more often after falling asleep, and spend less time in deep sleep. Studies have shown that 65% of people aged 65 and over have sleep disorders. Studies show that sleep disorders increase the risk of falling. Older adults with sleep disorders are 3.2 times more likely to fall (Parthasarathy et al., 2015). The nervous system contains the cerebellum, which controls body movements and, to some extent, balance. About 25% of cerebellum cells are lost with aging. The loss of these cells causes decreased flexibility, slowed movements, and stooped, shuffling gait in older adults. Changes in balance and coordination limit daily activities and increase the risk of falling (Quadagno, 2014).

Changes in the musculoskeletal and nervous system affect the ***sensory system***. Changes in sensory functions affect both the physical and socio-psychological conditions of older adults, as information about the environment is collected through our senses of sight, hearing, touch, smell and taste (Quadagno, 2014). One-third of adults over the age of 65 have hearing loss (Hutchison, 2017). As hearing loss affects communication, the risk of anxiety and depression increases in the older person. In this case, it can contribute to social isolation and loss of disability (WHO, 2015). Older adults need more light as the eye's adaptation to darkness, visual acuity, and ability to perceive details decrease with age. Due to poor vision, older adults may find it difficult to perform activities of daily living such as sewing and cooking and avoid participating in social activities (Hutchison, 2017). The functions of the senses of taste and smell decrease with aging. Especially not being able to smell the leaking gas and burning food can be dangerous. Older people have difficulty in doing daily tasks such as choosing medicine from the medicine box and pressing the control button, as the touch sensitivity of the fingertips decreases (Hutchison, 2017). Because the perception of pain is decreased simultaneously with the sense of touch, older adults respond later to painful stimuli. Burns are more serious in older adults because they are late in recognizing whether a surface is hot or not (Quadagno, 2014). As blood circulation decreases in older adults, their bodies lose their ability to regulate heating and cooling. Due to the inability to keep body temperature relatively constant, the risk of hypothermia increases in older adults in extreme hot or extremely cold weather changes. Since the elderly feel better in warm rooms, the room temperature should not be lower than 18°C (Sürmen, 2000).

As older adults' ***intrinsic capacity*** decreases due to the biological changes, losses and diseases described above, the functional capacity also decreases (WHO, 2015). The need for assistance to perform the activities of daily living necessary for independent living increases rapidly with aging (Üçku & Ergin, 1993). The level of independence defined as "doing things alone, making one's own decisions, having physical and mental capacity, having resources, social status and self-confidence" can be determined according to the performance of activities of daily living (Plath, 2008). Activities of daily living are described as basic activities of daily living (ADLs)- such as bathing, eating, dressing, walking a short distance, shifting from a bed to a chair- and instrumental activities of daily living (IADLs) – such as doing light housework, doing the laundry, handling finances, using the telephone, taking medications, shopping (Hooyman & Kiyak, 2018; Tel, Güler, & Tel, 2011).

Falls are the most common health problem in older adults due to changes in the musculoskeletal, nervous system and sensory system. About 30% of individuals aged 65 and over face falling incidents each year. Deaths caused by falling are in the second place in individuals aged between 55 and 84, and in the first place in individuals aged 85 and over. 67.6% of home accidents experienced by the older adults in Turkey are falls (Gürler, Tuncay, & Kars Fertelli, 2019). About 30-50% of falls are due to environmental factors in old age. According to assessments conducted in the USA, 55% of fall-related injuries take place within the home, particularly on stairs, while 23% happen nearby and the remaining 22% happen in places like highways, sidewalks, and other buildings (Kochera, 2002). Slippery flooring, dim lighting, obstacles and tripping hazards, poor stairway design, uneven streets and footpaths are the examples of environmental factors that cause falls (WHO, 2015). Insufficient lighting and dim environments, eye-catching bright lighting, and the inaccessibility of light switches, especially in the bedroom, can also cause an increase in falls (Öztürk, 2018). Since "fear of falling" or "post-fall anxiety syndrome" is seen in approximately one third of older adults, this limits the desire to perform daily living activities (Erdem & Emel, 2004). Improving the risks identified in and around the housing with architectural interventions is one of the most effective methods in reducing the risk of falling in older adults (Öztürk, 2018).

2.2 Psychological Aspect of Aging

Age-related changes in behavioral adaptation skills that occur with the physical losses of the older person constitute psychological aging. The effects of psychological aging on the older person are observed in cognitive function, personality, and mental health. Considering the psychological aspect of old age, it should not be forgotten that it is not only a period of loss of cognitive functions, but also a period of some individual gains such as coping with problems, making healthier decisions, being wiser and more mature (Hooyman & Kiyak, 2018; Hutchison, 2017; Quadagno, 2014; WHO, 2015).

Cognitive functions are related to mental functions and abilities such as intelligence, learning, memory, creativity and wisdom. Age-related changes in cognitive functioning affect the social behaviors of older adults, their relationships with their physical and social environments, and their work performance. The most studied areas are *intelligence*, *memory* and *learning*. The age-related changes in *fluid* and *crystallized intelligence* are the primary topic of discussion in the area of *intelligence*. Studies show that *fluid intelligence* declines with age, while *crystallized intelligence* increases with age. *Fluid intelligence* is the capacity to process new information and includes things like "respond quickly, to memorize quickly, to compute quickly with no error, and to draw rapid inferences from visual relationships" (Hutchison, 2017). Fluid intelligence also refers to the capacity for abstract reasoning, which is partly synonymous with creativity, as it is largely unaffected by prior learning. There are many studies that refer to the decrease in fluid intelligence after the age of 60 as the classical aging pattern. However, recent research has shown that an active lifestyle reduces fluid intelligence loss. A study of older adults in Austria followed the activity level of a group of 700 men and women over six years (Hooyman & Kiyak, 2018). Activities such as household maintenance like gardening or taking care of their car, domestic activities like washing dishes or cooking dinner, social activities like participating in a club or a sport have been found to reduce the decline in cognitive intelligence (Quadagno, 2014). *Crystallized intelligence* is about knowledge, skills and strategies that people learn through experience. Studies have shown that crystal intelligence remains the same or develops in most healthy adults between the ages of 30 and 80. *Memory and learning* are other cognitive functions that are related to each other. Although these functions also decline with age, research indicates that people

are capable of lifelong learning (Hutchison, 2017). In a study examining the relationship between personality and memory in old age, it is seen that older adults, who have an extroverted and active lifestyle, have higher memory performance (Meier, Perrig-Chiello, & Perrig, 2002). *Wisdom* relates to well-being in old age, which consists of the ability to reason, the ability to learn from experience, the ability to judge, and the ability to use knowledge. When the experiences of the elderly are evaluated in terms of theoretical, practical (use of wisdom in daily life) and productive (use of existing knowledge for the benefit of others) life knowledge, the old age period is a treasure. Wisdom, which is considered to be the summit in terms of developmental stages, is stated to be positively related to healthy and active aging (Yıldırım & Abukan, 2015). Social environments where interactions with other wise individuals are established and which facilitate the development of wisdom with age increase active aging. *Creativity,* which refers to the ability to implement original solutions and come up with original ideas or products, can increase with age, just as attaining wisdom. The proof of this is that many scientists, artists, writers and composers produced their most innovative works in the last stages of their lives. There are studies showing that activities that reveal creativity improve the physical health of the elderly. Individuals who participated in art work in a retirement housing were found to have better physical health and fewer symptoms of depression than those who did not (Hooyman & Kiyak, 2018).

Personality is the set of thoughts, feelings, and behaviors that distinguish one person from another, both innate and learned. Although personality remains relatively stable after age 30, changes can be observed in older adults' ability to cope with life's ups and downs. Coping ability is concerned with the mismatch between personal abilities and environmental demands mentioned in the environmental press model or person-environment fit model (Hendricks, 2010). The ability of older adults to function optimally against many new environmental demands that arise in old age, such as retirement, loss of a spouse due to death, coping with loneliness, chronic illness, and managing caregiving duties, may be reduced (Read, Vogler, Pedersen, & Johansson, 2006). Studies show that the change in personality in old age is caused by environmental factors rather than genetic factors. In the study conducted with the participation of 410 older adult twins (64-85 years), it was observed that neuroticism increased, whereas extraversion, conscientiousness, and perceived control significantly decreased over time with the primary effect of environmental factors (Kandler, Kornadt, Hagemeyer & Neyer, 2014).

Some studies show that social support, role change and environmental changes can be effective in increasing the ability of older adults to cope with stressful life situations. There is substantial evidence that social support acts as a buffer against stress. It is also proven that people who replace their loss in social roles with new roles feel more active, are less alone, and enjoy life more. It is discussed that changing one's environment architecturally or moving to a house specially designed for older adults reduces stress and increases life satisfaction (Kahana & Kahana, 1996).

Psychological development with aging is a natural process that includes some changes in cognitive functions, maturation of coping responses, stability and improvement in personality traits. Epidemiological studies show that most older adults experience such changes without major impairments in their behavior or mental health (Ağar, 2020). In fact, the older adults are less likely to have mental disorders than young and middle-aged adults, and most of these are chronic and recurrent conditions that occur early in life, not due to age-related changes and aging (Hooyman & Kiyak, 2018). However, conditions such as limitation of movement, chronic pain, inability to live independently, deaths, changes in socio-economic status cause loneliness, loss of control and hopelessness in some older adults and increase the risk of psychological diseases (Aslan & Hocaoğlu, 2017). The most common psychological disorders in older adults are dementia, depression and anxiety, and the prevalence of mental disorders in nursing home residents is higher than in those living in their own homes (Manav, Yeşilot, Demirci, & Öztunç, 2018). In a study involving 122 older adults, 72 of whom live in their own home and 50 in a nursing home, it was found that ADLs were decreased, depression and social isolation were higher in individuals living in nursing homes compared to those living at their ow home (Demir, 2017). It was revealed that 29% of the older adults living in their own home and 41% of those living in a nursing home in Turkey had depression (Şahin & Yalçın, 2003). Older adults living at home have higher levels of subjective happiness and perceived social support (Akyıl, et al., 2018).

2.3 Social Aspect of Aging

Social aging is related to the individual's gradual loss of power and ability in social life, family and business life, and the changes in social roles, status and expectations

(Kalınkara, 2016). An increase in the sense of social isolation and loneliness is observed in old age, which is a period when the most stressful events such as retirement, loss of spouse and institutionalization are clustered (Akbaş, Yiğitoğlu and Çunkuş, 2020). The loss of validity of the majority of the beliefs, actions, and habits learned by older adults in their youth, however, leads to older adults isolating themselves from society in today's fast-paced social environment. Social isolation is recognized as a strong risk factor for physical illness as well as cognitive and intellectual development (Hutchison, 2017). Studies show that the mortality risk of older adults who have meaningful social relationships is lower than those who have limited or unsatisfactory social relationships (Valtorta, Kanaan, Gilbody, Ronzi and Hanratty, 2016).

Family and social relationships play an important role in the life of older adults, due to factors such as the post-retirement period and post-empty nest period (when their children leave home) despite the increase in life expectancy (Walsh, 2016). Old age may be a period in which the social network is limited to family relations due to the loss of role and status. Relationships with spouse, children, bride-groom and grandchildren are defined as the most important source of social support for older adults. Especially, the role of being a grandparent is very important for older adults, who feel useful by transferring their own beliefs and cultural values to their grandchildren (Sever, 2020). The spouse is also the most important emotional, social and personal support source in cases of sickness and need for care in old age (Hutchison, 2017). However, depending on the increasing individualization, rationalization and institutionalization with industrialization, modernization and urbanization, the living arrangements of the elderly in both urban and rural areas have changed. Alternative living arrangements such as living alone, living with their spouse, living close to or far from their children, living in a nursing home have emerged for the elderly living with more than one generation in the traditional extended family (Sever, 2020). The number of older people living alone is expected to increase each year Older adults struggle with loneliness and social isolation, despite studies showing that they do not anticipate living in large families, are used to living alone due to changes in family structure, and consciously desire remote an intimacy with family members (Kalaycı & Uysal, 2020).

The design of the physical environment plays an important role in the ability of older adults to maintain their social ties and establish new relationships. In a study

emphasizing the importance of social activities in protecting both mental and physical health of older adults and preventing loneliness, it is claimed that mobility, which plays an important role in socialization, should be encouraged by designing safe, accessibility and walkable neighborhoods (Berg, Kemperman, Kleijn, and Borgers, 2015). In another study, it is emphasized that older adults need a transportation vehicle for their primary social and shopping activities and considering their limited mobility in the future, there should be places such as grocery stores, pharmacies, health centers, and cafes in their neighborhoods (Yen, Shim, Martinez and Barker, 2012). Against the threat of social isolation, exercise and recreation areas where older adults can actively participate in various activities and improve their productivity have an important role (Akıncıtürk and Keskil, 2019). Due to encourage older adults to participate in outdoor recreational activities, arrangements should be made such as elevators, not too steep and not high stairs or ramps, stair railings, a sufficient number of signposts, a sufficient number of clean and well-maintained public toilets (Çetiner and Uygur, 2020). It was mentioned by the WHO at the United Nations World Assembly on Aging in Madrid in 2002 that "action should be taken so that the elderly can live as productive and active members of the society". This direction focused on the establishment of age-friendly cities that will provide active and quality aging (WHO, 2015). The age-friendly city concept, which includes components such as urban design, accessibility, transportation, neighborhood order, housing design, social and physical environmental conditions, was set forth by WHO. It is emphasized that accessibility of the urban environment is the main function, especially in the development of social activities and services, activities for spending quality time, and participation in daily life (Aydemir, 2020). In another study, it is stated that the reason why older adults are not seen on the streets very often is that they live in buildings and landscaping that are not suitable for old age conditions (Eren and Var, 2018).

2.4 Theories of Aging

Theories about aging are basically divided into two groups as biological theories and psychosocial theories. Biological theories explain the anatomical and physiological changes that occur with aging. In other words, biological theories are concerned with issues such as how aging occurs at the molecular level in cells, tissues and body systems,

and which biochemical processes affect aging (Kalınkara, 2016). Psychosocial theories deal with the behavior of older adults and the entire aging process. Psychosocial theories, which form the basis of the earliest theories about aging, focus on the relationship between the older adult and the social environment (Lange and Grossman, 2018). This chapter discusses psychosocial theories of aging as it deals with the relationship between the older adult and environment. Theories are explained below, considering the historical process.

Activity Theory is the first psychosocial theory of aging that Havighurst and Albrecht published (1953), as a result of their study on a group of adults in 1949. They argued that the needs of older adults are essentially the same as those of middle-aged people, and therefore their participation in midlife activities for as long as possible will delay the negative effects of aging. The core tenet of activity theory is that activity in old age is essential for life satisfaction, and many researchers have found evidence to support this. However, some researchers argued that the type of activity is important and that socially connected activities, such as meeting friends for lunch or participating in hobby activities as a group, increase life satisfaction more than formal or solo activities (Harlow & Cantor, 1996; Lemon, Bengtson, & Peterson, 1972; Longino & Kart, 1982).

Disengagement Theory is another psychosocial theory of aging developed by sociologists Cumming and Henry (1961) in opposition to the Activity Theory. Disengagement Theory assumes that individuals gradually abandon their previous roles and activities after middle age and return to their inner world. Cumming and Henry claimed that this separation is desired by society and older adults, and served to maintain social balance for life satisfaction (Cumming & Henry, 1961; Lange & Grossman, 2018). However, many researchers argue that a significant proportion of older adults do not lose interest in life and that social withdrawal is inconsistent with engaging in meaningful relationships and activities that are key to life satisfaction (Baltes, 1987; Lange & Grossman, 2018; Lemon, Bengtson, & Peterson, 1972; Schroots, 1996). Researchers' interest in the Disengagement Theory has largely disappeared due to reasons such as prolongation of life, the development of the health system, and the understanding of the importance of life experiences of older adults (Özcan, 2019).

Life-Course (Life Span Development) Theory put forward by Baltes, Reese and Lpsitt (1980) revealed the concept of "life-course" in which life is divided into stages with predictable patterns. The main theme of the Life-Course Theory is that life consists of stages according to one's roles, relationships, inner values and goals, and individuals adapt to changing roles and relationships in these stages. Successfully adapting to changes in the life course is linked to life satisfaction. But people's ability to adapt is limited by external and internal factors (Lange & Grossman, 2018). Baltes and his colleagues explained these limitations and the nature of aging with a theoretical framework: (1) there are fundamental differences between normal, pathological and optimal aging (that is aging under development-enhancing and age-friendly environmental conditions); (2) the course of aging is heterogeneous among people; (3) there is too much latent reserve capacity in old age; (4) there is a loss of resource capacity and adaptability with age; (5) both individual and social knowledge (crystallized intelligence) strengthens the mind and compensates for age-related declines in fluid intelligence; (6) as age increases, the balance between gains and losses begins to increase negatively; and finally (7) the self in old age remains a flexible system for coping and maintaining integrity (Baltes, Reese, & Lipsitt, 1980; Schroots, 1996). The life course perspective still remains a dominant theme in the literature today.

Selective Optimization with Compensation Theory is a model of successful aging developed by Baltes (1987) based on the theoretical framework described above (Baltes, 1987). The main theme of this model is that individuals learn to manage the functional losses and gains of aging through selection, optimization and compensation processes. The concept of selection means that the older person with reduced skills can function by selecting several skill areas. The concept of optimization means that the older person strengthens their existing resources in order to use their existing capacity more efficiently. The concept of compensation refers to the individual's ability to continue his/her life by using alternative opportunities instead of lost opportunities (Baltes & Baltes, 1990). The Selective Optimization with Compensation Theory allows people to age successfully by recognizing their strengths and effectively managing them (Schroots, 1996).

Continuity Theory, created by Atchley in 1989, claims that Disengagement Theory and Activity Theory are insufficient to fully describe successful aging and draws its impetus from the Life-Course Theory to explain the aging process. According to this

theory, personality influences roles and life satisfaction and remains consistent throughout life. Therefore, it is natural for some roles to end in old age and to continue successfully in some roles (Kalınkara, 2016; Lange & Grossman, 2018). The main theme of Continuity Theory is that older adults try to preserve and maintain existing internal and external structures while making adaptive choices. Decision making, sense of ego integrity, self-esteem, and meeting important needs are essential for the continuity of the inner structure of the elderly individual. The structure of external continuity consists of social roles and relations, social support, environmental conditions and meaningful activities. According to this theory, older adults reach life satisfaction based on the continuity principle and achieve successful aging goals (Atchley, 1989).

Gerotranscendence Theory, introduced by Tornstam (1994), is one of the newest theories of aging. This theory proposes that aging individuals undergo a cognitive transformation from a materialistic and logical framework to a universal and transcendent one. Tornstam stated that an ontological change consisting of three levels occurs in the individual with age: the cosmic level, the level of self, and the level of social and personal relations. The cosmic level includes the change in the perception of time, space and object, the removal of the boundaries between the past and the future, the change in the way of perceiving life, the disappearance of fear of death and the increase of cosmic communion with the spirit of the universe. The level of self includes discovering the good and bad sides of the individual, the transition of self from selfishness to helpfulness and ego-integrity. The level of social and personal relations includes decreased interest in superficial relationships, increased need for solitude, understanding of the difference between self and roles, decreased interest in material things, and increased contemplation (Tornstam, 2005).

Chapter 3

Quality of Life (QOL) in Old Age

The development of the gerontology is the development of scientific efforts to understand the relationship between older adults and quality of life (George, 2006). Studies on the concept of quality of life in gerontology coincide with the discovery of the concepts of successful aging, subjective well-being, life satisfaction, and happiness in later life (van Leeuwen, et al., 2019). The first gerontological studies on quality of life were conducted in Europe and North America in the 1950s. Most of the early studies in Europe emphasized that the social aging concepts mentioned above, such as retirement, age, loneliness and isolation, have important effects on the quality of life of older adults (Shanas, et al., 1968; Townsend, 1957). Gerontological studies that emerged in the USA after 1950 focused on subjective experiences in later life. The concept of life satisfaction has been emphasized in psychosocial theories of aging mentioned above, such as activity, disengagement and continuity that emerged in this period (Havighurst & Albrecht, 1953; Cumming & Henry, 1961). After the 1960s, studies in clinical gerontology began to measure life satisfaction, and then quality of life (Neugarten, Havighurst, & Tobin, 1961). It remains highly relevant today, as most of the studies on quality-of-life assessment have focused on investigating what makes life good (Bond & Corner, 2004). On the other hand, there is no consensus on the definition and measurement of quality of life in old age, which is widely used in academic and daily life. In the following sections, approaches about QOL definition and domains are explained in detail, respectively.

3.1 Definition of Quality of Life

The word "quality" in the expression "quality of life" refers to "the degree of goodness " or " the degree of excellence", in short, an evaluative judgment in terms of good or bad (Michalos, 2014). The definition of quality of life (QOL) is divided into three: global, comprehensive and focused definitions (Bond & Corner, 2004). The most

global definition of QOL is meeting the general conditions of happiness and satisfaction (McCall, 1975). According to one of the most comprehensive global definitions, quality of life is “the possession of resources necessary to the satisfaction of individual needs, wants and desires, participation in activities enabling personal development and self-actualization, and satisfactory comparison between oneself and others" (Shin & Johnson, 1978). The World Health Organization Quality of Life Group (WHOQL) defined QOL as “individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns” (The WHOQOL Group, 1998). Comprehensive definitions express the individual's overall life satisfaction and general well-being, emphasizing the multidimensional nature of the concept and dividing QOL into different dimensions. George and Bearon (1980) defined quality of life in two dimensions as subjective evaluations, such as life satisfaction, self-esteem, etc., and objective conditions, such as general health and functional status, socio-economic status etc. Focused definitions are that different disciplines focus on only one or two of the quality of life dimensions according to their field of study. Apart from expert definitions, older adults define their quality of life according to their expectations, life experiences and life biographies. The most important components of QOL of older adults are family, social relationships, health, mobility/ability, financial conditions, activities, happiness, youth and living environment (Bond & Corner, 2004). In summary of all these definitions, QOL is a judgment consisting of the individual's objective quality of life, general subjective well-being, subjective satisfaction of needs, or multidimensional subjective state, rather than a simple objective description of one's life (Boggatz, 2020). Comprehensive definitions and older adults' own definitions also indicate that quality of life is a multidimensional concept without clear or fixed boundaries.

3.2. Domains of Quality of Life

Quality of life, which is a multidimensional concept, consists of certain “domains”. As in the definition of the concept, there are different perspectives on the domains of QOL in old age. Although different terms are used by different researchers, there is fairly broad consensus on the domains for QOL in old age. However, how the domains are defined differs between approaches. For this reason, the areas of quality of

life are examined in three groups as comprehensive approaches, gerontological approaches and architectural approaches within the scope of the thesis.

3.2.1 Comprehensive Approaches

The comprehensive approaches are approaches that discuss what quality of life domains are for people of all age groups. The three major comprehensive approaches that are thought to be basic are examined in this section.

Maslow's Hierarchy of Needs is the first theory to apply for understanding the domains of QOL. Although not directly related to the old age, many approaches have been influenced by this theory as it deals with the whole stages of the human life. The theory of hierarchy is based on the fact that the individual has needs throughout his /her life and sets goals in order to realize these needs. The individual who reaches a higher domain in the hierarchy is expected to adequately meet the needs of the lower domain. The needs are divided into five domains in order of priority as described below (Maslow, 1943).

1. *Physiological needs:* It is the lowest category that includes needs such as food, water, sleep, and shelter. If these needs, which are necessary for daily life, are not satisfied, they dominate the behavior of the individual.
2. *Safety or security needs:* The need to secure future satisfaction of physiological needs, protection from harm, and a safe and secure life.
3. *Belongingness needs:* The need for love and affection, which includes both the passive need to be loved and accepted and the active need to love others.
4. *Esteem needs:* The desire for power, success, competence, self-confidence, independence, and prestige. Like belongingness needs, esteem needs are divided into esteem or respect needs of others and self-esteem or self-respect needs.
5. *Self-actualization needs:* It is the highest need category and expresses the individual's need for self-fulfillment by improving himself/herself, enriching his/her personal life, and achieving his/her personal goals.

Hughes's QOL-network is an approach that aims to determine the central and universal components of quality of life in old age. Hughes proposed a QOL network system consisting of eight main domains. The main eight domains in the network are subdivided into sub-domains, and all domains are directly or indirectly related to each other. Their integration determines an individual's QOL level. According to Hughes, the eight domains are decisive for the QOL and the content of them are listed below (Hughes, 1990; Bond & Corner, 2004; Gerritsen, Steverink, Ooms, & Ribbe, 2004).

1. *Personal Autonomy:* Choice, decision-making, control, privacy.
2. *Expressed Satisfaction:* Life satisfaction, affect balance, psychological-wellbeing, positive self-image.
3. *Physical and Mental Well-being*: Physical health, handicap, functional abilities, dependency.
4. *Socio-economic Status:* Income, former occupation, marital status, housing ownership, standard of living, nutrition.
5. *Quality of Environment:* Temperature, comfort, security, personal space, décor, amenities, routine and rules.
6. *Purposeful Activity:* ADLs and IADLs, recreation, work, interests.
7. *Social Interaction*: Social contacts, family contacts, social roles.
8. *Cultural Factors:* Age, gender, class, race, religion.

The WHOQOL Group's WHOQOL-100 is a quality of life assessment guideline that was created with a cross-cultural approach as a result of studies conducted in 19 pilot countries and a comprehensive literature review. The conceptual structure of WHOQOL-100 consists of 24 facets grouped into six domains which are assumed to contribute to the overall assessment of quality of life. The six areas and facets that are decisive for QOL are listed below (The WHOQOL Group, 1998).

1. *Physical Capacity:* Pain and discomfort, energy and fatigue, sleep and rest.
2. *Psychological:* Positive feelings, thinking, learning, memory, concentration, self-esteem, body image and appearance, negative feelings.
3. *Independence:* Mobility, ADLs, dependence on medication or treatments, working capacity.
4. *Social relationships:* Personal relationships, activities, social support.

5. *Environment:* Physical safety and security, home environment, physical environment, transport.
6. *Spirituality/religion/personal beliefs*

3.2.2 Gerontological Approaches

The gerontological approaches are those that discuss what quality of life domains are for older adults. The five gerontological approaches that are regarded basic are examined in this section.

United Nation Principles for Older Persons is an important study in which the domains that affect QOL of older adults are determined with the participation of all countries of the world. It is emphasized that the principles determined in line with the International Aging Action Plan, which was accepted by the World Assembly on Aging and approved on 3 December 1982, should be included in the national action programs of the countries. The five principles set for older adults are explained below (UN, 1999).

1. *Independence:* Older adults should have access to basic needs such as adequate food, water, shelter, clothing and health services, and appropriate education and training programs and job opportunities. It should be ensured that older adults reside at home as long as possible by creating environments that are safe and suitable for personal preferences and changing capacities
2. *Participation:* Older adults should be integrated into society by voluntarily participating in services for the benefit of the community and establishing associations. Older adults should pass on their knowledge and skills to younger generations.
3. *Care:* Older persons should have access to health care and social and legal services to enhance their autonomy, protection and care.
4. *Self-fulfillment:* Older persons should have access to the educational, cultural, spiritual and recreational resources of society to be able to pursue opportunities for the full development of their potential.

5. *Dignity:* Older persons should be able to live in dignity and security without discrimination on the basis of age, gender, racial or ethnic origin, disability or other status.

Stewart and King's Conceptual Framework of QOL is an approach that aims to measure quality of life in older adults by listing potential domains and sub-domains of QOL. The framework provides a comprehensive review of all possible domains where quality of life is conceptualized. The 13 domains are decisive for QOL and the content of them are listed below (Stewart & King, 1994).

1. *Physical Functioning:* Lower body movements (walking, climbing stairs, getting out of a chair), upper body movements (reaching, caring), dexterity, basic movements (standing, walking short distances, climbing a few state), discretionary movements (running, walking long distances), mobility, ability to go places.
2. *Self-Maintenance/Self-Care:* Self-care (bathing, dressing, toileting, transferring, grooming, etc.), instrumental activities (shopping, errands, cooking, finances, etc.).
3. *Usual Activities:* Working, babysitting, caregiving, volunteering, community work, hobbies, recreational activities, work around the house.
4. *Social Functioning:* With friends, groups, neighbors, family, spouse/partner.
5. *Psychological Well-being:* Depression, anxiety anger, positive affect (interest in life, happiness, hopefulness/optimism, morale, enjoyment), perceived stress, distress about health.
6. *Cognitive Functioning:* Memory, confusion, attention, concentration, orientation, judgement, alertness.
7. *Energy/Fatigue:* Frequency of states of fatigue, "enough" energy to do everything.
8. *Sleep*: Sleep disturbance, daytime sleepiness.
9. *Self-esteem*: General esteem, physical self-esteem (physical appearance, competence), social self-esteem, intellectual self-esteem.
10. *Sense of Mastery/Control:* General control, control over health.

11. *Perceived Health:* Current health, future health, past health, resistance to illness.
12. *Pain and Discomfort:* Pain in general, specific pains (e.g., back pain), duration of pain frequency of pain.
13. *Life Satisfaction*: Current life in general, past life in general, components of life (e.g., social life, life situation).

Linderberg's Theory of Social Production Function (SPF), which is generally related to social relations, is used as a conceptual framework for the domains of QOL in old age. According to the SPF theory, each individual produces their own subjective well-being by achieving certain universal and more specific goals within the constraints they face. Inspired by Maslow's theory, SPF theory proposes a hierarchical approach to goals. The ultimate goal of the hierarchy, which is divided into two universal goals as physical and social well-being, is to achieve QOL by realizing six instrumental goals. The instrumental goals that lead to physical well-being are stimulation, external comfort, and internal comfort. The instrumental goals that lead to social well-being are affection, behavioral confirmation, and status. These six instrumental goals are achieved by using the resources people have. These goals, which represent the domains of QOL, are described below (Lindenberg, 1996; Ormel, Lindenberg, Steverink, & Verbrugge, 1999).

1. *Stimulation* refers to the right amount of exposure to activities (i.e. sports, work, creative activities, active recreation) that produce arousal, including mental, sensory and physical effort.
2. *Internal comfort* refers to the satisfaction of basic physical needs and the absence of health complaints, insecurity and fear. Basic ADLs and IADLs such as bathing, eating, dressing, getting in and out of the couch/bed, walking short distances, cooking, cleaning, ironing, shopping, cycling/riding, making phone calls, gardening are the activities that produce inner comfort.
3. *External comfort* refers to a safe and pleasant living environment. It is related to issues such as temperature, housing satisfaction, security.
4. *Affection* refers to positive inputs from love, emotional support, interaction, and caring relationships (intimate, family and friendship relations).

5. *Behavioral confirmation* is the feeling of doing the right thing in the eyes of oneself and others. It includes activities and resources such as norms, group membership, social skills, competence, trust, and a sense of community and belonging.
6. *Status* refers to the achievement of self-appreciation and appreciation of others as a result of having certain positive characteristics. It relates to scarce resources such as occupation, education, social class, unique skills.

The WHOQOL Group's WHOQOL-OLD is an add-on module derived following the standard WHOQOL-100 methodology for identifying gaps in older adults' QOL. It is used in conjunction with the WHOQOL-100, and a 24-item, with a 6-domain module produced as a result of focus group works with professionals working with older adults, caregivers, and older adults. The six domains are listed below (Power, Quinn, Schmidt, & the WHOQOL-OLD Group, 2005).

1. Sensory abilities
2. Autonomy
3. Past, present and future activities
4. Social participation
5. Death and dying
6. Intimacy

The ESRC Growing Older (GO) Program produced 24 projects as a result of research on older adults and aging in the UK between 1999 and 2004 by aiming to define the factors that determine the QOL in old age. The program proposes a structure-agent relationship parallel to the person-environment relationship. While agent represents person or action in the agent-structure relationship, the structure represents constants such as environment, wealth and gender. The GO Program claimed that quality of life in old age is the product of the interrelationship between structure and agent. The domains of quality of life in old age determined by the GO program are explained below (Walker, 2005).

1. Having good social relations with family, friends and neighbors.

2. Having social roles and participating in social and volunteer activities and other solo activities/hobbies.
3. Having health and functional ability.
4. Living in a good house and a good neighborhood.
5. Having a positive outlook and psychological well-being.
6. Having sufficient income.
7. Maintaining independence and control of one's life.

3.2.3 Architectural Approaches

The architectural approaches use an architectural viewpoint to describe quality of life in old age. The six architectural approaches are examined in this section.

Lawton's Good Life Model was introduced as a QOL model in his article "Environment and Other Determinants of Well-Being in Older Adults". This model consists of four partially overlapping QOL domains, with each domain serving as an independent indicator for QOL measurement. The model differs from other QOL models by approaching the objective environment as an important contributor to well-being. According to Lawton, QOL in old age is a multidimensional evaluation of person-environment system criteria. The four domains identified by Lawton are described below (Lawton, 1983).

1. *Behavioral Competence*: It is an individual's ability to be functionally and socially self-sufficient. Behavioral competence is a combination of simple to complex health conditions, functional status (self-maintaining ADLs and IADLs), cognition status (problem solving, symbolic thinking, memory, perceptual, sensory reception), time use (enrichment activities such as exploration, recreation, creativity), and social behavior (family and friend interaction).
2. *Perceived Quality of Life:* It is the set of subjective evaluations made by the older person for the objective environment and behavioral competence dimensions.

3. *Psychological Well-being:* It is the quality of the older person's inner experience and is directly and indirectly affected by many objective environmental characteristics. This domain, in which a person's competence and perceived quality of life are predominantly evaluated, provides a holistic view of past, present and future experiences.
4. *Objective Environment:* It consists of both physical and inter-personal domains. According to Lawton, the objective environment can be counted, graded, or measured in centimeters, grams, and seconds and evaluated by consensus. The subjective environment is the evaluation of the objective environment with personally attributed meaning and perceived quality of life.

Parker et al. (2004) determined four domains for QOL in old age in their study to understand the relationship between the quality of life of older adults living in nursing homes and the built environment. Each domain is divided into subdomains. These four domains and subdomains are listed below.

1. *Universal Domains*: Privacy (providing privacy in the bathroom and bedroom), personalization (shelves for personal items), choice and control (access to garden/outside spaces, and choice of shower and bed), and connection with the wider community (located on public transport route, access to local facilities within 400 m, spaces for family gatherings).
2. *Physical Domains:* Safety and health (security measures that permit unrestricted exploration of the garden or outdoors), support for physical weaknesses (step-free access to all outdoors, and accessible bathrooms), and comfort (suitable temperature, suitable air quality, suitable light level).
3. *Cognitive Domains:* Support for cognitive frailty (walls and doors in contrasting colors), awareness of outside world (seating areas with canopy, access to the view from the rooms, environmental comfort between indoor and outdoor), and normalness and authenticity (allowing the person to decorate their room).
4. *Staff Domain:* Separate room for staff.

WHO's Healthy Aging Concept emphasizes that older adults should have and maintain five basic functional abilities for quality and healthy aging. It is underlined that these functional abilities can be maintained and developed in an age-friendly environment. These five domains are listed below (WHO, 2015).

1. Ability to meet their basic needs.
2. Ability to learn, grow and make decisions.
3. Ability to be mobile.
4. Ability to build and maintain relationships.
5. Ability to contribute.

Dickson and Hailey's The Just Living Target is a four-domain diagram developed based on Maslow's Hierarchy for designing homes and communities that make human lives better as they age. They suggested that these four domains should also be supported by technological developments and innovations. These four areas are described below (Dickson & Hailey , 2019).

1. *Care:* Caring for professional staff, daily interaction with a neighbor, visits by a family member.
2. *Accessibility:* Accessible design of bathrooms, kitchens, corridors, parks, and transportation vehicles.
3. *Engagement:* Personal hobbies, group activities, and workshops
4. *Community:* Relations with family, relations with the wider community, need for belonging and love.

Taşöz (2020) emphasizes that the relationship between older adults and the built environment is important for the quality of life by referring to the WHO's Healthy Aging Concept. As a result of the study conducted with 30 older adults living in nursing homes using qualitative and quantitative methods, she identified six domains that affect the QOL. The domains in which each domain is divided into sub-domains are described below.

1. *Safety Category:* Safety handle bars, seating unit integration, safety of vertical circulation elements.

2. *Comfort Category:* Dining area furniture ergonomics, personal care furniture ergonomics, balcony furniture ergonomics, public space furniture ergonomics.
3. *Accessibility Category:* Accessible design of bathroom units, accessible design of dining area, reachable units and furniture, legible routes to sub-spaces, color coding for better wayfinding, efficient dimensions of interior spaces.
4. *Aesthetical Category:* Appealing interior spaces, aesthetical furniture.
5. *Social Category:* Varied social activities, efficient family times, desire to maintain self-confident, desire to maintain ADLs, fear for falling.
6. *Privacy Category:* Respect for personal space, respect for personal taste, respect for hobbies and daily rituals.

Kuboshima (2020) claims that the design of the built environment significantly affects the quality of life of older adults. As a result of interviews with 30 older adults living in three different housing designed for older adults, six domains for QOL in old age were determined.

1. *Control in Daily Basis Activities:* Basic movements, going to toilet, showering, cooking and dining, laundering, shopping, collecting mail.
2. *Meaningful Leisure Activities:* Continuing familiar activities, staying active and able, engagement in personal activities in private space, contribution.
3. *Meaningful Relationships:* With spouse, guests, neighbors, wider community.
4. *Maintenance of Possessions:* Storage of everyday items and rarely used items, maintenance furniture and nostalgic objects.
5. *Comfort:* Access to nature, warmth and sunshine, light, relief from fatigue and pain.
6. *Quality of Care:* Assisted shower, getting help with housework, on-site staff.

Chapter 4

Housing Design for Older Adults

There is no common view in terminology on the definition and scope of housing for older adults. In a study conducted in 2013, it was determined that there are 100 different terms describing the residence for older adults in the literature and the number could only be reduced to 72 even if the similar ones excluded. Care, service, support services, housing scales, management and operation, social class and demographics of residents are the reasons on the confusion and diversity of this term (Howe, Jones, & Tilse, 2013). However, the concept of housing for older adults is a widely used general term describing purpose-built and age-separated independent housing in old age.

The foundations of the concept of housing for older adults began to be laid with the retirement communities that emerged in the 1920s. The first examples of housing for older adults developed by various workers, fraternal and religious community organizations in order to provide a supportive living environment for their retired members emerged in the USA (Marans, Hunt, & Vakalo, 1984). After the Second World War, there was an increase in the demand for affordable housing for older adults with the inadequate and poor conditions of nursing homes. After the 1950s, the need for housing for the elderly increased in the USA, as well as in Canada, the United Kingdom, Austria and New Zealand. With the aging of the "baby boomers" generation after the 1980s, especially in America, England and Australia, housing diversity and options for older adults have increased (Weal, 1988). Since 2000s, the work on housing design for older adults has continued by focusing on the themes of cheap and higher quality models, sustainability, technology applications, social and physical landscaping (Hu, Xia, Skitmore, Buys, & Zuo, 2017).

The aim of this section is to discuss in detail the architectural design approaches that can improve the quality of life in housing design for older adults. Before moving on to housing design approaches for older adults, theories that deal with the relationship

between the older adults and the built environment are explained. In the last part of the chapter, architectural approaches used in housing design for older adults, including laws and regulations, standards, and design guidelines are discussed in detail.

4.1 Gerontological Theories

The origin of housing design theories for older adults is based on the relationship between the person and the built environment. Aging takes place in the context of a built environment, and just as biological, psychological, and social changes affect the aging process, the aging environment affects how we age and our quality of life (Hooyman & Kiyak, 2018). Due to age-related changes, older adults' ability to adapt to complex and changing environments decreases and they become more sensitive to features of the built environment than younger people (WHO, 2015). For this reason, the critical role of the built environment on older adults in both gerontology and architecture has always been emphasized.

The first of the major historical influences on theories of person–built environment relations in old age is the perspective put forward by the Chicago School of Urban Sociology in 1920s. Research at this school clearly demonstrated for the first time that the built environment has an impact on people's quality of life. German psychologist Lewin's (1936) field theory influenced contextual thinking by indicating that a function emerges as a result of the person-built environment relationship. Murray's (1938) environmental press theory revealed that a person's function can be influenced both objectively and subjectively by the built environment. These studies accompanied the emergence of a branch of gerontology called environmental gerontology, with the great contribution of Robert W. Kleemeier (1959). The concept of environmental gerontology, or "ecology of aging," as it is sometimes called, which deals with the interaction between the older person and their environments (p-e), was greatly expanded by Powell Lawton between the 1960s and 1980s (Peace, Wahl, Mollenkopf, & Oswald, 2007). Theoretical studies in the field of environmental gerontology have made important contributions to housing design for older adults.

The first important contribution of environmental gerontology is the perspective it brings to the definition of the ***built environment***. The built environment refers to the human-made environment designed at various scales such as buildings, roads, parks and infrastructures to support human activities (Scott, 2020). Similarly, environmental gerontology explains the relationship between older adults and the built environment by dividing the environment into several layers, from micro to macro. Housing, where older adults spend most of their lives, is considered the main component of the built environment. Bronfenbrenner's Theory of Human Ecology states that older adults struggle throughout their lives to cope with environmental conditions consisting of four levels: micro, meso, exo, and macro (Bronfenbrenner , 1979). Murrey and Eckert (1984), based on Bronfenbrenner's theory, suggested that there are four environmental levels that affect housing arrangement in their ecological housing model for older adults. Wahl and Oswald (2010) also explained these four built environment scales that affect the p-e interaction in detail as follows: (1) *The microsystem environment* is the older person's private living space, namely his/her home. It is where close interpersonal interactions such as family and friends take place; (2) *The mesosystem* environment is the system formed by the combination of two or more microsystems. It prepares the ground for interactions that directly affect the older person. Buildings where many micro-systems come together, such as apartments, nursing homes, are located on the mesosystem scale; (3) *The exosystem* is the environment formed by the local community or neighborhood. It is a scale that prepares the environment for interactions that indirectly affect the older person; (4) *The macrosystem* refers to interactions in a global context such as cities, countries, and infrastructure systems.

Lawton and Nahemow's the Press-Competence Model (PC), is one of the most widely accepted theories in environmental gerontology. The general assumption of the theory is that the lower the older adult's competence and the stronger the environmental pressure, the more negative the impact on the older person's quality of life. Competence is defined as the theoretical upper limit of an individual's abilities to function in different areas and relates to the older person's some physical and psychological changes, such as sensory loss, loss of physical mobility, or cognitive decline. Environmental pressure is defined as the demands that physical environments make on the individuals to adapt, respond, or change and relate to low housing standards, poor neighborhood conditions or undeveloped public transport, etc. The PC model claims that there is a level of adaptation

for every aging person to achieve the highest possible behavioral and emotional function with the optimal combination of available competence and given environmental conditions. Many practical studies in the architectural field in terms of designing housing and institutions for older adults have been directly or indirectly influenced by the PC model (Faletti, 1984; Lawton & Nahemow, 1973; Peace, Wahl, Mollenkopf, & Oswald, 2007; Phillips, Ajrouch, & Hillcoat-Nallétamby, 2010).

Carp and Carp's the Person-Environment Fit Model (PEF), has brought a new perspective to the PC model, emphasizing the role of the motivation and personal needs rather than the competence in person-environment processes. The basic assumption of the PEF model is that there is a mismatch between personal needs and environmental options, leading to reduced behavioral functioning and quality of life. In this model, the needs of the older person are divided into two as lower-order and higher-order, and a type of congruence is determined according to the person-environment relationship. Lower-order needs are conceptualized similarly to 'competence' outlined above and relate to ADLs necessary for independent living. For example, a person with low vision needs a well-lit and well-marked environment, while a person in a wheelchair needs a specially designed bathroom. Higher-order needs relate to issues such as privacy, relationship, and self-actualization associated with Maslow's Hierarchy of Needs. In this case, the type of congruence is the similarity between the strength of the old person's need and the quantity of the environment's supply. For example, a high privacy environment should be provided for a person with a high need for privacy. Empirical studies conducted in institutions designed for older adults confirmed the theory's assumption (Carp & Carp, 1984; Kahana, 1982; Peace, Wahl, Mollenkopf, & Oswald, 2007; Phillips, Ajrouch, & Hillcoat-Nallétamby, 2010).

Theories of place attachment and identity deal with the emotional, cognitive, behavioral and social links that older adults form with the built environment, in contrast to the two models that focus on the role of environment on quality of life described above (Rubinstein & Parmelee, 1992; Altman & Low, 1992). Attachment to place (in home, especially) is the manifestation of memory that provides a sense of identity through symbolically represented valuable objects (Chaudhurya & Oswald, 2019). Rubinstein and Parmelee (1992) considered that the place attachment occurs following three processes: social-centered, person- centered and body-centered processes. The social-centered

process concerns with how a person uses sociocultural rules in tasks related to home layout such as furniture placement and decoration. The person-centered process deals with expressing one's life course with the characteristics of the home environment. The body-centered process is the body's important relationship with sensory environmental characteristics such as temperature, light, and personal comfort (Rubinstein, 1989). Although most of the research is qualitative, there are also quantitative studies aimed at understanding and measuring the meaningful dimensions of housing (Kaspar, Oswald, & Hebsaker, 2015).

Theories of relocation examines how biological, psychological and social losses affect the relocation behavior of older adults and the role that the built environment plays in this behavior (Litwak & Longino, 1987). Golant's model of Residential Normalcy is one of the most recent relocation theories. According to Golant (2011), residential comfort zones are places where older adults experience cognitive and sensory lasting sensations and generally feel competent and are in control. Moving to a new address means going out of the residential comfort zone. Older adults should develop adaptive coping strategies to restore residential normality. Recently, relocation theories have emphasized the importance of smart technologies such as telehealth, telecare, information and communication technologies, robotics and gerontechnology to cope with individual or environmental conditions (Golant, 2017).

4.2 Architectural Polices and Guides

The architectural background of the housing design for the elderly consists of the laws, standards and guidelines used in the design. Housing is an important part of the built environment for older adults, who have the opportunity to spend more time in their homes, parks, recreational activity areas and similar social facilities with aging. In the Vienna International Plan of Action on Aging (1982), it is claimed that housing, which is the center of all activities, has a major impact on the QOL of older adults (UN, 1982). According to Heywood, Oldman, and Means (2002), housing is where ADLs and IADLs occur, and its size, location, design, and environmental comfort also have an impact on quality of life. Kelley-Gillespie and Farley (2007) found in their study that the elderly have more positive perceptions of their quality of life after moving to a home with support

services designed for them. Imamoglu and Imamoglu (1992) emphasized that the house should not be considered as an independent unit, as the housing conditions are affected by the interaction of the elderly person with the other components of the built environment. So how can the built environment be made suitable for older adults? The aim of this section is to review national and international laws, standards and design guides used in housing design in order to improve the QOL of the older adults.

4.2.1 Laws and Regulations

The laws and regulations used in housing design cover those with reduced mobility, such as disabled and older adults. Studies on legal regulations, whose main purpose is to make the built environment accessible and usable by everyone, date back to the 1960s. In this section, international and national laws used in housing design for the elderly are examined according to the historical process. The first three paragraphs define international laws and the next six paragraphs define national laws and regulations.

Architectural Barriers Act (ABA), passed in 1968, is the first law to address the accessibility in the built environment. The law enacted in the USA covers facilities such as mass housing, public transportation systems, post offices, social security offices, federal courthouses and prisons, and national parks. It contains a long list of specific requirements for making housing and facilities compatible with the ABA (ABA, 2015).

Fair Housing Amendments Act (FHAA), passed in 1988, is the law passed in the USA to prohibit discrimination based on disability in any housing transaction. According to the law, failing to design and construct housing such that it is functional and accessible to people with disabilities, particularly wheelchair users, constitutes housing discrimination (FHAA, 1988).

American Disability Act (ADA), passed in 1990, is a civil rights law that aims to guarantee that people with disabilities have the same opportunities and rights as everyone else. According to the ADA, all areas of public life, including work, school, transportation, and all open public and private spaces, should be accessible to persons with disabilities and older adults (ADA, 2010).

Turkish Zoning Law (No. 3194), passed in 1997, aims to ensure that the built environment is formed in accordance with the plan, science, health and environmental conditions. The regulation was brought into force based on this law in 1997 obliges TSE standards to establish an accessible and livable built environment for the disabled and older adults (Zoning Law, 1985).

Disabled Law (No. 5378), passed in 2005, requires compliance with accessibility standards in planning, design, construction, manufacturing, licensing and inspection processes in order to ensure accessibility for disabled and older adults in the built environment (Disabled Law, 2005).

Accessibility Monitoring and Inspection Regulation, passed in 2016, includes the establishment of commissions that will monitor and control accessibility for the disabled and older adults in residences, facilities, open spaces and public transport. If even one of the rules in the Accessibility Monitoring and Inspection Form for Buildings is missing, an administrative fine is imposed by the inspection commission (Accessibility Monitoring and Inspection Regulation, 2019).

Planned Areas Zoning Regulation, passed in 2017, consists of rules on building, project design, and inspection. The regulation includes rules regarding building entrances and ramps, stairs, elevators, railings, doors and windows, room dimensions and garden distances. It obliges the relevant administration to comply with and implement the rules regarding the disabled and older adults in TSE standards (Planned Areas Zoning Regulation , 2017).

Parking Lot Regulation, passed in 2018, requires regulations for the use of the disabled in accordance with the relevant rules and TSE standards. Each detached home is required to provide a disabled parking lot that is the proper size as one of the regulations of this law (Parking Lot Regulation, 2018).

Building Inspection Implementation Regulation, passed in 2019, is a legislation that concerns housing design. This legislation includes an “Accessibility Control Form” as part of the Architectural Project Control Form. The form includes various design considerations to control building accessibility requirements both during the planning and

building stages. Building inspection firms control all design elements such as garden entrances, garden path, pavements, building entrances, ramps, stairs, elevators, doors, disabled toilets, direction and markings, emergency and building installations during the design and construction phases with this form (Building Inspection Implementation Regulation , 2020).

4.2.2. Standards

Standards are a set of rules necessary for the construction of a building and its parts in certain sizes and in accordance with a certain type. The standards that can be used in housing design for older adults are specified in the laws and regulations of the countries. This section aims to provide brief information about national and international standards that can be used in housing design for older adults. Within the scope of international standards, information is given about the European Standardization Organization and the International Standardization Organization, as well as the standards of the USA, UK and Australia, which are the countries with the highest housing production for older adults. In the following paragraphs, first the special standards of the USA, Australia, England, and Turkey and then the international general standards are explained.

ANSI A117.1 Accessible and Usable Buildings and Facilities is the first accessibility standard accepted in the world. The standards adopted in the USA in 1961 include the design criteria required for residences to be usable by people with disabilities and reduced mobility (American National Standard Institute, 2010).

ADA Accessible Design Standards were adopted in 1991 with the passing of the American Disability Act. The standards, which were finalized with the regulations made in 2010, determine the technical minimum requirements for buildings and facilities to be easily accessible and usable by the disabled and those with limited mobility (ADA, 2010).

AS 1428.1 and AS 1428.2 Design for Access and Mobility were developed in Australia in 1992 consisting of two parts. AS 1428.1 covers the minimum requirements

for accessibility and mobility in building design, while AS 1428.2 covers the requirements for higher accessibility (Council of Standards Australia, 1992).

AS 4299 Adaptable Housing includes a set of standards developed for buildings and accommodation facilities in 1995 in response to the growing proportion of people aged 60 and over in Australia. It consists of design principles and standards required for "Adaptable Housing", which avoids economic costs and is accessible to all (Council of Standards Australian, 1995)

BS 4467 Guide to Dimensions in Designing for Elderly People is a British Standard that came into force in 1991 containing a set of rules required in the design of equipment and housing for older adults. It covers the anthropometric dimensions of older adults and the application examples of these data in housing design (British Standards Institution , 1991).

BS 8300-2 Design of an Accessible and Inclusive Built Environment is published by British Standards Institution and entered into force in 2018. The first edition was published in 2009, the standards were revised in 2018 and suggestions for inclusive design were added to the building content (British Standards Institution, 2018)

TS-9111 The Requirements of Accessibility in Buildings for People with Disabilities and Mobility Constraints was prepared by the Turkish Standards Institution in 1991. The standards, which were revised in 2011, include regulation principles for older adults and disabled to move independently and safely inside and outside the building. The standards contain a set of rules necessary for the design of the built environment, from parking lots and ring roads to building entrances, building elements (doors, windows, and stairs), circulation areas and services (corridors, halls and elevators), spaces (bathroom, toilet, kitchen, bedroom) and complementary equipment (electrical and heating installations and alarms, etc.) (TSE, 2011).

EN 17210 and CEN/TR 17622 Accessibility and Usability of The Built Environment were developed by the European Standardization Organizations CEN/CENELEC in 2021. They include design criteria for how the built environment will be accessible and usable at all stages of the building life cycle, including feasibility, design, construction, completion and post-use phases (CEN/CENELEC, 2021).

ISO 21542 Building construction: Accessibility and Usability of the Built Environment was developed by the International Organization for Standardization in 2021. It includes a set of accessibility requirements for the building elements, assemblies, components and connections that make up the built environment. (ISO, 2021).

4.2.3 Housing Design Guides

Housing design guides are design tools that encompass universal design principles and the laws, regulations and standards described above. Design guides provide guidance for the building designs to meet the psychological and social needs of the users. While the user requirement are subjectively evaluated, the physical standards are objectively evaluated and accepted by the legislation. This aspect of the design guides brings a holistic view to housing design for older adults. While the first two guidelines described below are used in the design of housing for everyone, including older adults, the next two examples were developed specifically for housing design for older adults. The reasons for choosing these six design guides, their contents and their relations with the immediate environment in housing design are explained in detail hereinafter.

Lifetime Homes Design Guide (LTH) was developed in 1991 by the UK-based Joseph Rowntree Foundation and the Habinteg Housing Association. The term “Lifetime Homes” meant residences designed for older adults in the first edition of the guide. Lifetime Homes Design Guide was developed to serve a wide range of people with different needs in an integrated and inclusive housing design. In 2008, the UK Government decided that all new homes should be built according to the Lifetime Homes Guide. This guide includes design criteria to ensure that appliances can be used for a lifetime at minimum cost and are more easily adaptable. It offers solutions at the scale of housing and approach to housing. It includes design consideration for residential spaces,

building elements and building systems. Design considerations in the guide do not have any rating criteria in themselves. All criteria must be met in the housing design (Lifetime Home, 2010).

Livable Housing Design Guidelines (LHD) were developed in 2010 by industry, community and human rights organizations with contributions from the National Dialogue on Universal Housing Design and funded by the Australian Government. The guidelines include a set of design criteria for safe and affordable housing to meet the changing needs and abilities of all people at various stages in their lives, including the disabled and older adults. The Guidelines define 15 design criteria for "Livable Housing" (Livable Housing Design, 2010). The Guidelines only offers solutions at the scale of housing and approach to housing. The Guidelines include design consideration for residential spaces, building elements and building systems. Each of the 15 design considerations for "Livable Housing" is broken down into sub-criteria based on these levels to achieve silver, gold or platinum level accreditation. For the silver level, seven key design considerations must be met, focusing on key structural and spatial elements. Gold level includes additional non-mandatory design requirements. Platinum level includes all 15 design considerations. Housing designed for older adults must be platinum-level to allow for aging in place.

Universal Design Guidelines for Homes in Ireland (UDH) were developed in 2015 in Ireland, the only country with a statutory Center of Excellence in Universal Design. The Guidelines underline the need for housing to be built in accordance with universal design principles so that individuals can continue to live in their current homes even as they get older or become disabled. "Universally Designed Homes" refer to homes that has the flexibility to respond to people's changing needs in a cost-effective way, increases energy efficiency and enables longer independent living with smart technologies. The Guidelines offer housing and housing approach and neighborhood scale solutions. The Guidelines include design criteria for residential spaces, building elements and building systems. There is a three-level rating among the design consideration. All design considerations of scale, area, structural elements and systems are divided into three performance levels. The UD Home level is a mandatory design requirement that optimizes flexibility, adaptability and usability for all users. The UD Home+ level includes the design requirements needed to more easily adapt to the

changing needs of people over time. The UD Home++ level includes high-level design criteria for an individual to live independently for a long time and to improve their quality of life (Centre for Excellence in Universal Design, 2015).

Older Persons' Housing Design: A European Good Practice Guide (OPHD) were developed by institutes from five EU countries (Sweden, Italy, Spain, Hungary, and the UK) between April 2005 and September 2007. The Guidelines, the product of an interdisciplinary work group made up of sociologists, economists, architects, engineers, and those responsible for study and research in welfare, was tested and verified by various institutes. Its main purpose is to bring together the requirements on how new homes should be planned or what renovations should be made in existing homes to provide staying in their own homes as much as possible for older adults. The design guide includes four scales: residence, neighborhood, neighborhood and urban context. The guidelines include design considerations for residential spaces, building elements and building systems. The design considerations in the guidelines are divided into two levels as fundamental needs and special needs (Sweden, Italy, Spain, Hungary, the UK, 2007)

EVOLVE Tool - Evaluation of Older People's Living Environments (EVOLVE) was developed by the University of Sheffield and The University of Kent in 2010 and supported by various institutions. The tool is the product of a detailed research that includes a review of literature, guidelines, regulations, and standards, analysis of housing designs, consultation with architects, interviews with older adults and their families, and analysis of 23 extra care housing plans. The guidelines offer housing and housing approach and neighborhood scale solutions. The guidelines include design consideration for residential spaces, building elements and building systems .Design considerations in the guide do not have any rating criteria in themselves (The University of Kent & The University of Sheffield , 2010)

Accessibility Guide in Turkey (AGT) prepared by the Ministry of Family, Labor and Social Services, General Directorate of Services for the Disabled and Older Adults (2020), based on accessibility legislation and standards. The Accessibility Guide, which includes all accessibility legislation and standards, consists of 12 sections such as stairs, garden entrances, garden pathways, building entrances, parking lots, ramps, stairs, horizontal-vertical circulation, doors, windows, kitchens, bathrooms, toilets, rooms and

other complementary equipment such as alarms and signs. Accessibility measures and criteria in each section are explained with sample solutions, plan, section, and perspective drawings. The guidelines offer housing and housing approach scale solutions. The guidelines include design considerations for residential spaces, building element systems and service systems. Design consideration in the guide do not have any rating criteria in themselves (Ministry of Family Labor and Social Services, 2020).

Chapter 5

A Housing Design Assessment Approach to Improve the Quality of Life in Old Age

Old age is a time when a person experiences psychological, biological and social losses and changes, as explained in detail in Chapter 2. Older adults are more cautious and often need assistance with ADLs and IADLs that they used to be able to perform easily due to biological loses. On the other hand, they have difficulty maintaining their social relationships and activities. This is due to the consequences of social ageing, such as the leisure time gained through retirement, the loss of status due to negative changes in social roles and the empty nest that results from the change of lifestyle. Although years of experience, wisdom in coping, learning and creativity are still positive aspects of ageing, most older adults suffer from psychological disorders such as loneliness, depression and dementia caused by biological and social losses. Changes caused by the three aspects of ageing reduce well-being and life satisfaction in old age, in other words, the quality of life.

On the other hand, it can be seen that theorists concerned with ageing look for ways to compensate for or minimize the losses caused by ageing, as mentioned in chapter 2.4. Havighurst and Albrecht's (1953) activity theory argues that staying active in old age is a necessary component of quality of life and that social and individual activities must be maintained for this to happen. Baltes et al. (1987) state, albeit from a different perspective, that the individual's ability to cope with the functional losses of ageing and his or her successful adaptation to changes in the life course are related to his or her quality of life. Atchley's (1989) continuity theory states that continuity of internal integrity, such as decision-making and self-esteem, and external integrity, such as social relationships and meaningful activities, enhances the quality of life of older people. The theories emphasize that maintaining and improving quality of life reduces the negative effects of ageing, although their perspectives differ.

Quality of life in old age is a multidimensional concept with physical, psychological and social domains that are assessed both objectively and subjectively, as explained in detail in Chapter 3. Being able to live independently and actively for as long as possible is a desirable condition for quality of life. The older adult's home, which is the center of ADLs and IADLs and all other meaningful activities, directly affects the ability to live independently and thus quality of life. Theories developed about older people and the built environment emphasize that there is a meaningful relationship between the person's abilities and the design of the home for quality of life. Furthermore, the theories emphasize that the multi-layered built environment that centers the home and extends to the city influences the quality of life. They have empirically demonstrated that the built environment must respond to the needs of older adults through compensatory or complementary design considerations. On the other hand, architectural policies and guidelines have developed design considerations that facilitate the lives of older adults, enable them to live independently and thus improve their quality of life, as discussed in more detail in Chapter 4.

All these efforts show us that it is possible to increase the quality of life by living independently for a long time in a home where age-related losses are compensated for or supplemented by design. So, there is a connection between the domains that make up quality of life and the design considerations that shape housing. With the exception of the EVOLVE, the housing design guides mentioned in chapter 4.2.3 indirectly link to the quality of life domains to which the design considerations relate. Although these links can be understood through detailed reading, all the design guides, including LTH, LHD, UDH, OPHD, AGT, address in detail design considerations that enhance quality of life. The EVOLVE offers a system that links quality of life domains directly to housing design considerations. As mentioned in 3.2.3, Parker et al. (2004) and Kuboshima (2020) established a direct relationship between quality of life domains and housing design issues and reconciled them. On the other hand, Lawton (1983), Dickson and Hailey (2019) and Taşöz (2020) focused more on the quality of life domains required for housing design and indirectly related to design considerations. It can be seen that academic studies and design guides that establish a link between housing design and quality of life in old age do not treat the two topics with the same importance. Either the design considerations are more dominant or the quality of life domains. However, Lawton's model (PC) and

Carp and Carp's model (PEF), which have been emphasizing the design of housing for older people for years, show that quality of life and design considerations should harmonize and complement each other.

However, there is no complete unity between academic studies and design guides in determining quality of life and housing design considerations. Taşöz (2020) and Kuboshima (2020) conducted a survey study with older adults to identify quality of life domains. While Dickson and Hailey (2019) based the domains of quality of life on Maslow's theory, Parker and colleagues (2004) conducted both theoretical and case studies for domains. Although these studies indicate broadly similar domains, they do not fully correspond to housing design considerations from architectural guidelines and policies. In determining quality of life domains, it is necessary to fill the gaps in design considerations with appropriate domains, using a more general to specific approach as in Chapter 3.2.

On the other hand, the housing design guides mentioned in chapter 4.2.3. also differ in the way they address design considerations. While LTH and LHD provide design considerations for very basic building elements and systems, UDH offers more comprehensive design suggestions ranging from spaces, systems, materials, building elements to the use of technologies. However, the sizes and shapes they recommend for the same design elements are generally the same, based on laws and standards. The OPHD and the EVOLVE contain more specific design considerations as they were developed for older adults. The design considerations in these guides are in line with international standards for all older adults in some areas, while they are in line with national laws and regulations in certain areas such as width and height. Therefore, it is necessary to consider TS -9111 standards and laws in certain areas when evaluating a house built in Turkey. This is where AGT comes into play, which was created considering the policy requirements in Turkey. In summary, these guides, which complement each other, should also be combined with Turkish laws, regulations and standards.

There are also differences in the design scales at which guidelines start with the housing design assessment. While LTH, LHD and AGT provide considerations for the housing, and its immediate surroundings, UDH and EVOLVE provide solutions at the scale of housing, buildings, immediate surroundings and neighborhoods. As is common

in environmental gerontology, OPDH determines the scale of design as housing, immediate environment, neighborhood and urban context. As explained in Chapter 4, environmental gerontology recognizes that there are four environmental scales that influence the design of housing: Microsystem, Mesosystem, Exosystem and Macrosystem. Although the OPHD provides a holistic view of the design scale, it is not a comprehensive guide as it lacks design considerations required for the design elements.

Another difference between the housing design guides is that they rank the design considerations in order of merit or priority. LTH, LHD and UDH distinguish between critical basic structural and spatial design considerations and design considerations related to more advanced, particularly technological systems. EVOLVE also considers all design considerations it associates with quality of life domains to be equally important. Although the OPHD divides design considerations into basic and complementary, it asserts that all these considerations should be considered as much as possible in housing design. AGT, on the other hand, does not rank performance characteristics among design considerations. It merely provides suggestions for further design. However, all design guidelines agree that all design considerations must be considered in their housing so that older adults can live independently for as long as possible and improve their quality of life. Therefore, dividing design considerations according to their importance contradicts the concept of lifetime housing. This may lead to the neglect of design considerations that may be needed in the future.

In summary, there is a strong relationship between quality of life and housing design in old age, and to understand this relationship, studies have been conducted in the areas of quality of life and housing design, both separately and in combination. Academic studies and guidelines, while making important contributions, do not provide a comprehensive approach to housing design that enables older people to live independently for as long as possible, thereby improving their quality of life. **A comprehensive housing design approach that is valid in Turkey** should meet the following objectives, which have been identified in accordance with gaps in the literature and are described in detail above:

- **Objective 1:** To include all design considerations of space, building elements and systems, material etc. that will allow the older adult to live

independently for as long as possible, without categorizing them according to their performance or in order of priority.

- **Objective 2:** To include design considerations for all scales of the built environment, including the housing, its immediate surroundings, the community, and the urban context.
- **Objective 3:** To consider Turkish policies for specific design considerations as well as international standards applicable to all older adults.
- **Objective 4:** To clearly define the areas of quality of life identified w with a general to specific approach, where every design consideration is matched.

The main purpose of this thesis is to develop **a comprehensive housing design approach in Turkey** that meets the above objectives. The assessment approach aims to identify what needs to be done to improve the quality of life in housing designed for older adults. Unlike other guidelines, the assessment approach proposed in this thesis focuses on quality of life in older age. As highlighted in the relocation theories, the person moves into a home designed for them after age 60, then moves to an institution in their 80s, and later to a private care center, meaning the older adult experiences three moves in their lifetime. This approach, emphasized in the planning guides, aims to ensure that a person can live independently in that home for as long as possible when they move into a home designed for them after age 60. The assessment approach aims to identify the deficiencies in the home design to minimize the possibility of a future move and suggest ways to address those deficiencies. It makes it possible to determine the deficiencies that can be corrected with minor or major interventions. This approach is therefore suitable for architects and related professionals.

At the same time, the housing design assessment approach serves three of the Sustainable Development Goals; *Good Health and Well-Being*, *Reduce Inequality* and *Sustainable Cities and Communities* Contributing to the goal of *Good Health and Well-Being* and linking these areas to design considerations serves the goal of *Reduce Inequality*. Allowing older adults to live independently in their homes for as long as possible contributes to the goal of *Sustainable Cities and Communities*. In addition, a five-scale assessment approach that extends from home to city contributes to all three goals to ensure that older adults' quality of life is sustainable from home to city.

The aim of this section is to explain the main structure of the proposed housing design assessment approach in detail. The **housing design assessment approach** consists of five development phases: Design Scale, Design Elements, Design Considerations, Type of Design Considerations, and Quality of Life Domains. The five development phases of the assessment approach are described in detail below.

Development Phase 1 of The Assessment Approach-Design Scale: It consists of five scales of the built environment, including the housing, the building, the immediate surroundings, the community, and the urban context, for a comprehensive assessment approach as explained in Objective 2 (Figure 5.1). These five scales are explained below, respectively.

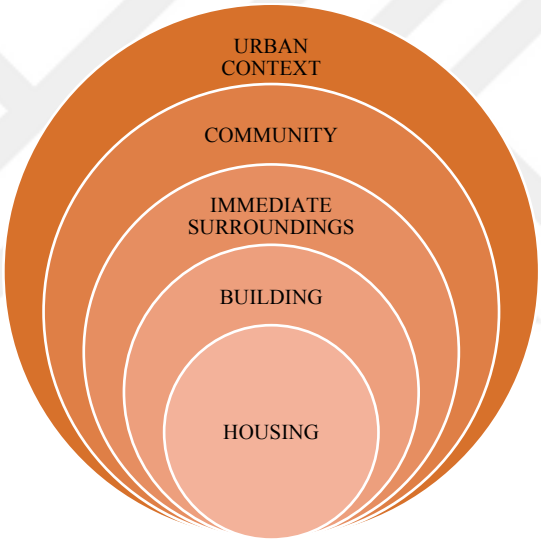


Figure 5.1 Five design scales adopted for the assessment approach

- **Housing Scale**, which is the center of ADLs and IADLs for older adults, is also the center of the assessment approach. The housing scale refers to a single-family home or a single flat in a multi-story building. The housing scale includes design considerations for the entrance space, spaces for living and circulation spaces from the group of design elements. All spaces in the home should be accessible, comfortable, safe, and easy to use. This enhances the quality of life as older adults feel freer, safer and cooler.
- **Building Scale,** refers to a single collective building with multiple housing units. This design scale is included in the assessment if the housing is a flat

in a multi-story building. The building scale includes design considerations for the building entrance and circulation spaces from the group of design elements. Buildings provide the link between the old person's flat and the outdoor spaces by having a common entrance and circulation space.

- **Immediate Surroundings Scale** is the area outside the housing that allows one to approach the building entrance or the housing entrance. The common circulation spaces and parking lot that provide access to the housing or building are assessed at this scale. The immediate surroundings is the first scale where the older adult communicates with the outside world and the community. It should be safe, quiet, and accessible, as it provides a buffer zone between the home privacy and the outside environment.
- **Community** Scale is a neighborhood with various facilities and housing designed for older adults. Community is the scale at which shared pathways, shared open space, shared spaces, and neighborhood relationships are created where older adults interact with the larger community outside the home.
- **Urban Context Scale** based on transportation and circulation planning. Because determining the specific needs of older adults requires a more detailed study at the urban scale, it is discussed only in terms of transportation spaces.

Development Phase 2 of The Assessment Approach-Design Elements: This is the development phase that classifies the design considerations by design elements and is directly related to the design considerations. This evaluation approach proposes a comprehensive classification after reviewing all design considerations in design guidelines and national policies. Design elements basically consist of spaces and design elements that design and operate spaces. These design elements are divided into five groups: Materials and Components, Building Element Systems, Service Systems, Fittings and Appliances. These five groups are in turn divided into subgroups (Figure 5.2). Such categorization facilitates the evaluation of design considerations. Each of the design elements is described in detail in Chapter 5.2.

Figure 5.2 The hierarchical representation of design elements

Development Phase 3 of The Assessment Approach-Design Considerations: Design Considerations are one of the two focal points of the assessment approach. This section is a data collection of six design guides LTH, LHD, UDH, OPHD, EVOLVE, AGT mentioned in Chapter 4.2. Existing design guidelines used their own national standards for some design aspects. Therefore, as stated in Objective 3, Turkish standards in the AGT and international standards applicable to all older adults were considered for certain design considerations. In Chapter 5.2, the design considerations of each design element and the quality of life domains where the design considerations match are explained in detail.

Development Phase 4 of The Assessment Approach- Type of Design Considerations: This development phase of the assessment approach is related to the type of the design considerations. The design considerations are divided into two as objective and subjective. This distinction is necessary for the proper execution of the assessment process. The type of each design consideration is described in detail in Chapter 5.2.

- **Objective Design Consideration:** Objective design considerations are design considerations that can be counted, graded, or measured in centimeters, grams, and seconds. The assessment process of objective design considerations is carried out by architects and related professionals within the architectural project and on site.
- **Subjective Design Consideration:** Subjective design considerations are design considerations related to personally attributed meaning and perceived quality of life. The assessment process of the subjective design issues is conducted by the architect or the person in the stakeholder group leading the evaluation process, seeking the resident's opinion.

Development Phase 5 of The Assessment Approach- Quality of Life Domains: This development phase is the second focal point of the assessment approach. The analysis of the data in Chapter 3.2 identified 4 main domains, 8 sub-domains and 40 functions (Figure 5.3). The four main domains are independence, psychological well-being, social engagement, and support. Each main domain is divided into two sub-domains, and the sub-domains are in turn divided into functions. Each design consideration corresponds to

at least one function that is core to quality of life. The domains of quality of life are described in detail in Chapter 5.1.

The assessment approach consists of the five phases of development described above and has two focal points: Design Considerations and Quality of Life Domains. The main purpose of the approach is to establish the relationship between design considerations and quality of life domains. First, Chapter 5.1 identifies the quality of life domains, which are the fifth development phase of the assessment approach. In Chapter 5.2, development phases 1, 2, 3, and 4 are considered together because they are interrelated, and the relationship between design considerations and the corresponding quality of life domains is explained.

5.1 Determination of Quality of Life Domains

Quality of life domains constitute the 5th development phase of the assessment approach and are one of two important focal points. This section describes the quality of life domains that emerged from the analysis of the information in Chapter 3.2 and 4.2. Through the analysis of general, gerontological, and architectural approaches, four main areas of quality of life have been identified: Independence, Psychological Well-Being, Social Engagement, and Support. Each domain is divided into two subdomains and the subdomains are divided into functions. Functions form the core of quality of life and are the part that corresponds to design considerations. The structure of the quality of life domains consists of 4 domains, 8 subdomains and 40 functions. In the further sections, the individual areas and their contents are explained (Figure 5.3, and Table 5.1).

5.1.1 Domain 1: Independence

Independence, which can be defined as an older person's ability to perform ADLs and IADLs alone, is the first domain of quality of life according to Maslow (1943), Lawton (1978), Stewart and King (1994), Lindenberg (1996), The WHOQOL Group (1998), UN (1999), Walker (2005), WHO (2015) and Kuboshima (2020), although it is explained with different labels. Maintaining independence in old age is the most important factor affecting the quality of life of older adults, whose internal capacity and

functional competence decline with biological changes. Independence has a direct impact on other domains of quality of life. Independence, identified as the first domain of the proposed framework, is divided into two subdomains: “ADLs” and “IADLs”.

Table 5.1 Hierarchical relationship between quality of life domains, sub-domains and functions

Quality of Life Domains					
Code	**Domain**	**Code**	**Sub-Domain**	**Code**	**Function**
1	Independence	1-1	ADLs	1-1-1	Ability to be mobile
				1-1-2	Ability to self-transfer
				1-1-3	Ability to take care of one's own body
				1-1-4	Ability to go to the toilet on one's own
				1-1-5	Ability to self-feed
				1-1-6	Ability to self-dress
		1-2	IADLs	1-2-1	Ability to prepare meals
				1-2-2	Ability to do housework
				1-2-3	Ability to do one's own shopping
				1-2-4	Ability to manage one's own health
				1-2-5	Ability to manage transportation
				1-2-6	Ability to manage technological devices
2	Psychological Well-Being	2-1	Subjective Comfort	2-1-1	Sense of privacy
				2-1-2	Sense of security and safety
				2-1-3	Sense of belonging to one's own home
				2-1-4	Sense of peaceful sleep and rest
				2-1-5	Sense of self-esteem
				2-1-6	Sense of self-actualization
		2-2	Objective Comfort	2-2-1	Suitable equipment size and height
				2-2-2	Enough storage/worktop space
				2-2-3	Suitable environmental comfort
				2-2-4	Suitable material
				2-2-5	Visual well-being
				2-2-6	Access to nature and view
3	Social Engagement	3-1	Meaningful Relationships	3-1-1	Relations with partner
				3-1-2	Relations with family and friends
				3-1-3	Relations with neighbors
				3-1-4	Relations with the wider community
		3-2	Meaningful Activities	3-2-1	Continuing familiar activities
				3-2-2	Looking after plants/flowers and pets
				3-2-3	Staying active
				3-2-4	Contributing to volunteer activities
				3-2-5	Doing recreational activities with others
4	Support	4-1	Care Support	4-1-1	Caregiver support
				4-1-2	On-site staff support
				4-1-3	Access to healthcare professionals
		4-2	Technological Support	4-2-1	Alarm systems
				4-2-2	Structural supports
				4-2-3	Assisted living technologies
				4-2-4	Social robots

Subdomain 1-1. ADLs: ADLs, which express basic activities and movements in daily living, are an indicator of older adults' ability to live their lives independently. ADLs consist of a set of skills and are the main factor that determines transportation lines and spatial dimensions in housing and environmental design. ADLs are divided into 6 functions to distinguish which ability impacts which housing design considerations. Reference is made to these six functions in the quality of life domains proposed by Maslow (1943), Lawton (1978), Stewart and King (1994), Lindenberg (1996), The WHOQOL Group (1998), UN (1999), Walker (2005), WHO (2015), Kuboshima (2020), The WHOQOL-OLD Group (2005), and Parker et al. (2004).

- ***Ability to be mobile*** involves basic movements such as standing, walking, moving from one place to another, sitting and standing up on one's own, going up and down stairs
- ***1-1-2. Ability to self-transfer*** refers to moving from one body position to another, e.g., moving from a bed to a chair/wheelchair and the ability to get up from a bed/chair by grasping assistive devices.
- ***1-1-3. Ability to take care of one's own body*** includes tasks such as bathing and grooming, brushing teeth, combing hair, and nail care.
- ***1-1-4. Ability to go to the toilet on one's own*** refers to going to the toilet, getting up again by using it properly and cleaning oneself.
- ***1-1-5. Ability to self-feed*** refers to tasks such as moving food from plate to mouth, chewing, and swallowing.
- ***1-1-6. Ability to self-dress*** includes tasks such as dressing and undressing self, putting on shoes/socks, and selecting clothing from closet.

Subdomain 1-2. IADLs: Although not essential for basic functioning, IADLs relate to activities that support daily living and enable older persons to live independently in the community and interact with their environment. The ability to maintain and perform IADLs that can be easily transferred to another person has a positive impact on the older person's quality of life. Reference is made to these six functions in the quality of life domains proposed by Maslow (1943), Lawton (1978), Stewart and King (1994), Lindenberg (1996), The WHOQOL Group (1998), UN (1999), Walker (2005), WHO (2015), Kuboshima (2020), The WHOQOL-OLD Group (2005), and Parker et al. (2004).

Figure 5.3 The hierarchical representation of the relationship between quality of life domains, sub-domains and functions

- ***1-2-1. Ability to prepare meals*** involves a variety of complex tasks, such as getting food from the refrigerator, preparing food on the counter, cooking on the stove, arranging food on plates, and bringing food to the table.
- ***1-2-2. Ability to do housework*** includes tasks such as vacuuming, cleaning the house, keeping the house tidy, taking out the trash, washing dishes, hanging and folding laundry.
- ***1-2-3 Ability to do one's own shopping*** includes shopping for clothes, groceries, and other items necessary for daily living, and buying medications.
- ***1-2-4. Ability to manage one's own health*** refers to taking control of one's health, such as taking medications on time and attending medical appointments.
- ***1-2-5. Ability to manage transportation*** refers to commuting to places outside the home by car or public transportation.
- ***1-2-6. Ability to manage technological devices*** refers to the use of telephone, computer, and other technical aids for communication.

5.1.2 Domain 2: Psychological Well-Being

Psychological changes in older adults are quite positive, and mental disorders in old age are usually due to biological and social losses. It is likely that biological and social well-being will also affect psychological well-being. Regardless of these, psychological well-being is an inner experience of the older person, as in Lawton's (1978) Good Life Model. The sense of comfort that the design of the built environment evokes in older adults leads to psychological well-being. Hughes's (1990) QOL-network and Lindenberg's (1996) Theory of Social Production Function identify comfort as an important quality of life domain. Taşöz (2020) and Kuboshima (2020) diversify the comfort domains that make up psychological well-being. Taking these approaches into account, psychological well-being, which is determined as the second domain of quality of life, is divided into two subdomains: subjective comfort and objective comfort (Figure 5.3, and Table 5.1).

Subdomain 2-1. Subjective Comfort: It is related to "higher needs" such as privacy, security, and belongingness, which Frances Carp and Abraham Carp (1984)

emphasize in their PEF model. Subjective comfort, which cannot be measured objectively (e.g., in meters or minutes), can be assessed by the emotions it evokes in the older adults. Subjective comfort consists of 6 functions. The description of each function and the sources used are described below.

- ***2-1-1. Sense of privacy*** is to use curtains, to create a protected space, to set spatial boundaries to which only the occupants have access so that they cannot be seen or heard by others. One of domains of quality of life that Hughes (1990), The WHOQOL-OLD Group (2005), Parker et al. (2004) and Taşöz (2020) recommend relates to a sense of privacy.
- ***2-1-2. Sense of security and safety*** includes the use of guardrails to create a sense of security against the fear of falling, the use of non-slip floor materials, having a door that gives a sense of security to the house, providing easy access to communication devices in case of emergency. One of domains of quality of life that Maslow (1943) and Taşöz (2020) recommend relates to a sense of security and safety. Reference is made to this function in the quality of life domains suggested by Hughes (1990), Lindenberg (1996) and UN (1999).
- ***2-1-3. Sense of belonging to one's own home*** includes situations such as taking the opinions of the elderly in the design of the house, allowing them to choose and use their own furniture, creating spaces for their nostalgic objects. One of domains of quality of life that Hughes (1990), Kuboshima (2020) and Taşöz (2020) recommend relates to a sense of belonging to one's own home.
- ***2-1-4. Sense of peaceful sleep and rest*** is about having comfortable seats, having a comfortable bed, keeping bedrooms away from noise, creating completely dark spaces for a good sleep. Reference is made to this function in the quality of life domains suggested by Maslow (1943), Stewart and King (1994), and the WHOQOL Group (1998) and Kuboshima (2020).
- ***2-1-5. Sense of self-esteem*** is related to independently performing ADLs and IADLs such as being able to bathe, prepare and eat meals, clean one's own home, managing one's own health, communicating with people. Reference is made to this function in the quality of life domains suggested

by Maslow (1943), Stewart and King (1994), Lindenberg (1996), The WHOQOL Group (1998) and UN (1999).

- ***2-1-6. Sense of self-actualization*** is related to situations that are the peak of Maslow's hierarchy, such as having personal hobbies and activities, performing religious rituals, participating in social/cultural/recreational activities, contributing to volunteer work. Reference is made to this function in the quality of life domains suggested by Maslow (1943), Lindenberg (1996), The WHOQOL Group (1998) and UN (1999).

Subdomain 2-2. Objective Comfort: It relates both to the perceived quality of life domain in Lawton's (1978) Good Life Model and to lower-level needs in Frances Carp and Abraham Carp's (1984) the PEF model, such as a well-lit, well-marked environment, suitable equipment size and height. Objective comfort consists of 6 functions. The description of each function and the sources used are described below.

- ***2-2-1. Suitable equipment size and height*** include situations such as accessible-height cabinets, accessible-height and one-handed handrails, doorknobs, cabinet handles, reachable height, and all hand-operated (not finger-operated) switches, sockets and controls. Reference is made to this function in the quality of life domains suggested by Lawton (1978), Lindenberg (1996), The WHOQOL Group (1998), Walker (2005), Dickson and Hailey (2019) and Taşöz (2020).
- ***2-2-2. Enough storage/worktop space*** is related to situations such as the sufficient amount of storage in the kitchen, bathroom, hall and other rooms, and the sufficient amount of counter work surface in the kitchen. Reference is made to this function in the quality of life domains suggested by Lawton (1978), Lindenberg (1996), The WHOQOL Group (1998), Walker (2005), Dickson and Hailey (2019) and Taşöz (2020).
- ***2-2-3. Suitable environmental comfort*** includes situations such as natural and artificial lighting and ventilation of the house and its surroundings, adjusting the temperature according to each room of the house, especially sound insulation in the bedroom for a good sleep. The presence of task lighting on the counter in the kitchen, on the mirror in the bathroom for

shaving, and in the living room for reading, positively affects QOL in old age. Reference is made to this function in the quality of life domains suggested by Hughes (1990), Lindenberg (1996) and Kuboshima (2020).

- ***2-3-4. Suitable material*** is related to the properties of the materials used in building elements and spaces such as non-slip floor materials, easy-to-clean wall and floor materials. Reference is made to this function in the quality of life domains suggested by Lawton (1978), Lindenberg (1996), The WHOQOL Group (1998), Walker (2005), Dickson and Hailey (2019) and Taşöz (2020).
- ***2-3-5. Visual well-being*** concerns three areas: material and component properties such as glare, reflection, color; aesthetic comfort such as aesthetic furniture, attractive interiors; and visual contact with nature. Reference is made to this function in the quality of life domains suggested by Hughes (1990), Taşöz (2020) and Kuboshima (2020).
- ***2-3-6. Access to nature and view*** is related to situations such as the windows being visible, the window recordings not blocking the view, the old person sitting and watching the activities done outside. One of domains of quality of life that Kuboshima (2020) recommends is about access to nature and view.

5.1.3 Domain 3: Social Engagement

Social isolation and loneliness are seen in the older adults due to biological losses and changes in social roles. According to Hughes (1990), The WHOQOL Group (1998), UN (1999), Stewart and King (1994), Walker (2005), Dickson and Hailey (2019), Kuboshima (2020), Lindenberg (1996), Taşöz (2020) The WHOQOL-OLD Group (2005) and Parker et al. (2004), maintaining social relationships and social contribution increases the QOL in old age. Older adults acquire new roles and goals through social relationships and activities, which are a means of making use of time in old age. Social engagement, which is determined as the third domain of QOL, is divided into two subdomains as “meaningful relationships” and “meaningful activities” (Figure 5.3, and Table 5.1).

Subdomain 3-1. Meaningful Relationships: What is meant by meaningful relationships is to increase life satisfaction through mutual sharing. The space requirement of relationships, which make a significant contribution to the quality of life of older adults, varies according to the type of relationship. Meaningful Relationships are divided into 4 functions. Reference is made to these four functions in the quality of life domains proposed by Hughes (1990), The WHOQOL Group (1998), UN (1999), Stewart and King (1994), Walker (2005), Dickson and Hailey (2019), Kuboshima (2020), Lindenberg (1996), Taşöz (2020), The WHOQOL-OLD Group (2005) and Parker et al. (2004).

- ***3-1-1. Relations with partner*** means more space as the same house is shared by two people. In particular, this relationship affects the number and type of bedrooms.
- ***3-1-2. Relations with family and friends*** are often based on welcoming guests. Performing a variety of activities such as cooking, eating, playing games and chatting with guests requires a sufficient number of seats and chairs, an appropriately sized dining table, and a kitchen large enough for multiple people to work together. For overnight guests, there should be a sofa bed in the house or in the guest room and living room.
- ***3-1-3. Relations with neighbors*** exist both at home and in the community. There is also both privacy and sociability in this relationship. The entrance door is a place where the old adult can have a quick chat with his neighbor. Balconies and windows that see each other are the other elements of housing where relations with neighbors are established. Although the neighbor's presence creates a sense of security, the sense of privacy is an important determinant of this relationship. There should be enough distance to provide privacy between the windows facing each other and adequate sound insulation should be made in the house. Socializing places with neighbors in the community are outdoor spaces and communal facilities. For this, there should be accessible roads, garden furniture for drinking tea, eating, and spaces for common activities with neighbors in the community.

- ***3-1-4. Relations with the wider community*** are relations with the general public at the urban scale. A sense of security and accessibility are key points for starting and maintaining a relationship with the city.

Subdomain 3-2. Meaningful Activities: Meaningful activities improve the sense of self-actualization of older adults and enable them to socialize. These activities, which positively affect both biological and psychological health, increase the life satisfaction of older adults. Meaningful activities, which are an important domain of QOL, are divided into 5 functions.

- ***3-2-1. Continuing familiar activities*** at home are about personal activities and hobbies that the old person makes a habit of. Engagement in daily religious activities, reading, watching TV, engagement in personal hobbies such as handicrafts, artwork, small job are examples of these activities. A special storage area for hobbies, a well-lit reading corner and a special area for religious rituals affect the continuity and quality of these activities. Reference is made to this function in the quality of life domains suggested by Hughes (1990), Dickson and Hailey (2019), Stewart and King (1994), Walker (2005), Lindenberg (1996) and Kuboshima (2020).
- ***3-2-2. Looking after plants/flowers and pets*** are activities that older adults take responsibility for. Cultivating plants and flowers allows older adults to decorate and adorn their homes, adding to a sense of belonging. A private outdoor space of the house such as a balcony/terrace creates the environment for these activities. Providing pets with a small space to keep their equipment and a small corner to feed them enhances companionship between the older adults and pet(s). Greenhouses, gardens, places reserved for the care of animals encourage older adults in the community to do these activities together. One of domains of quality of life that Kuboshima (2020) recommend relates to looking after plants/flowers and pets.
- ***3-2-3. Staying active*** represents the activities necessary to develop and maintain the functional abilities of older adults. Creating space at home for equipment that needs to be used in daily physical activities motivates older adults to stay active. Going for a walk is another activity that older

adults do to stay active. Providing accessible and safe walking paths with rest spaces in the community and in the urban area increases the older person's sense of security and safety against the fear of falling. Reference is made to this function in the quality of life domains suggested by Hughes (1990), Stewart and King (1994), Lindenberg (1996) and Kuboshima (2020).

- ***3-2-4. Contributing to volunteer activities*** develops the sense of self-actualization of older adults and enables them to socialize. Providing common spaces for voluntary work, such as sharing professional knowledge, transferring skills to young people, helping to organize charity bazaars, encourages the participation of older adults. Reference is made to this function in the quality of life domains suggested by UN (1999), Walker (2005), WHO (2015), Dickson and Hailey (2019) and Kuboshima (2020).
- ***3-2-5. Doing recreational activities with others*** refers to the whole of religious, cultural, social and entertainment activities held together. Meaningful relationships are established through activities done at home, such as playing games with guests, watching movies, and having a barbecue in the garden. Participating in outdoor exercises with other residents of the congregation, going to the mosque for religious ceremonies, and gathering on special occasions and nights are community-scale activities. Reference is made to this function in the quality of life domains suggested by Taşöz (2020), Kuboshima (2020), Dickson and Hailey (2019), Stewart and King (1994) and Hughes (1990).

5.1.4 Domain 4: Support

Although it is desirable that they be able to perform ADL and IADLs alone, older adults cannot be 100% independent due to ongoing losses in their intrinsic capacity and functional abilities. Receiving support for basic activities such as doing housework, bathing and preparing meals is important to ensure the sustainability of life quality in old age. Support, which is determined as the fourth domain of QOL, is divided into two sub-domains as “care support” and “technological support” (Figure 5.3, and Table 5.1).

Subdomain 4-1. Care Support: Care support means that people such as caregivers, on-site staff, assist older adults in the ADLs and IADLs, while healthcare professionals treat them. Care support, which is a commensal relationship in a way, is divided into three functions.

- ***4-1-1. Caregiver support*** is the support that the older person receives at home. Caregivers assist older adults with bathing, preparing meals, feeding, and household chores. The bathroom should have enough space for the caregiver to easily assist older adults in activities such as undressing, body washing, drying and dressing. The older person may want to do some activities on their own under the caregiver's supervision. It is important to use a shower cabin/curtain for a sense of privacy. Washing, drying and folding the laundry are among the housework done by the caregivers. The fact that the washing machine is in the bathroom or close to the bathroom speeds up the work of the caregiver. The kitchen should have enough space so that the caregiver can communicate with older adults while preparing meals. Having an extra bed or sofa bed in the living room allows the caregiver to stay home when needed. Reference is made to this function in the quality of life domains suggested by UN (1999), Dickson and Hailey (2019) and Kuboshima (2020).
- ***4-1-2. On-site staff support*** refers to the staff who observe the general condition of older adults and direct help according to the needs. Quick support for older adults can be provided through a caretaker in a building or a staff station in the community. Staff stations include caretaker, technical staff, medical staff and caregivers. Reference is made to this function in the quality of life domains suggested by UN (1999), Dickson and Hailey (2019) and Kuboshima (2020).
- ***4-1-3. Access to healthcare professionals*** refers to the treatment of older adults by safely reaching health centers. The difference from others is that the older adults receive support in health centers, not at home. Therefore, transportation to health centers such as the family doctor in the community, the pharmacy, and the hospital in the urban should be

accessible and reliable. Reference is made to this function in the quality of life domains suggested by UN (1999), Dickson and Hailey (2019) and Kuboshima (2020).

Sub-Domain 4-2. Technological Support: Technological support includes construction technologies, IoT technologies such as smart home, smart transportation, smart health, and robotic technologies such as social robots. Technological support is divided into four functions. Although not directly mentioned in the quality-of-life approaches in Chapter 3.2, design considerations related to technological support are included in the design guides in Chapter 4.2. Sustainable Development Goals also draw attention to the importance of robotics and digital technologies for quality of life in old age. There is a development from smart housing to cognitive housing (Görez & Metin, 2022).

- ***4-2-1. Alarm systems*** is divided into two groups: alarms that warn the older person in an emergency situation and alarms that the older person calls for help in an emergency situation. The heat detectors, carbon monoxide/gas detectors, smoke detectors used in the house warns the older person in case of danger. There should be emergency call alarms/buttons in certain parts of the house so that the older person can call for help in an emergency. The alarm pull cord at an easily accessible height in the bathroom and the emergency call button at the head of the bed in the bedroom contribute to the older person's sense of security. There are design considerations for this domain in the EVOLVE, UDH, OPHD, and AGT design guides.
- ***4-2-2. Structural supports*** relate to building construction. The construction of the house must be strong and durable enough to support the supporting elements and systems. In particular, bathroom walls should be strong and durable enough to support grab bars and safety bars, as older adults put all their strength into the grab bars when moving from a wheelchair to a shower seat. In cases where the older person is bedridden or unable to walk, a transfer lift system is used to take them from the bedroom to the bathroom. Therefore, the ceiling construction of the bathroom and bedroom must be strong and durable to support the

installation of any possible ceiling mounted rail mechanism. There are design considerations for this domain in the EVOLVE, UDH, OPHD, LTH, LHD and AGT design guides.

- ***4-2-3. Assisted living technologies*** provide support to older adults in four areas: health, environmental comfort, entertainment and communication. There must be infrastructure in the built environment for this technology. There are design considerations for this domain in the UDH and OPHD design guides.
- ***4-2-4. Social robots*** are a source of technological support that improves quality of life in old age by helping older adults to perform ADLs and IADLs independently, and by following their movements and interacting with them socially (Broekens, Heerink, & Rosendal, 2009; Góngora Alonso , et al., 2019). Studies are underway for affordable social robots that will reduce the workforce of caregivers and even replace caregiver support in the world, including Turkey. Although not mentioned in the approaches in Chapter 3.2 and in the design guides in Chapter 4.2, these studies indicate that social robots will be a quality of life domain in the near future. Social robots, which are semi-humanoid robots, are matched with design considerations for caregiver support in housing.

5.2. Relationship Between Design Considerations and Quality of Life Domains

This section aims to explain the relationship between design considerations and quality of life (Figure 5.5). Design considerations constitute the 3rd development phase of the assessment approach and are one of two important focal points. The 1st development phase ***design scale***, the 2nd development phase ***design elements***, and the 4th development phase ***type of design considerations*** are directly related to ***design considerations***, which are the 3rd development phase of the assessment approach. Design considerations are data from the six design guidelines (LTH, LHD, UDH, OPHD, EVOLVE, AGT) mentioned in Chapter 4.2. ***Quality of life domains***, which are 5th development phase of the assessment approach and are one of two important focal points,

are identified in Chapter 5.1. The relationship between the five development phases of the assessment approach is established as follows:

- Design considerations in design guides are classified according to which design element they belong to.
- Design elements are then classified according to the design scales they belong to.
- A hierarchical structure is obtained that progresses in the form of Design Scale - Design Elements - Design Considerations.
- After this structure is created, the type of design considerations is determined objectively and/or subjectively.
- Finally, each design consideration is matched to the quality of life domains to which it relates.
- The structure of the assessment approach is formed as follows (Figure 5.4).

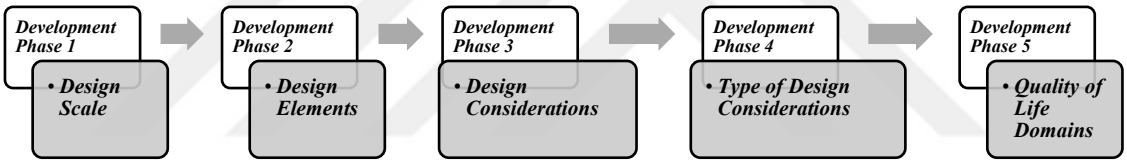


Figure 5.4 The structure of the assessment approach

The relationship between design considerations and quality of life domains is established through design elements (Figure 5.5). Therefore, the relationship between the five development phases of the assessment approach is explained through the design elements. Design elements are divided into two groups as space and design elements. The spaces are divided into four groups within themselves, and the elements of the design are divided into five groups. The relationship between the five development phases of the assessment approach is explained under the main headings of space and design elements. In addition, the sources from which each design idea is derived are also explained.

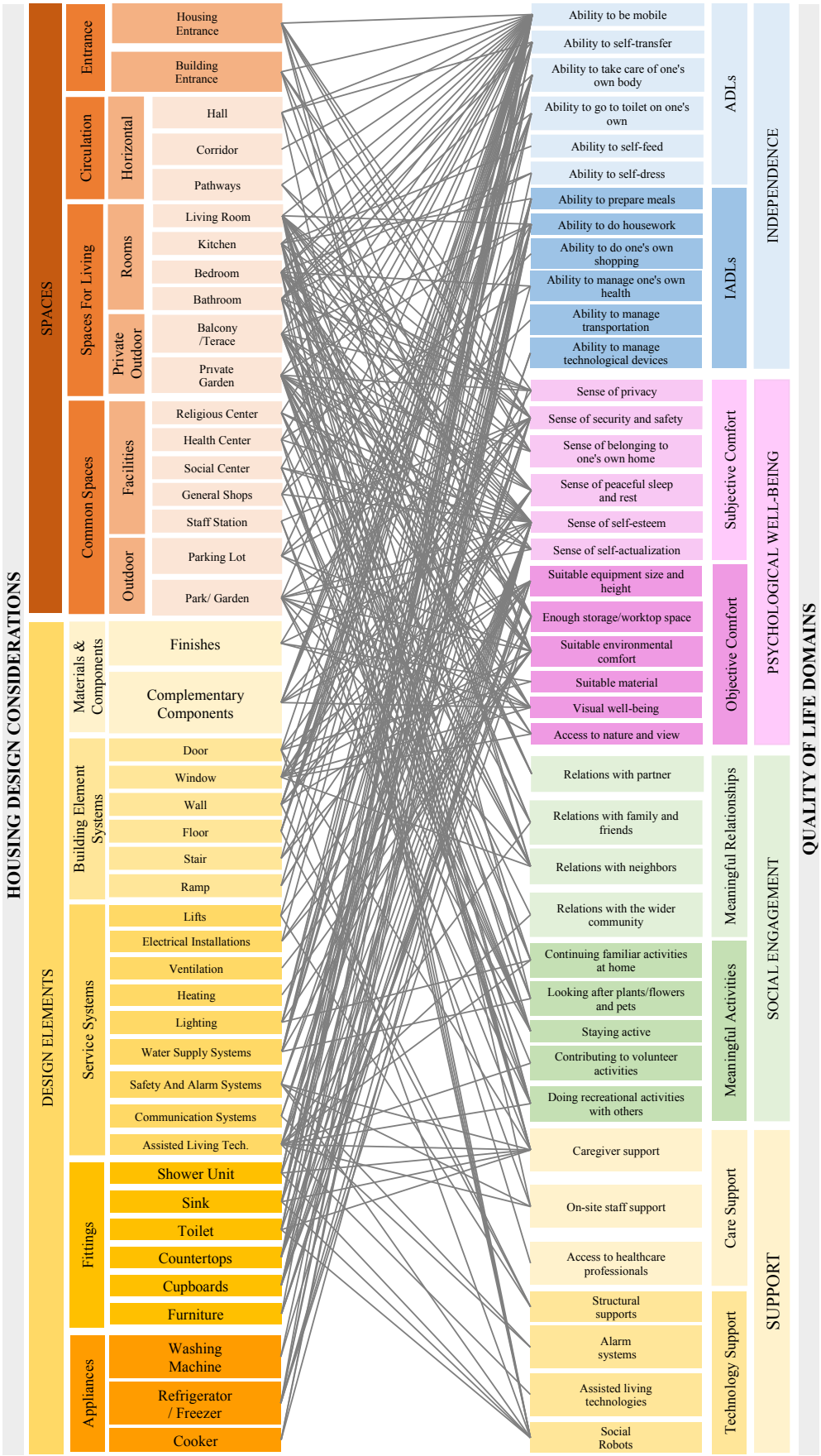


Figure 5. 5 The network of relationships formed as a result of the matching of quality of life and housing design considerations

5.2.1. Spaces

Spaces are the main design element, and other design elements shape or operate the space. Spaces are divided into four groups within themselves: entrance, space for living, circulation and common spaces. These four spaces are divided into sub-spaces (Table 5.2). Each space contains its own unique design considerations independent of other design elements. These design considerations, called general layout, and related QOL domains are explained in this section.

Table 5.2 The hierarchical representation of spaces and sub-spaces

SPACES					
Code	**Space**	**Code**	**Space**	**Code**	**Sup-Space**
SE	Entrance	SE-HE	Housing Entrance		
		SE-BE	Building Entrance		
SC	Circulation	SC-V	Vertical		
		SC-H	Horizontal	SC-HH	Hall
				SC-HC	Corridor
				SC-HP	Pathways
SL	Space for Living	SL-R	Room	SL-RL	Living Room
				SL-RK	Kitchen
				SL-RB	Bedroom
				SL-RBT	Bathroom
		SL-O	Private Outdoor	SL-OPG	Private Garden
				SL-OBT	Balcony/Terrace
SCO	Common Spaces	SCO-F	Facilities	SCO-FRC	Religious center
				SCO-FHC	Heath Center
				SCO-FSC	Social Center
				SCO-FSS	Staff Station
				SCO-FGS	General Shop
		SCO-O	Outdoor	SCO-OPL	Parking Lot
				SCO-OPG	Park/Garden

5.2.1.1. Entrance

The entrance is divided into two sub-spaces as housing entrance and building entrance. The housing entrance is a customizable space, while building entrance is a common area where older adults interact with the other occupants. It can be said that the entrance space is the place where the sense of belonging first begins. Recognizing the entrance to his /her own home or building, even from afar, gives the older adult a sense of security and pleasure. The LTH, LHD, OPHD, EVOLVE, UDH and AGT have similar design considerations for housing and building entrances.

Housing Entrance: First of all, the entrance of the house should be visible and recognizable by older adults, even from a distance. This design consideration is related to *(2-1-2) sense of security and (2-1-3) sense of belonging to one's own home* in *subjective comfort*, which is the sub-domain of *psychological well-being*. The type of this design consideration is subjective, and it is evaluated subjectively. Then, it is accepted as one of the basic design considerations that the entrance of the house is at the same level as the garden path (no-step). That is, for older adult to reach the entrance door, the entrance landing of the housing and the main travel route that provides the approach to the housing should be at the same level. If there is a level difference, it is obligatory to make accessible ramps and stairs according to AGT. Design considerations for stairs and ramps are described in Chapters 5.2.2.2. The interior and exterior of the house should be at the same floor level, that is, there should not be a threshold higher than 1,3 cm at the entrance of the house according to AGT. These two design considerations regarding to the *(1-1-1) ability to be mobile* within *ADLs*, which is the subdomain of *independence*, are objective design considerations. The type of this design consideration is objective, and it is evaluated objectively.

Another design consideration is that there is a customizable space in front of the entrance, separated from the main travel path. EVOLVE and OPHD, one of the design guides developed especially for older adults, attach great importance to this design consideration. According to UDH the customizable space should be a minimum of 180 x 180 cm. Having a customizable space at the entrance matches many QOL domains and ultimately contributes significantly to QOL in old age. This space, decorated by the older adults with furniture and flowers according to their own pleasure, fuels *(2-1-3) sense of belonging to one's own home,* in *subjective comfort*, which is the sub-domain of *psychological well-being*. The customizable space, on the other hand, enables meaningful activities and relationships to be produced. *(3-2-2) Looking after plants/flowers* at the entrance are one of the *meaningful activities*, which is the sub-domain of *social engagement*. The entrance is where guests are welcomed. It also supports *(3-1-3) relations with neighbors*, one of the sub-domains of *social engagement*, by providing a space to chat with neighbors. While evaluating the presence or absence of a customizable space objectively, the occupant's information is needed about the activities carried out in this space. The last design consideration regarding the housing entrance is the canopy. According to UDH, the minimum dimensions of the canopy should be 120 cm deep and

150 cm wide, and with a maximum height of 230 cm. Protecting the entrance with a canopy is related to *(2-2-3) suitable environmental comfort* within the *objective comfort*, which is sub-domain of *psychological well-being*. The type of this design consideration is objective, and it is evaluated objectively (Table 5.3).

Table 5.3 The housing entrance design considerations and related quality of life domains

Design Element: SE-HE: HOUSING ENTRANCE				
Design Scale	Design consideration	Type of D. C.	QOL Domains	Resources
DS1	The entrance should be in visible and recognizable location.	SBJ OBJ	2-1-3 2-1-2	OPHD,EVOLVE, UDH, AGT
	The entrance should be at the same level as the main travel route. If there is a level difference, accessible ramps and stairs should be built.	OBJ	1-1-1	LHT,LHD OPHD,EVOLVE, UDH, AGT
	The entrance landing and the house should be at the same floor level. The entrance threshold cannot exceed 1,3 cm.	OBJ	1-1-1	LHT,LHD OPHD,EVOLVE, UDH, AGT
	The entrance should move away from the main travel route to provide a customizable space.	OBJ	2-1-1 2-1-3	OPHD,EVOLVE
	The entrance has a customizable area for various activities with dimensions of min 180x180.	SBJ OBJ	3-2-2 3-1-3	OPHD,EVOLVE UDH
	There should be an entrance landing with a canopy providing protection from the weather.	OBJ	2-2-3	LHT,OPHD, EVOLVE, UDH AGT
	Dimensions of the canopy: min 120 cm deep, 150 cm wide and max 230 cm high.	OBJ	2-2-3	UDH

Related QOL Domains:

1-1-1:ability to be mobile; 2-1-2 sense of security and safety; 2-1-5: sense of self-esteem; 2-1-6: sense of self-actualization; 2-2-3: suitable environmental comfort; 2-2-5: 3-1-3: relations with neighbors;

Abbreviations:

SBJ: Subjective OBJ: Objective DS1: Housing Scale

Building Entrance: If the housing of the older adult is an apartment, the sense of belonging starts from the entrance of the building. The entrance to the building should be visible and recognizable even from afar by older adults, just like in the residence. This design consideration is related to *(2-1-2) sense of security* and *(2-1-3) sense of belonging to one's own home* in *subjective comfort*, which is the sub-domain of *psychological well-being*. The type of this design consideration is subjective, and is evaluated subjectively. The building entrance should be at the same level as the main travel route that provides access to the building from the road. If there is a level difference, it is obligatory to make accessible ramps and stairs according to AGT. This design considerations regarding to

the *(1-1-1) ability to be mobile* within *ADLs*, which is the subdomain of *independence*. The type of this design consideration is objective, and it is evaluated objectively.

The building entrance is an area used by many people every day and where many activities take place, such as pushing a wheelchair, carrying luggage, shopping or talking to neighbors. Therefore, sufficient space for wheelchair access and other activities at the building entrance is another design consideration. UDH states that the required area for the building entrance landing should be a minimum of 240 x 240 cm. This design consideration is related to *(1-1-1) ability to be mobile* within *ADLs*, sub-domain of *independence*, and *(3-1-3) relations with neighbors* within *meaningful activities*, one of the sub-domains of *social engagement.* The type of this design issue is objective in terms of the dimensions of the space, and subjective in terms of the activities performed in the space. The last design consideration regarding the building entrance is the canopy. According to UDH, the minimum dimensions of the canopy should be 150 cm deep and with a maximum height of 280 cm. Protecting the entrance with a canopy is related to *(2-2-3) suitable environmental comfort* within the *objective comfort*, which is sub-domain of *psychological well-being.* The type of this design consideration is objective, and it is evaluated objectively (Table 5.4).

5.2.1.2 Circulation

Circulation includes spatial transitions such as corridors, halls, and lobby that provide horizontal connection between spaces, and structural elements such as stairs, ramps, and elevators that provide vertical connection between spaces. Well-designed circulation areas with a logical, accessible and clear circulation route make a significant contribution to the quality of life of the older adults. The dimension of the circulation spaces may restrict or support the older person's ability to be mobile and move with caregiver support as needed. Therefore, AGT and all housing design guides emphasize that the dimensions of the corridors should be such that they allow wheelchair maneuvering when necessary. In this section, the general design considerations of the corridors, halls and pathways, which are horizontal circulation spaces, are explained. In vertical circulation, ramps and stairs are explained in the Building Element Systems.

Table 5.4 The building entrance design considerations and related quality of life domains

Design Element: SE-BE: BUILDING ENTRANCE				
Design Scale	Design consideration	Type of D.C.	QOL Domains	Resources
DS2	The building entrance should be in visible and recognizable location.	SBJ OBJ	2-1-3 2-1-2	OPHD,EVOLVE, UDH, AGT
	The entrance should be at the same level as the main travel route. If there is a level difference, accessible ramps and stairs should be made.	OBJ	1-1-1	OPHD,EVOLVE, UDH, AGT
	There should be an entrance landing with a canopy providing protection from the weather. Dimensions of the canopy: min 150 cm deep and max 280 cm high.	OBJ	1-1-1 2-1-3	OPHD, EVOLVE, UDH
	The building entrance should be a minimum of 240 x 240 cm for wheelchair access and various activities.	SBJ OBJ	1-1-1 3-1-3	OPHD, EVOLVE, UDH, AGT

Related QOL Domains:

1-1-1: ability to be mobile; 2-1-2: sense of security; 2-1-3: sense of belonging to one's own home; 2-2-3: suitable environmental comfort; 3-1-3: relations with neighbors

Abbreviations:

SBJ: Subjective OBJ: Objective DS2: Building Scale

Halls: Halls are circulation spaces belonging to the scales of housing and building. Halls are the first spaces to be reached after passing through the entrance door of housing or building. Halls in housing are the spaces used to welcome people and to manage and store cars (such as wheelchairs, strollers), coats and shoes. With these features, the entrance hall corresponds to two quality of life areas: *(1-1-1) ability to be mobile* within *ADLs*, sub-domain of *independence*, and (*2-2-2) enough storage* within the *objective comfort*, which is sub-domain of *psychological well-being*. Therefore, the halls in housing should be large enough to allow both wheelchairs maneuvering and storage. According to AGT, LHD and OPHD, there must be a clear maneuvering area (at least 150 cm diameter circle) adjacent to the entrance door in the entrance hall. UDH, on the other hand, accepts the minimum dimensions of the entrance hall as 180 x180 cm, considering a transfer area where the older adult can pass from the outdoor wheelchair to the indoor wheelchair. This design consideration supports *(1-1-2) ability to self-transfer* within *ADLs*, sub-domain of *independence.* The type of these design considerations is objective, and they are evaluated objectively.

On the other hand, the halls in a building is reception, management and storage (such as mailboxes) spaces just like the housing. In addition, OPHD and EVOLVE

recommend leaving an area in the entrance hall of a building designed for older adults that allows a caretaker to be present. According to these guides, a caretaker who is in contact with all the apartments in the building makes a significant contribution to the quality of life by responding to the possible needs and emergency calls of older adults. This design consideration is related to *(4-1-2) on-site staff* within *care support*, sub-domain of *support*. The type of this design consideration is objective, and it is evaluated objectively. Another design consideration is related to the dimensions of the building hall. The building hall should be large enough to allow easy and comfortable use of the building occupants and other persons when there is heavy traffic. There is no clear dimension other than the maneuvering area regarding the width of the building hall in the current guidelines. If there is a lobby in the entrance hall, there are clear measurements on AGT. The lobby, which has two separate entrance doors, is the hall that acts as a buffer zone between the inside and outside of the building. According to AGT, there should be a space of at least 150 cm between the door swings in the lobby, and the clean dimensions of the lobby should be at least 280 x 350 cm. This design consideration supports *(1-1-1) ability to be mobile* within *ADLs*, sub-domain of *independence*. .The type of this design consideration is objective, and it is evaluated objectively (Table 5.5).

Corridors: Corridor is generally long and narrow horizontal circulation spaces that connect spaces on the same floor. The dimensions of the corridors are very important, especially for wheelchair users. AGT, LHD and UDH accept a minimum corridor width of 120 cm for housing. It is the minimum size required for a walking person and a wheelchair user to pass side by side or opposite each other. According to AGT, EVOLVE and UDH, corridors in buildings should be at least 180 cm considering two-way wheelchair traffic. It is the minimum size that two wheelchair users can pass side by side or opposite each other. AGT determines that the height of the corridors from the clean floor is at least 220 cm in order to ensure uninterrupted circulation in both housing and buildings. These design considerations are related to *(1-1-1) ability to be mobile* within *ADLs*, sub-domain of *independence.* The short and simple walking distances between the corridor and the interior doors in the housing is design considerations that supports the *(1-1-1) ability to be mobile* within *ADLs*, sub-domain of *independence.* Similarly, the floors of all spaces and the floor of the circulation area should be at the same level in order to pass between the spaces without obstacles. These types of design considerations are objective and evaluated objectively (Table 5.6).

Table 5.5 The hall design considerations and related quality of life domains

Design Element: SC-HH: HALL				
Design Scale	Design consideration	Type of D.C.	QOL Domains	Resources
DS1	There should be a clean maneuvering and transfer area of at least 180 x180 cm adjacent to the entrance door in entrance hall.	OBJ.	1-1-1 1-1-2	UDH
	The entrance hall should have additional storage space for a wheelchair or walker frame.	OBJ.	2-2-2	UDH, OPHD, EVOLVE
	The entrance hall should have a general storage area for coats and shoes.	OBJ.	2-2-2	UDH, OPHD, EVOLVE
	There should be an area in the building hall that allows the presence of caretaker.	OBJ.	4-1-2	OPHD, EVOLVE
DS2	There should be an area in the building hall that allows the presence of caretaker.	OBJ.	4-1-2	OPHD, EVOLVE
	If there is a lobby in the entrance hall, its dimensions should be at least 280 x 350 cm.	OBJ.	1-1-1	AGT

Related QOL Domains:
1-1-1:ability to be mobile; 1-1-2: ability to self-transfer; 2-2-2: enough storage; 4-1-2: on-site staff
Abbreviations:
SBJ: Subjective OBJ: Objective DS1: Housing Scale DS2: Building Scale

Table 5.6 The corridor design considerations and related quality of life domains

Design Element: SC-HC: CORRIDOR				
Design Scale	Design consideration	Type of D.C.	QOL Domains	Resources
DS1	The clean width of the corridors should be at least 120 cm.	OBJ.	1-1-1	UDH, AGT LHD
	The clean height of the corridors from the floor should be at least 220 cm.	OBJ.	1-1-1	AGT
	The floors of all rooms and the floor of the circulation area should be at the same level.	OBJ.	1-1-1	UDH, OPHD EVOLVE, LTH, LHD
	Walking distances between the corridor and interior doors should be short and simple.	OBJ.	1-1-1	UDH, OPHD
	The clean width of the corridors should be at least 120 cm.	OBJ.	1-1-1	UDH, AGT LHD
DS2	The clean width of the corridors should be at least 180 cm.	OBJ.	1-1-1	UDH, AGT EVOLVE
	The clean height of the corridors from the floor should be at least 220 cm.	OBJ.	1-1-1	AGT

Related QOL Domains:
1-1-1:ability to be mobile
Abbreviations:
SBJ: Subjective OBJ: Objective DS1: Housing Scale DS2: Building Scale

Pathways: Pathways are routes that connect buildings, housing, other communal and open spaces, and are located at the immediate surrounding, community and the urban context. Firstly, the immediate surrounding includes garden pathways running from the

property boundary to the entrance of housing or building. Just like corridors, the design of pathways is also important for the quality of life of older adults. The pathways approaching the entrance should be safe, uninterrupted, straight or gently sloping. According to AGT and OPHD, the slope of the pathways can be at most 5% and this slope spreads along the pathways. If there is more than 5% slope, ramp should be constructed according to the design considerations in section 5.2.2.2. This design consideration also applies to urban and community scale pathways. On the other hand, the width of the pathways leading to the entrance differs in the scale of the housing and the building. According to the design guidelines, the pathways leading to the housing entrances should be at least 120 cm and the pathways leading to the building entrances should be at least 200 cm. These design considerations are essential to allow the older adult to get home easily and are relevant to the *(1-1-1) ability to be mobile* within *ADLs*, sub-domain of *independence.* The type of this design consideration is objective, and it is evaluated objectively.

The community and urban context scale include pavement, streets and roads that connect or separate buildings, facilities, and open spaces. Pathways at these two scales are desired to have a clear, logical and easy to understand road hierarchy from the main road to smaller streets. According to UDH, such a hierarchy allows older adults to dominate the walking route and increases one's self-esteem by preventing confusion. That's why this design consideration is about both *(1-1-1) ability to be mobile* within *ADLs*, sub-domain of *independence* and (*2-1-5) sense of self-esteem* within *subjective comfort*, which is sub-domain of *psychological well-being*.

Another design consideration concerns the width of pavements in urban context and community. Pavements should be wide enough for people using wheelchairs or walking aids to move freely with other people and should not be cut by obstacles such as trees, garbage cans, street lamps. According to UDH and AGT, the width of the pavements must be at least 200 cm. Likewise, the height of the pathways route should be free of obstacles such as signboards, other equipment and tree branches and should be at least 220 cm. These design considerations are directly related to *(1-1-1) ability to be mobile* within *ADLs*, sub-domain of *independence.* The type of this design consideration is objective, and it is evaluated objectively. The type of this design consideration is objective, and it is evaluated objectively.

Resting landing on the pathways are another design consideration. According to AGT, people with reduced mobility, including older adults, need a rest every 30 m during movement. It requires making resting landing adjacent to the pathway with a clear area of 150 x 150 cm every 30 m. The existence of a resting landing allows the older adult to spend time relaxing on the urban or community scale and improves their quality of life. Therefore, this design consideration is about that *(2-1-4) sense of peaceful sleep and rest* within *subjective comfort*, which is sub-domain of *psychological well-being*. The type of this design consideration is objective, and it is evaluated objectively (Table 5.7).

Table 5.7 The pathways design considerations and related quality of life domains

Design Element: SC-HP: PATHWAYS				
Design Scale	Design consideration	Type of D.C.	QOL Domains	Resources
DS3	The pathway from the boundary of the property to the entrance of the residence should be continuous and without steps.	OBJ.	1-1-1	UDH, AGT LHD
	If there is a building entrance, the clear width of the pathway should be at least 200 cm.	OBJ.	1-1-1	UDH, AGT LHD, LTH, OPHD, EVOLVE
	If there is a housing entrance, the clear width of the pathway should be at least 120 cm.	OBJ.	1-1-1	UDH, AGT LHD, LTH OPHD, EVOLVE
DS3 DS4	The clean height of the pathways should be at least 220 cm.	OBJ.	1-1-1	AGT
DS5	The slope of the pathways should be at most 5%. Ramps should be built on roads where the slope is more than 5%.	OBJ.	1-1-1	AGT OPHD
DS4 DS5	Pathways should have a clear, logical and easy to understand road hierarchy from the main road to the smaller streets.	OBJ.	1-1-1 2-1-5	UDH
	The clean width of the pathways should be at least 200 cm.	OBJ.	1-1-1	UDH, AGT
	There should be a resting landing adjacent to the pathway with a clear area of 150 x 150 cm every 30 m.	OBJ.	2-1-4	AGT

Related QOL Domains:

1-1-1: ability to be mobile; 2-1-4: sense of peaceful sleep and rest; 2-1-5: sense of self-esteem

Abbreviations:

SBJ: Subjective, OBJ: Objective, DS1: Housing Scale, DS2: Building Scale, DS3: Immediate Surroundings Scale, DS4: Community Scale, DS5: Urban Context Scale

5.2.1.3. Spaces for Living

Spaces for Living belonging to the old person's residence are divided into rooms and private outdoor spaces. The rooms are divided into four sub-spaces as kitchen, living room, bathroom, bedroom, and private outdoor spaces are divided into two as balcony and private garden. All living spaces should be large enough so that furniture can be arranged in different ways and meaningful relationships and activities can be produced. The design considerations suggested by the examined design guidelines for the general layout of living spaces and their relationships with the quality of life domains are described below.

Living Room: The living room is a space where the older adult can do their own daily activities, socialize with and accommodate their guests. The first design consideration for this space, which actively uses it, is its location. According to UDH and LTH, living rooms should be level with the residential entrance on an accessible route. The second design consideration concerns the dimensions of the living room. According to EVOLVE, the living room should have a space of at least 3.5 m in diameter, considering that four people can sit comfortably. But this is the minimum dimension and it is necessary to leave enough space considering the activities in the living room. These activities can be divided into four as personal activities, activities with others, caregiver assistance and storage (Table 5.8).

Firstly, the living room should be large enough to perform daily personal activities such as religious rituals, hobbies, and exercises. Performing these activities in the living room is related to the four domains of quality of life. The first two domains are (*3-2-1) continuing familiar activities at home* and (*3-2-3) staying active* within *meaningful activities*, which is sub domains of *social engagement*. The other two are related to the psychological well-being provided by the older adult having the space to perform these activities. Performing these meaningful activities gives the older adult *(2-1-5) sense of self-esteem,* and (*2-1-6) sense of self-actualization* within *subjective comfort, which are* sub-domain of *psychological well-being.* Secondly, it should have enough space for guests to sit comfortably and chat and do activities together. This consideration of design enables both to establish meaningful relationships and to carry out meaningful activities and is associated with two domains of quality of life: *(3-1-2) relations with family and*

friends, and *(3-2-5) doing recreational activities with others.* Third, there should be a convenient bed space in the living room to be used when needed. LTH, OPHD and UDH emphasize the need for bed space in the living room for possible caregiver assistance to older adults. This design consideration is related to (*4-1-1) caregiver support* within *care support*. Fourth, the living room should have a storage or display area for personal items and activity/hobby items. Generally, this need is met with cabinets such as bookshelves, showcases and dressers, and decorating the inside of the cabinets by older adult increases the sense of belonging. Therefore, this design is related to two functions of *psychological well-being*: *(2-1-3) sense of belonging to one's own home* within *subjective comfort*, and *(2-2-2) enough storage* within *objective comfort* (Table 5.8).

Maneuvering and circulation space for wheelchairs is another important design consideration in the living room. Maneuvering area is another important design consideration regarding the living room. The maneuvering area, which is vital for the elderly using wheelchairs or walking aids, is a clear space for 150 cm turning circle according to all design guides. According to EVOLVE and UDH, the maneuver area should be located at the entrance of the living room. AGT emphasizes that a passage width of at least 90 cm should be left between the furniture in the living room for wheelchair circulation. These two design considerations are directly related to *(1-1-1) ability to be mobile* within *ADLs*, sub-domain of *independence.* If there is a dining area in the living room, it is better to place the maneuvering area so that it covers the approach to the dining table. The design considerations of the dining area are explained in detail in the kitchen section (Table 5.8).

Final design considerations of the general layout of the living room are related to subjective design considerations. OPHD recommends decorating the living room to the occupant's taste and giving an opportunity to choose among possible interior arrangements. The involvement of the older adult in interior design strengthens *(2-1-3) sense of belonging to one's own home, (2-1-5) sense of self-esteem* within *subjective comfort*, and *(2-2-5) visual well-being* within *objective comfort,* which are sub-domains of *psychological well-being.* OPHD also recommends arranging furniture so that the older adult can do most of the housework sitting down. This design consideration is directly related to *(1-2-2) ability to do housework* within *IADLs*, which is sub-domain of *independence*. The fact that the older adult does the housework by herself/himself

supports the *(2-1-5) sense of self-esteem* within *subjective comfort,* which is sub-domain of *psychological well-being*. EVOLVE and OPHD suggest providing a comfortable and safe TV watching area facing the door and window to see if anyone is calling. This detailed design matches three quality of life domains. Having doors and windows within sight of the older adult provides *(2-1-2) sense of security and safety* within *subjective comfort,* which is sub-domain of *psychological well-being*. Watching television in a comfortable position creates a *(2-1-4) sense of peaceful sleep and rest* within *subjective comfort,* which is sub-domain of *psychological well-being*, and allows the older adult to carry out their *(3-2-1) continuing familiar activities at home* within *meaningful activities*, which is sub-domain of *social engagement* (Table 5.8).

Kitchen: The kitchen is often a busy space where many activities are done at the same time and is associated with many domains of quality of life. For this reason, it is important where the kitchen or kitchenette is located in the house. UDH and OPHD recommend that the kitchen or kitchenette should be physically separated from other areas of the home and not be part of the circulation path in the home to prevent accidents. This design consideration matches many domains. Having the kitchen in a safe location facilitates the older adult's functions of *(1-1-1) the ability to be mobile* within *ADLs*, and *(1-2-1) the ability to prepare meals* within *IADLs*. Doing their chores safely in the kitchen increases the older adult's *(2-1-2) sense of security and safety,* and *(2-1-5) sense of self-esteem* (Table 5.9).

Maneuvering space is another kitchen design consideration and actually determines the kitchen's minimum dimensions. According to all design guidelines except LTH, there should be a maneuvering area of at least 150 cm diameter circle in front of fixed countertops and appliances. In other words, the minimum width of the kitchen is calculated by multiplying the counter width by the number of countertops and adding 150 cm to the result. It reveals another design idea by allowing the presence of more than one person in the kitchen. According to EVOLVE and OPHD, there should be space for more than one person in the kitchen for family members, friends or caregivers to be involved in preparing the older person's meals. These two design considerations are associated with seven domains. Having enough space in the kitchen allows *(1-1-1) the ability to be mobile* and *(1-2-1) the ability to prepare meals*. Preparing meals is a function that develops the older adult's *(2-1-5) sense of self-esteem*. The older adult's cooking with grandchildren,

friends, or family members creates meaningful relationships such as *(3-1-1) relations with partner* and *(3-1-2) relations with family and friends*, and *meaningful activities* such as *(3-2-5) doing recreational activities with others*. According to the OPDH, there should also be sufficient space in the kitchen for *(4-1-1) caregiver support* and *(4-2-4) social robots*, as older adults are expected to live in their homes as long as possible (Table 5.9).

Table 5.8 The living room design considerations and related quality of life domains

Design Element: SL-RL: LIVING ROOM				
Design Scale	Design consideration	Type of D.C.	QOL Domains	Resources
DS1	Living room should be level with the housing entrance on an accessible route.	OBJ.	1-1-1	UDH, LTH
	The living room should have a space of at least 350 cm in diameter.	OBJ.	1-1-1	EVOLVE
	The living room should be large enough to perform daily personal activities such as religious rituals, hobbies, and exercises.	OBJ.	3-2-1, 3-2-3 2-1-5, 2-1-6	UDH, OPHD
	The living room should have enough space for guests to sit comfortably and chat.	OBJ.	3-1-2, 3-2-5	UDH, OPHD, EVOLVE
	There should be a convenient bed space in the living room to be used when needed.	OBJ.	4-1-1	UDH, LTH, OPHD
	There should have a storage or display area for personal items and activity/hobby items.	OBJ.	2-1-3, 2-2-2	OPHD
	There should be a clean maneuvering area (at least 150 cm diameter circle) at the entrance of the living room.	OBJ.	1-1-1	UDH, EVOLVE
	There should be a passage width of at least 90 cm between the furniture in the living room.	OBJ.	1-1-1	AGT
	The living room should be decorated according to the occupant's taste.	SBJ.	2-1-3, 2-1-5 2-2-5	OPHD
	The furniture in the living room should be arranged in such a way as to do the cleaning of the house sitting down.	SBJ.	1-2-2, 2-1-5	OPHD
	A comfortable and safe TV watching area should be provided facing the door and window to see if someone is calling.	SBJ. OBJ.	2-1-2, 2-1-4 3-2-1	OPHD EVOLVE

Related QOL Domains:

1-1-1: ability to be mobile; 1-2-2: ability to do housework; 2-1-2: sense of security and safety; 2-1-3: sense of belonging to one's own home; 2-1-4: sense of peaceful sleep and rest; 2-1-5: sense of self-esteem; 2-1-6: sense of self-actualization; 2-2-2: enough storage/worktop space; 3-1-2: relations with family and friends; 3-2-1: continuing familiar activities at home; 3-2-3: staying active; 3-2-5: doing recreational activities with others; 4-1-1: caregiver support

Abbreviations:

SBJ: Subjective OBJ: Objective, DS1: Housing Scale

Dining space is another design consideration for the kitchen. The dining space is a space that matches many domains of quality of life, such as eating, sharing food, and providing hospitality. The first design consideration concerns the location of the dining

area. The dining area can be located in its own room, living room or kitchen. However, in all locations it is desirable that the dining area be close to the kitchen to minimize the transport distance of the food and beverage trays and to prevent possible accidents. According to UDH, the dining area should be inside or immediately adjacent to the kitchen. If the dining area is in the living room, UDH suggests having a small table in the kitchen for breakfast and snacks as well. The fact that the dining area is close to the kitchen facilitates the functions of *(1-1-1) ability to be mobile* and *(1-1-5) ability to self-feed.* Easy and safe access to the dining area increases the older adult *(2-1-2) sense of security and safety* and *(2-1-5) sense of self-esteem.* On the other hand, EVOLVE states that the dining area should be large enough for at least four people to eat together. This design consideration allows for sharing food and providing hospitality, and is related to (*3-1-1) relations with partner*, *(3-1-2) relations with family and friend, and (3-2-5) doing recreational activities with others.* At the same time, having enough space in the dining area allows for (*4-1-1) caregiver support* and *(4-2-4) social robots* (Table 5.9).

Wheelchair access to the dining table is another design consideration. Unlike other design guides, AGT includes detailed design considerations on this subject. First of all, there should be a clean maneuvering area with a diameter of 150 cm in the dining area to approach the table with a wheelchair. It is better to place the maneuvering area in the living room or kitchen so that it covers the approach to a dining table. Secondly, a clean area of at least 90 cm wide and at least 49 cm deep should be left under the dining table for the wheelchair to be positioned. These two design considerations found in the TS-911 relate to three domains of quality of life. Access to the dining table and positioning the wheelchair allows *(1-1-1) ability to be mobile.* Once the dinner table is safely reached, the older adult's *(1-1-5) ability to self-feed* comes into play, and being able to do this function independently boosts the older adult's *(2-1-5) sense of self-esteem.* Design considerations related to kitchen appliances and fittings are explained under the relevant headings (Table 5.9).

Bedroom: Bedrooms are multifunctional and private spaces that are used as sleeping places, resting places, dressing rooms and sometimes work areas. The first design consideration is the location of the bedroom, as it is in other rooms. LTH, LHD and UDH recommend that older adults' bedrooms should be at entry level. An accessible entry-level bedroom adds to the *(1-1-1) ability to be mobile*. EVOLVE and OPHD emphasize that

the bedroom should be independent from other rooms for the *(2-1-1) sense of privacy*. In addition, an independent bedroom provides an environment for older adults to foster their *(2-1-4) sense of peaceful sleep and rest*. According to OPHD, EVOLVE and UDH, the bedroom should be with a bathroom or close to the bathroom. Showering and dressing are interrelated functions that require privacy. Therefore, the shorter the distance between the bathroom and the bedroom, the stronger both the *(1-1-1) ability to be mobile* and the *(2-1-1) sense of privacy*. Considering the rapid change of body temperature during movement between the bedroom and bathroom of older adults, this design issue is also important in terms of *(2-2-3) suitable environmental comfort* within *objective comfort*, which is sub-domain of *psychological well-being* (Table 5.10).

Table 5.9 The kitchen design considerations and related quality of life domains

Design Element: SL-RK: KITCHEN				
Design Scale	Design consideration	Type of D.C.	QOL Domains	Resources
DS1	The kitchen or kitchenette be physically separated from other areas of the home and not be part of the circulation path in the home.	OBJ.	1-1-1, 1-2-1 2-1-2, 2-1-5	UDH, OPHD
	There should be a maneuvering area of at least 150 cm diameter circle in front of fixed countertops and appliances.	OBJ.	1-1-1, 1-2-1 2-1-5, 3-1-1 3-1-2, 3-2-5 4-1-1, 4-2-4	UDH, LHD, EVOLVE OPHD AGT
	There should be space for more than one person in the kitchen for family members, friends or caregivers to be involved in preparing the older person's meals.	OBJ.	1-1-1, 1-2-1 2-1-5, 3-1-1 3-1-2, 3-2-5 4-1-1, 4-2-4	EVOLVE OPHD
	There should be a dining area inside or immediately adjacent to the kitchen.	OBJ.	1-1-1, 1-1-5 2-1-2, 2-1-5	UDH
	The dining area should be large enough for at least four people to eat together.	OBJ.	3-1-1, 3-1-2 3-2-5, 4-1-1	EVOLVE
	There should be a clean maneuvering area (at least 150 cm diameter circle) when approaching the table with a wheelchair.	OBJ.	1-1-1, 1-1-5 2-1-5	AGT
	A clean area of at least 90 cm wide and at least 49 cm deep should be left under the dining table for the wheelchair to be positioned.	OBJ.	1-1-1, 1-1-5 2-1-5	AGT

Related QOL Domains:

1-1-1: ability to be mobile; 1-1-5: ability to self-feed; 1-2-1: ability to prepare meals; 2-1-2: sense of security and safety; 2-1-5: sense of self-esteem; 3-1-1: relations with partner; 3-1-2: relations with family and friends; 3-2-5: doing recreational activities with others; 4-1-1: caregiver support; 4-2-4: social robots

Abbreviations:

SBJ: Subjective OBJ: Objective, DS1: Housing Scale

The dimensions for the bedroom are another design consideration. The bedroom should be large enough to accommodate a bed (single or double), wardrobe, bedside, dressing table and maneuvering space. According to UDH, double and twin bedrooms

should be at least 13 m^2, and single bedrooms should be at least 8 m^2. However, it is better to determine the bedroom dimensions by considering the maneuvering and circulation spaces required for the wheelchair. First of all, the furniture in the bedroom should be placed in such a way that the wheelchair does not prevent with circulation. Furniture should be arranged considering two important functions in the bedroom: moving from a wheelchair to a bed and vice versa, and using a closet for dressing. According to TS, EVOLVE, UDH and OPHD, there should be a clean maneuvering area around the bed (side edge and/or foot end) with a diameter of at least 150 cm to allow transfer from the wheelchair. This design consideration allows the *(1-1-1) ability to be mobile* and *(1-1-2) ability to self-transfer* to emerge. The older adult's ability to self-transfer increases *(2-1-5) sense of self-esteem.* AGT recommends providing 90 cm of circulation space on both sides of the double bed and at least one side of the single bed. However, OPHD and EVOLVE state that these dimensions should be 120 cm due to the possibility of converting the bedroom into a hospital room. This distance is required for special equipment such as O2 cylinders and caregiver assistance. Accordingly, a circulation area of 120 cm matches three areas: *(1-1-1) ability to be mobile, (2-2-2) enough storage space*, (*4-1-1) caregiver support,* and *(4-2-4) social robots.* AGT states that a clean maneuvering area with a diameter of at least 150 cm should be provided in front of the wardrobes in the room. This design consideration allows the *(1-1-1) ability to be mobile* and *(1-1-6) ability to self-dress.* The older adult's ability to self-dress increases *(2-1-5) sense of self-esteem* and *(2-1-1) sense of privacy* (Table 5.10).

Bed location and selection are other design considerations in bedroom. OPHD recommends allowing older adults to choose the type of bed they want and this bed should not look like a hospital bed. Since sleep plays an important role in psychological well-being, these design considerations contribute to *(2-1-4) sense of peaceful sleep and rest*, *(2-1-3) sense of belonging to one's own home* within subjective comfort and *(2-2-5) visual well-being* within objective comfort in the older adult. However, when choosing a bed, the possibility of staying in bed for a long time should be considered. According to the OPHD, the bed should be easily integrated with technical aids. It is a necessary design issue for the person to be able to control their own health and to receive caregiver assistance. This design is related to *(1-2-4) ability to manage one's own health,* (*4-1-1) caregiver support,* and *(4-2-4) social robots.* The distance between the bed and the bedside table should be minimized for ease of access to an object. Finally, the distance

between the bed and the bedside should be minimized for ease of access to an object. This design consideration allows the *(1-1-1) ability to be mobile* (Table 5.10).

Table 5.10 The bedroom design considerations and related quality of life domains

Design Element: SL-RB: BEDROOM				
Design Scale	Design consideration	Type of D.C.	QOL Domains	Resources
DS1	The older adults' bedroom should be on the entry level.	OBJ.	1-1-1	LHT, LHD, UD
	The bedroom should be independent from other rooms.	OBJ.	2-1-1 ,2-1-4	EVOLVE OPHD
	The bedroom should be with a bathroom or close to the bathroom.	OBJ.	1-1-1, 2-1-1 2-2-3	OPHD,UD EVOLVE
	The bedroom should be large enough to accommodate a bed (single or double), wardrobe, bedside, dressing table and maneuvering space.	OBJ.	1-1-1, 1-1-2 1-1-6, 4-1-1 3-1-1, 4-2-4	UDH, EVOLVE OPHD, AGT
	There should be clean maneuvering area (at least 150 cm diameter circle) around the bed (side edge and/or foot end).	OBJ.	1-1-1, 2-1-1 2-1-5	UDH, EVOLVE OPHD, OBJ
	There should be 120 cm of circulation space on both sides of the double bed and on at least one side of the single bed.	OBJ.	1-1-1, 2-2-2 4-1-1, 4-2-4	EVOLVE OPHD
	There should be clean maneuvering area at least 150 cm diameter circle) in front of the wardrobes.	OBJ	1-1-1, 1-1-6 2-1-1, 2-1-5	AGT
	The preferences of the resident should be considered in the selection of bed	SBJ.	2-1-3, 2-1-4 2-1-5	OPHD
	The bed should not look like a hospital bed.	SBJ.	2-2-5	OPHD
	The bed should be easily integrated with technical aids when along stay in bed necessary.	SBJ.	1-2-4, 1-1-4	OPHD
	The distance between the bed and the bedside table should be minimized for ease of access to an object.	OBJ	1-1-1	OPHD EVOLVE

Related QOL Domains:

1-1-1: ability to be mobile; 1-1-2: ability to self-transfer; 1-1-6: ability to self-dress; 2-1-1: sense of privacy; 2-1-3: sense of belonging to one's own home: 1-2-4: ability to manage one's own health; 2-1-4: sense of peaceful sleep and rest: 2-1-5: sense of self-esteem; 2-2-2: enough storage space 2-2-3: suitable environmental comfort; 2-2-5: visual well-being; 3-1-1: relations with partner; 4-1-1: caregiver support; 4-2-4: social robots

Abbreviations:

SBJ: Subjective OBJ: Objective, DS1: Housing Scale

Bathroom: The bathroom is the space where a number of different activities take place, such as providing independent access for the wheelchair user, assisting an older person, dressing, undressing, and doing laundry. The first design consideration is the location of the bathroom. All design guidelines recommend a wheelchair accessible bathroom on the entry level. An accessible entry level bathroom adds to the *(1-1-1) ability to be mobile.* According to OPHD, EVOLVE and UD, the bathroom should be inside or immediately adjacent to the master bedroom. This design consideration matches the three

domains of quality of life described in the bedroom section: *(1-1-1) ability to be mobile*, *(2-1-1) sense of privacy* and *(2-2-3) suitable environmental comfort* (Table 5.11).

The dimensions for the bathroom are another design consideration. According to OPHD, EVOLVE and UDH, the bathroom should be large enough to provide fittings such as showers, sinks and closets; storage areas such as wall cabinets, laundry boxes and towel racks; and sufficient maneuvering and circulation areas for activities. OPHD states that for assisted bathing, the bathroom should be large enough for the caregiver and the older person to find it at the same time. The OPHD also recommends a dry area in the bathroom to dress and undress. That is, a large enough bathroom allows many functions of quality of life to take place. These functions are (*1-1-1) ability to be mobile, (1-1-2) ability to self-transfer, (1-1-3) ability to take care of one's own body, (1-1-4) ability to go to the toilet, (1-1-6) ability to self-dress, (2-1-1) sense of privacy, (2-2-2) enough storage space, (2-2-3) suitable environmental comfort, (4-1-1) caregiver support,* and *(4-2-4) social robots* (Table 5.11).

Maneuvering space for wheelchairs is another important design consideration in the bathroom. According to all design guides except LHD, the bathroom should have a clean maneuvering area of at least 150 cm diameter to cover access to the toilet, washbasin and shower area. This design consideration matches many domains: (*1-1-1) ability to be mobile, (1-1-2) ability to self-transfer, (1-1-3) ability to take care of one's own body, (1-1-4) ability to go to the toilet* and *(1-1-6) ability to self-dress.* The space that allows all this ADLs to be performed independently increases the older adult's *(2-1-5) sense of self-esteem.* Design considerations related to bathroom appliances and fittings are explained under the relevant headings (Table 5.11).

Balconies and Terraces: Balconies or terraces are semi-open spaces attached to a private residence where various activities take place, such as enjoying the beautiful weather, growing plants, watching outdoor activities. Except for UD and OPHD, there are no design considerations for this space in the design guidelines. The first design consideration is related to the location of the balcony or terrace. According to UD, there should be direct access to the balcony/terrace from inside the house. This design consideration provides *(2-2-6) access to nature and view* from the room where the balcony is located, and facilitates *(1-1-1) ability to be mobile* (Table 5.12).

Table 5.11 The bathroom design considerations and related quality of life domains

Design Element: SL-RBT: BATHROOM				
Design Scale	Design consideration	Type of D.C.	QOL Domains	Resources
DS1	There should be a wheelchair accessible bathroom on the entry level. (There should be no level difference on the bathroom floor.)	OBJ.	1-1-1	LHT, LHD, UDH,AGT EVOLVE OPHD
	The bathroom should be inside or immediately adjacent to the master bedroom.	OBJ.	1-1-1, 2-1-1 2-2-3	EVOLVE OPHD,UDH
	The bathroom should be large enough to accommodate fittings such as shower area, washbasins, and toilets.	OBJ.	1-1-1, 1-1-2 1-1-3, 1-1-4	OPHD,UDH EVOLVE
	The bathroom should be large enough to accommodate storage areas such as wall cabinets, laundry boxes and towel racks.	OBJ.	2-2-2	OPHD,UDH EVOLVE
	The bathroom should be large enough for the caregiver and the older person to find it at the same time.	OBJ.	1-1-1, 4-1-1 4-2-4	OPHD
	The bathroom should have a dry area for dressing and undressing.	OBJ.	1-1-6, 2-1-1 2-2-3	OPHD
	The bathroom should have a clean maneuvering area of at least 150 cm diameter to cover access to the toilet, washbasin and shower area.	OBJ.	1-1-1, 1-1-2 1-1-3, 1-1-4 1-1-6, 2-1-5	UDH, LHT, LHD,AGT OPHD, EVOLVE

Related QOL Domains:

1-1-1: ability to be mobile; 1-1-2: ability to self-transfer; 1-1-3: ability to take care of one's own body; 1-1-4: ability to go to the toilet; 1-1-6: ability to self-dress; 2-1-1: sense of privacy; 2-1-5: sense of self-esteem; 2-2-2: enough storage space; 2-2-3: suitable environmental comfort; 4-1-1: caregiver support, 4-2-4: social robots

Abbreviations:

SBJ: Subjective OBJ: Objective, DS1: Housing Scale

The dimensions for the balcony/terrace are other design considerations. According to the OPHD, the balcony should be large enough to accommodate flower boxes or pots and a cupboard for tools and materials needed to cultivation of plants. This design consideration matches two domains: *(3-2-2) looking after plants/flowers and pets*, and *(2-2-2) enough storage/worktop space*. However, providing a place to grow plants on the balcony makes important contributions to psychological well-being. Decorating the balcony of the older adult with flowers increases *(2-1-3) sense of belonging to one's own home* and enriches *(2-2-5) visual well-being*, while taking responsibility for their plants increases the older adult's *(2-1-5) sense of self-esteem*. UDH recommends that there be enough space in the balcony to sit and relax and enjoy the fine weather. Having a place to sit on the balcony provides a space to perform *(3-2-1) continuing familiar activities at home,* such as reading a book and listening to music. At the same time, *(2-2-6) access to nature and view* by sitting creates *a (2-1-4) sense of peaceful sleep and rest* in the older adult (Table 5.12).

Maneuvering space for wheelchairs is another important design consideration in the balcony/terrace. According to UDH, the balcony or terrace should have a clear maneuvering area of at least 150 cm in diameter, excluding all furniture and other items. This design consideration matches *(1-1-1) ability to be mobile*, *(3-2-1) continuing familiar activities at home, (3-2-2) looking after plants/flowers and pets,* and *(2-1-5) sense of self-esteem*. Another design consideration suggested by UDH is that the balcony or terrace should have a space where privacy is ensured. A private area can be created on the balcony with removable items such as curtains and panels. This design consideration reinforces the *(2-1-1) sense of privacy*. It also allows the older adult to manage *(3-1-3) relations with neighbors*. UDH states that balcony/terrace should be closed with a dismountable system to protect it from weather conditions. This design consideration is about *(2-2-3) suitable environmental comfort* (Table 5.12).

Private Gardens: Private gardens are important spaces for the health and quality of life of older adults. UDH and OPHD are design considerations guides for private gardens. Access to the garden from inside or outside the house should be level and wide enough for older adults to easily use. There should not be any elevation in the garden that will create a level difference. The width of the garden paths that provide access to all places in the garden (paved area, clothesline, etc.) should be at least 120 cm. There should be a clear maneuvering space of at least 150 cm in diameter for wheelchairs in necessary places on the garden path. These design considerations are related to (*1-1-1) ability to be mobile* and *(2-2-6) access to nature and view* (Table 5.13).

The dimensions for the private gardens are another design consideration. The size and type of garden should be according to the abilities and individual preferences of older adults. This is an important issue for the formation of *(2-1-3) sense of belonging to one's own*. According to UDH and OPHD, the garden should have enough space to cultivate flowers and vegetables. This design consideration is related to *(3-2-2) looking after plants/flowers and pets, (2-2-5) visual well-being* and *(2-1-5) sense of self-esteem.* For older adults with limited mobility, there should be garden beds, large plants pots and hanging baskets at a suitable height in the garden. This design consideration is related to (*2-2-1) suitable equipment size and height.* According to the OPHD, there should be enough space in the garden to take care of pets. *(3-2-2) Looking after pets* improves older

adults' *(2-1-5) sense of self-esteem.* Sensory garden design makes important contributions to the psychological well-being of the older adult. According to UDH, the benefits of the sensory garden approach in landscape design should be considered for older adults with sensory and cognitive difficulties. This design consideration is related to *(2-1-5) sense of self-esteem* and *(2-1-6) sense of self-actualization* (Table 5.13).

UDH states that there should be a paved area with canopy of at least 180 cm in depth in the garden to sit, relax and chatting with people. A paved area with canopy allows for meaningful relationships such as hosting neighbors, playing with grandchildren and activities such as doing exercise, reading books to emerge, establish and sustain. This design consideration is associated with five domains: (*3-1-2) relations with family and friends, (3-1-3) relations with neighbors, (3-2-1) continuing familiar activities at home, (3-2-3) staying active, (3-2-5) doing recreational activities with others.* This area also creates a *(2-1-4) sense of peaceful sleep and rest* in the older adult. There should be a space in the paved area where privacy is provided. This design consideration reinforces the *(2-1-1) sense of privacy.* It also allows the older adult to manage *(3-1-3) relations with neighbors*. Finally, having a variable-height clothesline for drying clothes in the garden supports the *(1-2-2) ability to do housework* (Table 5.13).

5.2.1.3 Common Spaces

Common spaces are open, semi/open and closed spaces used by everyone located at the scale of the immediate surroundings, community and urban context. Common spaces play an important role in helping older adults to socialize, form meaningful relationships, and engage in meaningful activities. Having access to these spaces, which offer the opportunity to engage with the wider community, enhances the older adults' sense of self-confidence. Participating in activities that take place in common spaces gives the older adult an opportunity for self-actualization. Common areas, which are divided into three as facilities, car parks, and parks, must be on an accessible road route. The design considerations suggested by the six design guidelines for the general layout of common spaces and their mapping to the quality of life domains are described below.

Table 5.12 The balconies and terraces design considerations and related quality of life domains

Design Element: SL-OBT: BALCONY/ TERRACE				
Design Scale	Design consideration	Type of D.C.	QOL Domains	Resources
DS1	There should be direct access to the balcony/terrace from inside the house.	OBJ.	1-1-1, 2-2-6	UDH
	The balcony/terrace should be large enough to accommodate flower boxes or plant pots.	OBJ. SBJ.	2-1-3 , 2-1-5 2-2-5, 3-2-2	OPHD
	The balcony/terrace should be large enough to accommodate a cupboard for tools and equipment.	OBJ.	2-2-2	OPHD
	There be enough space in the balcony/terrace to sit and relax and enjoy the fine weather.	OBJ.	2-1-4 , 2-2-6 3-2-1	UDH
	There should be enough space for drying clothes in the balcony/terrace.	OBJ.	1-2-2	UDH
	The balcony/terrace should have a clear maneuvering area of at least 150 cm in diameter, excluding all furniture and other items.	OBJ.	1-1-1, 2-1-5 3-2-1 , 3-2-2	UDH
	There should be a space in the balcony/terrace where privacy is provided.	OBJ.	2-1-1, 3-1-3	UDH
	The balcony/terrace should be closed with a dismountable system to protect it from weather conditions.	OBJ.	2-2-3	UDH

Related QOL Domains:

1-1-1: ability to be mobile; 1-2-2 ability to do housework; 2-1-1: sense of privacy; 2-1-4: sense of peaceful sleep and rest; 2-1-5: sense of self-esteem; 2-2-2: enough storage space; 2-2-3: suitable environmental comfort; 2-2-5: visual well-being; 2-2-6: access to nature and view; 3-1-3: relations with neighbors; 3-2-1: continuing familiar activities at home; 3-2-2:looking after plants/flowers and pets

Abbreviations:

SBJ: Subjective OBJ: Objective, DS1: Housing Scale

Facilities: Facilities, which consist of six main utilities: religious centers, social centers, staff stations, health center, bank, shops, are located in the community and the urban context. Necessary design considerations for facilities are concerned with their presence at the community scale, while at the urban scale it is about access to them. EVOLVE, OPHD, and UDH state that facilities for the daily needs of older adults should be community scale. According to EVOLVE and OPHD, a community should have a place of worship, family doctor/ policlinic, pharmacy, general store, bank/ATM, café, public education centers, public transport stops and hairdresser. All facilities in the community should be located within a radius of 400 m from the older person's housing. This design consideration shortens the travel distance, allowing older adults to walk to the facilities. Walking helps the older adult *(3-2-3) staying active* while improving their *(1-1-1) ability to be mobile* (Table 5.14).

Table 5.13 The private garden design considerations and related quality of life domains

Design Element: SL-OPG: PRIVATE GARDEN				
Design Scale	Design consideration	Type of D. C.	QOL Domains	Resources
DS1	Access to the garden from inside or outside the house should be level and wide enough for older adults to easily use.	OBJ.	1-1-1, 2-2-6	UDH
	There should not be any elevation in the garden that will create a level difference.	OBJ.	1-1-1, 2-2-6	UDH
	The width of the garden paths should be at least 120 cm.	OBJ.	1-1-1, 2-2-6	UDH
	There should be a clear maneuvering space of at least 150 cm in diameter for wheelchairs.	OBJ.	1-1-1 2-2-6	UDH
	The size and type of garden should be according to the abilities and individual preferences of older adults.	SBJ.	2-1-3	OPHD
	The garden should have enough space to cultivate flowers and vegetables.	OBJ.	2-1-5, 2-2-5 3-2-2	UDH OPHD
	For older adults with limited mobility, there should be garden beds, large plants pots and hanging baskets at a suitable height in the garden	OBJ.	2-1-5, 2-2-1 2-2-5, 3-2-2	UDH OPHD
	The benefits of the sensory garden approach should be considered in garden landscape design.	SBJ.	2-1-5, 2-1-6 2-2-5	UDH
	There should be enough space in the garden to take care of pets.	OBJ.	2-1-5, 3-2-2	OPHD
	There should be a paved area of at least 180 cm in depth in the garden.	OBJ.	2-1-4, 3-1-2 3-1-3, 3-2-1 3-2-3, 3-2-5	UDH
	The paved area should have a pergola, canopy or other shading device.	OBJ.	2-2-3	UDH
	There should be a space in the paved area where privacy is provided.	OBJ.	2-1-1, 3-1-3	UDH
	There should be enough space for drying clothes	OBJ.	1-2-2	UDH

Related QOL Domains:

1-1-1: ability to be mobile; 1-2-2 ability to do housework; 2-1-1: sense of privacy; 2-1-3: sense of belonging to one's own; 2-1-4: sense of peaceful sleep and rest; 2-1-5: sense of self-esteem; 2-1-6: sense of self-actualization; 2-2-3: suitable environmental comfort*;* 2-2-5: visual well-being; 2-2-6: access to nature and view; 3-1-2:relations with family and friends; 3-1-3: relations with neighbors; 3-2-1: continuing familiar activities at home; 3-2-2:looking after plants/flowers and pets; 3-2-3: staying active; 3-2-5: doing recreational activities with others.

Abbreviations:

SBJ: Subjective OBJ: Objective, DS1: Housing Scale

Having a family doctor/ policlinic and pharmacy in community allows older adults to *(1-2-4) ability to manage one's own health* by giving them (*4-1-3) access to healthcare professionals.* The general stores in the community, where they can meet the basic needs, allow older adults to (*1-2-3) ability to do one's own shopping.* The religious center in the community contributes to the strengthening of the older adult's *(2-1-6) sense of self-*

actualization through worship. Social centers such as a public education center, workshops enable older adults to build *(3-1-4) relationships with the neighbors* and *(3-2-5) doing recreational activities with others.* The older adult's *(3-2-4) contribution to volunteer activities* in social centers enriches the *(2-1-6)* sense of self-actualization. The presence of all these facilities and access to them alone enhances the older adult's *(2-1-5) sense of self-esteem*. However, EVOLVE and OPHD underline the need for a staff station in a community of older adults. Linked to older adults' housing, this center provides support to older adults in emergencies. *(4-1-2) On-site staff support* provides the elderly adult with the health care, cleaning service, maintenance and repair service, hairdresser service and caregiver support they need at home. The presence of *staff support* creates a (*2-1-2) sense of security and safety* in older adults (Table 5.14).

OPHD divides the facilities offered to older adults in an urban context into three centers: (a) indispensable facilities such as the city hospital, food shops; (b) necessary but not indispensable facilities such as social centers, cultural and religious centers, post offices and banks; (c) useful facilities such as shopping malls, restaurants, cafes, bookstores and sports centers. According to OPHD, it is necessary to ensure easy and safe access of older adults to all services in the urban context by reducing the risks that cause social segregation. Access to facilities in the city is matched to six domains: *(1-1-1) ability to be mobile, (1-2-3) ability to do one's own shopping, (1-2-4) ability to manage one's own health, (3-1-4) relationships with the wider community, (3-2-4) contribution to volunteer activities* and *(3-2-5) doing recreational activities with others.* Participating in activities in the urban contributes to the older adults' (2-1-6) sense of self-actualization. Therefore, the travel route from the community to the urban context must be safe and accessible so that older adults can make the most of the services provided in the urban context. Public transportation stops are important facilities that provide transportation to the facilities in the urban. Access to activities in the city by public transport improves the *(1-2-5) ability to manage transportation* in older adults. It also provides a *(2-1-2) sense of security and safety* in the older adult and improves *(2-1-5) sense of self-esteem* (Table 5.14).

Table 5.14 The facilities design considerations and related quality of life domains

Design Element: SCO-F: FACILITIES				
Design Scale	Design consideration	Type of D.C.	QOL Domains	Resources
DS4	There is a family doctor/ policlinic within a radius of 400 meters from the old person's housing.	OBJ.	1-1-1, 1-2-4 2-1-5, 3-2-3 4-1-3	EVOLVE OPHD
	There is a pharmacy within a radius of 400 meters from the old person's housing.	OBJ.	1-1-1, 1-2-4 2-1-5, 3-2-3 4-1-3	EVOLVE OPHD
	There is a general store within a radius of 400 meters from the old person's housing.	OBJ.	1-1-1, 1-2-3 2-1-5, 3-2-3	EVOLVE OPHD
	There is a religious center within a radius of 400 meters from the old person's housing.	OBJ.	1-1-1, 2-1-5 2-1-6, 3-2-3 3-1-3	EVOLVE OPHD
	There is a social center within a radius of 400 meters from the old person's housing. (café, public education centers, workshops, etc.)	SBJ.	1-1-1, 2-1-5 2-1-6, 3-2-3 3-1-3, 3-2-4 3-2-5	EVOLVE OPHD
	There is a staff station within a radius of 400 meters from the old person's housing.	OBJ.	2-1-2, 4-1-1 4-1-2	EVOLVE OPHD
	There is a bank within a radius of 400 meters from the old person's housing.	OBJ.	1-1-1, 2-1-5 3-2-3	EVOLVE OPHD
	There is a hairdresser stop within a radius of 400 meters from the old person's housing.	OBJ.	1-1-1, 1-2-3 2-1-5, 3-2-3	EVOLVE OPHD
	There is a public transport stops within a radius of 400 meters from the old person's housing.	OBJ.	1-2-5 2-1-5	EVOLVE OPHD
DS5	Access from the community to indispensable facilities such as the city hospital, food shops should be unobstructed and reliable.		1-2-3, 1-2-4 1-2-5, 2-1-2 2-1-5, 4-1-3	OPHD
	Access from the community to necessary but not indispensable facilities such as social centers, cultural and religious centers, post offices and banks should be unobstructed and reliable.		1-2-5, 2-1-2 2-1-5, 2-1-6 3-1-4, 3-2-4 3-2-5	OPHD
	Access from the community to useful facilities such as shopping malls, restaurants, cafes, bookstores and sports centers should be unobstructed and reliable.		1-2-3,1-2-5 2-1-2, 2-1-5 2-1-6, 3-1-4 3-2-4, 3-2-5	OPHD
	The urban context should have public transport stops.		2-1-1; 3-1-3	OPHD

Related QOL Domains:

1-1-1:ability to be mobile; 1-2-3: ability to do one's own shopping; 1-2-4 ability to manage one's own health; 1-2-5 ability to manage transportation; 2-1-2 sense of security and safety; 2-1-5: sense of self-esteem; 2-1-6: sense of self-actualization; 3-1-3: relations with neighbors; 3-2-1:continuing familiar activities at home; 3-2-3: staying active; 3-2-4 contributing to volunteer activities; 3-2-5: doing recreational activities with others; 4-1-1 caregiver support; 4-1-2 on-site staff support; 4-1-3 access to healthcare professionals.

Abbreviations:

SBJ: Subjective OBJ: Objective, DS4: Community Scale, DS5: Urban Context Scale

Park and Gardens: Parks and gardens are open spaces that allow the realization of outdoor activities at the scale of the immediate surroundings, community and urban context. UDH recommends small garden with plants around the housing or building land in the immediate surroundings. According to UDH, specific green spaces in the immediate surroundings of the house help distinguish one building or house from another, especially for people with visual or cognitive difficulties. A distinction should be made between different green space designs and similarly designed residences or apartments. It increases the *(2-1-3) sense of belonging to one's own home* by contributing to *(2-2-5) visual well-being*. However, the garden should be designed to prevent plants from being used as hiding places by humans. This is an important design consideration for *a (2-1-2) sense of security and safety* (Table 5.15).

OPHD recommends parks and gardens enriched with garden furniture, various fountains, the use of different colors and scents, different types and sizes of plants and trees in the community. The parks and gardens within the community should be accessible and usable by everyone. Accessible and usable by all, parks and gardens within the community provide *(2-2-6) access to nature and view* and contribute to *(2-2-5) visual well-being*. According to OPHD, there should be enough space for outdoor games/sports and recreation activities in parks and gardens. This design consideration helps older adults *(3-2-3) stay active* by playing sports. In addition, parks and gardens provide a setting for older adults to engage in *(3-2-5) doing recreational activities with neighbors* and build meaningful *(3-1-3) relations with their neighbors*. Another design issue is related to seating areas. Seating areas in parks and gardens should be arranged in such a way that they can be used as sunny areas and shaded areas all year round. This design consideration is both related to *(2-2-3) suitable environmental comfort* and contributes to *(2-1-4) sense of peaceful sleep and rest.* The design considerations of parks and gardens at the urban scale are related to access. According to the OPHD, access for older adults from the neighborhood to parks and gardens in the urban context should be unobstructed and reliable. This design consideration is related to the *(2-1-2) sense of security and safety*, unlike the others (Table 5.15).

Parking Lot: The design considerations of the parking lot exist only at the scales of the immediate surroundings and the community. According to all design guides, a parking lot should be as close as possible to the entrance of a building/house and in a convenient

location for older adults. AGT indicates that the parking lot must be at a distance of maximum 30 m from the housing. This is a design consideration that promotes *(1-1-1) ability to be mobile* and *(1-2-5) ability to manage transportation*. All design guidelines require the construction of accessible parking lots for people using wheelchairs or walking aids. According to AGT, the width of the accessible parking lot should be at least 400 cm and the length 600 cm, and it is obligatory to have at least one in each detached house. According to AGT, the recommended number of accessible parking spaces for buildings; 1 for 20 flats, 2 for 21-50 flats, 3 for 51-100 flats, and 1 for every 100 or more flats. UDH and AGT recommend that 5% of public parking spaces in the community be accessible parking (Table 5.16).

Table 5.15 The park and gardens design considerations and related quality of life domains

Design Element: SCO-OPG: PARK /GARDEN				
Design Scale	Design consideration	Type of D.C.	QOL Domains	Resources
DS3	There should be small gardens full of plants around the housing or building land.	OBJ.	2-2-5, 2-2-6	OPHD, UDH
	A distinction should be made between different green space designs and similarly designed residences or apartments.	OBJ.	2-2-5, 2-1-3	UDH
	The garden should be designed in such a way as to prevent the use of plants as hiding places by humans.	OBJ.	2-1-2	UDH
DS4	The parks and gardens within the community should be enriched with garden furniture, various fountains, the use of different colors and scents, different types and sizes of plants and trees.	OBJ.	2-2-5, 2-2-6	OPHD
	There should be enough space for outdoor games/sports and recreation activities in parks and gardens.	OBJ.	1-1-1, 2-1-5 2-1-6, 3-2-3 3-2-4, 3-2-5 3-1-3	OPHD
	Seating areas in parks and gardens should be arranged in such a way that they can be used as sunny areas and shaded areas all year round.	OBJ.	2-1-4, 2-2-3	OPHD
DS5	Access from the community to parks and gardens should be unobstructed and reliable.	OBJ.	2-1-2, 2-1-5 2-2-6	OPHD

Related QOL Domains:

1-1-1:ability to be mobile; 2-1-2 sense of security and safety; 2-1-5: sense of self-esteem; 2-1-6: sense of self-actualization; 2-2-3: suitable environmental comfort; 2-2-5: visual well-being; 2-2-6: access to nature and view; 3-1-3: relations with neighbors; 3-2-3: staying active; 3-2-4 contributing to volunteer activities; 3-2-5: doing recreational activities with others.

Abbreviations:

SBJ: Subjective OBJ: Objective, DS3: Immediate Surroundings Scale, DS4: Community Scale, DS5: Urban Context Scale

These design considerations are related to *(1-1-1) ability to be mobile* and *(1-2-5) ability to manage transportation*. Accessible parking should be marked in a way that is visible, legible, understandable and simple to all. This design consideration is related to *(1-2-5) ability to manage transportation* and *(2-2-5) visual well-being*. According to OPHD, LHD and UDH, the parking lot should be protected from weather conditions such as snow and ice and should be covered if possible. This design consideration is both related to *(2-2-3) suitable environmental comfort* and contributes to *(2-1-2) sense of security and safety* (Table 5.16).

Table 5.16 The parking lot design considerations and related quality of life domains

Design Element: SCO-OPL: PARKING LOT				
Design Scale	Design consideration	Type of D.C.	QOL Domains	Resources
DS3	The parking lot should be as close as possible to the entrance of the building/house and in a convenient location for older adults.	OBJ.	1-1-1, 1-2-5 2-1-5	OPHD, UDH,AGT LTH,LHD EVOLVE
	The parking lot must be at a distance of maximum 30 m from the housing.	OBJ.	1-1-1, 1-2-5	AGT
	The housing must have a parking lot measuring at least 400 cm and the length 600 cm.	OBJ.	1-1-1, 1-2-5 2-1-5	AGT
	The number of accessible parking lot (400 cm x 600 cm) for buildings should be as follows: 1 for 20 flats; 2 for 21-50 flats; 3 for 51-100 flats and 1 for every 100 or more flats.	OBJ.	1-1-1, 1-2-5 2-1-5	AGT
	The parking lot should be protected from weather conditions such as snow and ice and should be covered if possible.	OBJ.	2-2-3, 2-1-2	OPHD, UDH, LHD
DS4 DS5	5% of public parking spaces in the community be accessible parking.	OBJ.	1-1-1, 1-2-5 2-1-5	AGT,UDH
	An accessible parking lot should be at least 400 cm and the length 600 cm.	OBJ.	1-1-1, 1-2-5 2-1-5	AGT
DS3 DS4 DS5	Accessible parking should be marked in a way that is visible, legible, understandable and simple to all.	OBJ.	1-2-5, 2-2-5	OPHD AGT,UDH

Related QOL Domains:

1-1-1:ability to be mobile; 1-2-5 ability to manage transportation; 2-1-2 sense of security and safety; 2-1-5: sense of self-esteem; 2-2-3: suitable environmental comfort; 2-2-5: visual well-being

Abbreviations:

SBJ: Subjective OBJ: Objective, DS3: Immediate Surroundings Scale, DS4: Community Scale, DS5: Urban Context Scale

5.2.2 Design Elements

Design elements are divided into five groups as materials and components, building elements, service systems, fittings and appliances. These five groups are divided

into subgroups within themselves (Table 5.17).Unlike spaces, design elements have relationships both with each other and with the spaces. For example, the material of the stair step is a design issue related to the building element, while that of the living room is related to the space. These design elements and related QOL areas are described in this section.

Table 5.17 The hierarchical representation of design elements and sub-design elements

DESIGN ELEMENTS			
Code	**Design Element**	**Code**	**Sub-Design Element**
MC	Materials and Components	MC-F	Finishes
		MC-C	Complementary Components
BE	Building Element Systems	BE-D	Door
		BE-W	Window
		BE-S	Stair
		BE-R	Ramp
		BE-WL	Wall
		BE-FL	Floor
SS	Service Systems	SS-L	Lifts
		SS-E	Electrical Installations
		SS-V	Ventilation
		SS-H	Heating
		SS-LT	Lighting
		SS-WS	Water Supply Systems
		SS-SA	Safety and Alarm Systems
		SS-CS	Communication Systems
		SS-AL	Assisted Living Technologies
FT	Fittings	FT-SU	Shower Unit
		FT-TO	Toilet
		FT-SK	Sink
		FT-CT	Countertops
		FT-CB	Cupboards
		FT-FR	Furniture
AP	Appliances	AP-WM	Washing Machines
		AP-RF	Refrigerators
		AP-CK	Cookers

5.3.2.1 Materials and Components

Materials and components are divided into two sub-design elements as finishes and complementary components. Finishes are design considerations related to material, while components are complementary design elements such as handrail grab bars.

Finishes: The safety, intelligibility, and comfort of spaces within a housing are significantly and widely impacted by surface finishes, which also define the aesthetic

qualities of the housing. The first design consideration regarding surface finishes is about the flooring material in the spaces. Except for the LTH, all design guidelines include design considerations for the floor material. The flooring material of all spaces in all design scale should be flat, solid, durable, non-slip in wet and dry conditions. The use of *(2-2-4) suitable materials* in spaces is an objective comfort that supports the older person's *(1-1-1) ability to be mobile* and provides a *(2-1-2) sense of security and safety*. According to OPHD and EVOLVE, the wall and floor material in spaces should be cleaned easily. This design consideration is related to *(1-2-2) ability to do housework*. According to EVOLVE, OPHD and UDH, loose carpets or rugs should not be used in spaces, and pathways should not be covered with loose and slippery materials such as gravel. These design considerations are related to *(1-1-1) ability to be mobile* and *(2-1-2) sense of security and safety* (Table 5.18).

The second design consideration regarding surface finishes is related to the material of the design elements. There are design considerations with stairs, ramps, doors and windows from building elements in design guides. According to all design guides, the material of the steps and ramps should be hard, non-slip and matte. Visual contrast should be provided at the beginning and end of the ramp and stair. Likewise, doors and windows should contrast visually with adjacent walls in terms of color and material. These design considerations are related to *(1-1-1) ability to be mobile, (2-2-5) visual well-being,* and *(2-1-2) sense of security and safety*. The second design consideration regarding surface finishes is related to the color of the materials used in the spaces. According to OPHD and EVOLVE, the walls and floors of all living spaces should contrast visually with each other. Wall and floor surfaces of all living spaces should have low glare and low reflectivity. These two design considerations are of great importance for older adults with sensory and cognitive difficulties. The precise separation between wall and floor prevents accidents and creates a (*2-1-2) sense of security and safety* in older adults. In particular, the use of *(2-2-4) suitable materials* that prevent reflection from sunlight increases the *(2-2-5) visual well-being* and *(2-2-3) environmental comfort* of the older adult. According to the OPHD, contrasting materials and colors should be used to ensure safety and accessibility on the pathways along the travel route. This design consideration is related to *(1-1-1) ability to be mobile, (2-2-5) visual well-being* and (*2-1-2) sense of security and safety* (Table 5.18).

Table 5.18 The finishes design considerations and related quality of life domains

Design Element: MC-F: FINISHES				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SE-HE SE-BE SC-HC	The flooring material of all spaces in all design scale should be flat, solid, durable, non-slip in wet and dry conditions.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-4	OPHD, AGT UDH, LHD EVOLVE
SC-HH SL-RL	The wall and floor material in spaces should be easy to clean.	OBJ.	1-2-2, 2-1-5	OPHD EVOLVE
SL-RK SL-RB	Loose carpets or rugs should not be used in spaces.	OBJ.	1-1-1, 2-1-2 2-1-5	EVOLVE OPHD, UHD
SL-RBT SC-HP	Pathways should not be covered with loose and slippery materials such as gravel.	OBJ.	1-1-1, 2-1-2 2-1-5	OPHD, AGT UDH, EVOLVE
	Contrasting materials and colors should be used to ensure safety and accessibility on the pathways along the travel route.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-4	OPHD
BE-S BE-R	The material of the steps and ramps should be hard, non-slip and matte	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-4	AGT, UHD EVOLVE OPHD
	Visual contrast should be provided at the beginning and end of the ramp and stair.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-4	OPHD EVOLVE
BE-W BE-D	Doors and windows should contrast visually with adjacent walls in terms of color and material	OBJ.	2-1-2, 2-2-4	OPHD EVOLVE

Related QOL Domains:

1-1-1:ability to be mobile; ; 1-2-2 ability to do housework; 2-1-2 sense of security and safety; 2-1-5: sense of self-esteem; 2-2-4: suitable material; 2-2-5: visual well-being

Abbreviations:

SBJ: Subjective OBJ: Objective, SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HC: Corridor, SC-HH: Hall, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL-RBT: Bathroom, BE-S: Stairs, BE-R: Ramps, BE-W: Windows, BE-D: Doors

Complementary Components: There are design considerations for components in the corridors and balcony/terrace from the spaces, in the stairs and ramps from the building elements, and in the toilets, sinks and shower unit from the fittings. According to all design guidelines, except LTH, there should be handrails on both sides of stairs and ramps. AGT states that the height of the handrails must be at least 110 cm. In addition, there should be a 110 cm high railing on the open side of the balcony/terrace. According to EVOLVE, OPHD, UDH and AGT, handrails should be designed to prevent people and objects from falling. These design considerations are related to (1-1-1) ability to be mobile, *(2-1-2) sense of security and safety* and *(2-2-1) suitable equipment size and height*. The ability of the older adult to use stairs and ramps on their own increases their *(2-1-5) sense of self-esteem*. According to EVOLVE, OPHD and UDH, the handrails color should visually contrast to adjacent surfaces. This design consideration is related to *(1-1-1) ability to be mobile* and *(2-2-5) visual well-being* (Table 5.19).

Components of the fittings help fulfill the functions of ADLs, which are an important part of the quality of life of older adults. There are similar design considerations for handrails or grab bars in all design guides for fittings to be used by wheelchair users or older adults using walking aids. According to AGT, there should be grab bars at a height of between 80 and 95 cm on the walls where the sink, toilet and shower areas are adjacent. This design consideration is related to four domains within ADLs, whose sub-domain is independence: *(1-1-1) ability to be mobile, (1-1-2) ability to self-transfer, (1-1-3) ability to take care of one's own body, (1-1-4) ability to go to the toilet*. Doing all these functions alone increase the older adult's *(2-1-5) sense of self-esteem* (Table 5.19).

Table 5.19 The complementary components design considerations and related quality of life domains

Design Element: MC-C: COMPLEMENTARY COMPONENTS				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
BE-R	There should be 110 cm high handrails on both sides of the ramp.		1-1-1, 2-1-2 2-1-5, 2-2-1	AGT
BE-S	There should be 110 cm high handrails on both sides of the stairs.		1-1-1, 2-1-2 2-1-5	AGT
BE-R BE-S SL-OBT	Handrails should be designed to prevent people and objects from falling.		1-1-1, 2-1-2 2-1-5	OPHD, AGT UDH, EVOLVE
	The handrails color should visually contrast to adjacent surfaces.		1-1-1, 2-2-5	OPHD, AGT UDH, EVOLVE
FT-SU	The height of the grab bars on the shower unit should be between 80-95 cm		1-1-1, 1-1-2 1-1-3, 2-1-2 2-1-5, 2-2-1	AGT
	The width/diameter of the grab bars should be between 32 mm and 40 mm		2-2-1	AGT
	The grab bars should be on all walls of the shower unit except the surface where the seat is.		1-1-1, 1-1-2 1-1-3, 2-1-2 2-1-5	AGT
FT-SK	There should be fixed grab bars at a height of 90 cm from the floor on both sides of the sink.		1-1-1, 1-1-3 2-1-2, 2-1-5 2-2-1	AGT
FT-TO	Depending on the position of the toilet, there should be movable or fixed grab bars on both sides.		1-1-1, 1-1-2 1-1-4, 2-1-2 2-1-5, 2-2-1	AGT

Related QOL Domains:

1-1-1:ability to be mobile; 1-1-2: ability to self-transfer; 1-1-3: ability to take care of one's own body; 1-1-4: ability to go to the toilet; 2-1-2 sense of security and safety; 2-1-5: sense of self-esteem; 2-2-1: suitable equipment size and height; 2-2-5: visual well-being;

Abbreviations:

SBJ: Subjective OBJ: Objective, SL-OBT: Balcony/ Terrace, BE-S: Stairs, BE-R: Ramps, FT-SU: Shower Unit, FT-SK: Sink, FT-TO: Toilet

5.2.2.2 Building Element Systems

Building element systems are divided into six groups as doors, windows, stairs, ramps, walls and floors. Doors, windows, walls and floors create spaces, while stairs and ramps provide the connection between spaces. That's why building element systems are main design elements. The design considerations required for the building elements used in all spaces are similar. The data in AGT are considered in the design issues related to the dimensions.

Doors: AGT states that the clear width of the door of a space must be at least 90 cm and the net height must be at least 210 cm. The opening direction of the door (hinge side) should be adjacent to the turning wall. According to UDH, LTH and EVOLVE, the distance between the opening edge of the door and any adjacent wall should not be less than 30 cm. AGT recommends that the height of the door threshold not exceed 1.3 cm. These design considerations are related to *(1-1-1) ability to be mobile.* According to UDH, EVOLVE and AGT, mechanism that slows the closing of the door should be used on the door to extend the maneuvering time at the passages. Doors should open with minimum pressure. This design consideration also contributes to (*2-1-2) sense of security and safety.* The door handle and other parts of the door should be in the appropriate form and height that everyone can use. These design considerations match domain *(2-2-1) suitable equipment size and height.* While all doors open inwards, the bathroom door must be opened outwards or be a sliding door for emergency intervention. The bathroom door should have locks that can be opened from the outside. These are essential design considerations for the older adult to receive *(4-1-1) caregiver support* (Table 5.20).

Building and housing entrance doors are different in size than interior doors. According to AGT, the clean height of the housing entrance door should be at least 210 cm and the clean width should be at least 100 cm. The width of the building entrance door should be at least 150 cm. There should be 150 cm maneuvering space for wheelchairs in front and behind the entrance doors. These design considerations are related to *(1-1-1) ability to be mobile.* According to the OPHD, entrance doors should give the older adult a (*2-1-2) sense of security and safety* (Table 5.20).

Table 5.20 The doors design considerations and related quality of life domains

Design Element: BE-D: DOOR				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SL-RL SL-RK	The clear width of door should be at least 90 cm	OBJ.	1-1-1	AGT
SL-RB SL-RBT	The clean height of door from the floor should be at least 210 cm.	OBJ.	1-1-1	AGT
	The height of the door threshold not exceed 1.3 cm	OBJ.	1-1-1	AGT
	Mechanism that slows the closing of the door should be used on the door to extend the maneuvering time at the passages.	OBJ.	1-1-1, 2-1-2	AGT, UDH EVOLVE
	The opening direction of the door (hinge side) should be adjacent to the turning wall.*	OBJ.	1-1-1	UDH, AGT, EVOLVE
	The distance between the opening edge of the door and any adjacent wall should not be less than 30 cm.*	OBJ.	1-1-1	UDH, LTH, EVOLVE
	The height of the door handle from the floor should be between 90 -110 cm.	OBJ.	1-1-1, 2-2-1	AGT
	Door handle should be used with one hand and should not require a grip.	OBJ.	1-1-1, 2-2-4	AGT
	Door should open with minimum pressure.	SBJ.	1-1-1, 2-1-2	AGT, UDH, EVOLVE
SE-BE	The width of the building entrance door should be at least 150 cm.	OBJ.	1-1-1	AGT
SE-HE	The clean width of the entrance door should be at least 100 cm.	OBJ.	1-1-1	AGT
SE-BE SE-HE	The clean height of the housing entrance door should be at least 210 cm.	OBJ.	1-1-1	AGT
	There should be maneuvering area (at least 150 cm diameter circle) in front and behind the entrance door for a wheelchair.	OBJ.	1-1-1	AGT, UDH EVOLVE, OPHD
	The entrance door should give a sense of security.	SBJ.	2-1-2	OPHD
	Doorbells should be 120 cm high from the floor to the middle of the bell.	OBJ.	2-2-1	AGT
SL-RBT	The bathroom door should open outwards or be a sliding door.	OBJ.	1-1-1; 2-1-2 4-1-1	OPHD, EVOLVE
	The bathroom door should have locks that can be opened from the outside.	OBJ.	2-1-2 4-1-1	OPHD EVOLVE

Related QOL Domains:

1-1-1: ability to be mobile; 2-1-2 sense of security and safety; 2-2-1: suitable equipment size and height; 2-2-4: suitable material; 4-1-1: caregiver support.

Abbreviations:

SBJ: Subjective OBJ: Objective**,** SE-HE: Housing Entrance, SE-BE: Building Entrance, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL-RBT: Bathroom

* These design principles do not apply to the bathroom (SL-RBT).

Windows: Windows should be easy to use, operate and maintain for older adults, both for standing and sitting positions, and provide enough natural light and fresh air. According to AGT, window sills should be 80 cm above the floor to prevent older adults with low vision from hitting the window glass. EVOLVE, UDH, LTH, LHD and OPHD

also recommend that window sills should be above ground level. This design consideration is related to *(2-2-1) suitable equipment size and height* and (*2-1-2) sense of security and safety.* AGT indicates that the window handle should be placed at a height between 80 cm and 110 cm. This design consideration is related to *(2-2-1) suitable equipment size and height.* The window handle should be used with one hand and should not require a grip, and should open with minimum pressure. The glass used in the windows should be of a feature to prevent the scattering of broken glass pieces in case of any impact. This design consideration is related to *(2-2-3) suitable material* and *(2-1-2) sense of security and safety* (Table 5.21).

According to all design guides, unlike other spaces, the windows of the living room should be positioned to face the landscape, open spaces, and parks. Watching out the window by sitting is an important activity for older adults who spend a lot of time at home. This design consideration is related to *(3-2-1) continuing familiar activities at home* and *(2-2-6) access to nature and view.* At the same time, it contributes to the formation of *(2-1-4) sense of peaceful sleep and rest* in the older adult. Windows are important building elements in *(3-1-3) relations with neighbors*. According to LHD, correctly positioned windows invite better interaction with neighbors. EVOLVE recommends that South, East and West facing windows have a shading apparatus to reduce glare from direct sunlight. This design aspect is important for *(2-2-5) visual well-being* and *(2-2-3) suitable environmental comfort*. According to UDH, a window/view panel suitable for use by people at all eye level should be built adjacent to the door in the entrance spaces. This design consideration strengthens the *(2-1-2) sense of security and safety* against possible uninvited guest. Controlling who is at the door and preparing oneself accordingly adds to the older adult's *(2-1-1) sense of privacy* (Table 5.21).

Stairs: Stairs are building elements that most of the older adults have difficulty in using. Stairs can be a perpetrator of falls, especially for older adults with hearing and balance difficulties. For this reason, AGT recommends providing access between levels by ramps and lift and using stairs when necessary. According to AGT, EVOLVE and UDH, the step of stairs length should be at least 120 cm. Stairs should have a landing every 12 steps. Because, landings are important areas for a *(2-1-4) sense of peaceful rest* in older adults. The width of the landings must be at least 120 cm. However, the landing with door entrance should be at least 150 cm x 150 cm. There should be a landing of at

least 120 x 150 cm at the beginning and end of the stairs. The riser heights and going width of interior and exterior stairs should be equal. The riser height should be between 15 and 16 cm and the going width should be between 28 and 30 cm. The risers of the stairs should be covered to prevent people from walking under them. All these design considerations are directly related to *(1-1-1) ability to be mobile*. A stair designed with these considerations builds *(2-1-2) sense of security and safety,* and using it alone increases the older adults' *(2-1-5) sense of self-esteem* (Table 5.22).

Table 5.21 The windows design considerations and related quality of life domains

Design Element: BE-W: WINDOW				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SL-RL SL-RK SL-RB SC-HC	The window sills should be 80 cm above the floor.	OBJ.	2-1-2, 2-2-1	AGT
	Window handles should be placed at a height between 80 cm and 110 cm.	OBJ.	1-1-1, 2-2-1	AGT
	Window handles should be used with one hand and should not require a grip.	OBJ.	1-1-1, 2-2-3	AGT
	Windows should open with minimum pressure.	SBJ.	1-1-1, 2-1-2	AGT, UDH EVOLVE
	The glass used in the windows should be of a feature to prevent the scattering of broken glass pieces in case of any impact.	OBJ.	2-1-2, 2-2-4	AGT
	S, E, W sided windows should have shading apparatus to reduce glare caused by direct sunlight.	OBJ.	2-2-3, 2-2-4 2-2-5	EVOLVE, UDH
SL-RL	The windows in the living room face the open activity areas and the view.	OBJ.	2-2-6, 3-2-1	UDH,LHD EVOLVE
	There should be windows in the living room that allow old people to sit and look out.	OBJ.	2-1-4, 2-2-6 3-1-3, 3-2-1	AGT, UDH, LHD, LTH, EVOLVE, OPHD
SE-HE SE-BE	A window/view panel suitable for use by people at all eye level should be built adjacent to the door.	OBJ.	2-1-1, 2-1-2	UDH

Related QOL Domains:

1-1-1:ability to be mobile; 2-1-1: sense of privacy; 2-1-2 sense of security and safety; 2-1-4: sense of peaceful sleep and rest; 2-2-1:suitable equipment size and height; 2-2-3: suitable environmental comfort; 2-2-4: suitable material; 2-2-5: visual well-being; 2-2-6: access to nature and view; 3-1-3: relations with neighbors

Abbreviations:

SBJ: Subjective OBJ: Objective, SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HC: Corridor, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL-RBT: Bathroom

Ramps: Ramp instead of stairs is a more useful building element for older adults with limited mobility. Ramps are located in the garden entrance, garden path, building entrance, and inside the building. According to AGT, the net width of the ramps should be at least 100 cm. The slope of the building entrance ramps should be at most 8%. If the ramp is long, there should be a 150 x 150 cm landing every 9 meters. There should be a

landing of at least 150 x 150 cm at the beginning and end of the ramps. These design considerations are related to *(1-1-1) ability to be mobile, (2-1-2) sense of security and safety,* and *(2-1-5) sense of self-esteem domains* (Table 5.23).

Table 5.22 The stairs design considerations and related quality of life domains

Design Element: BE-S: STAIR				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SE-HE SE-BE SC-V	The step length should be at least 120 cm.	OBJ.	1-1-1	AGT, UDH EVOLVE
	Stairs should have a landing every 12 steps.	OBJ.	1-1-1, 2-1-4	AGT, UDH EVOLVE
	The width of the landings must be at least 120 cm.	OBJ.	1-1-1, 2-1-4	AGT, UDH EVOLVE
	the landing with door entrance should be at least 150 cm x 150 cm.	OBJ.	1-1-1, 2-1-4	AGT
	There should be a landing of at least 120x150 cm at the beginning and end of the stairs.	OBJ.	1-1-1, 2-1-4	AGT
	The heights and widths of stair steps inside and outside should be equal.	OBJ.	1-1-1, 2-2-1	AGT, UDH EVOLVE
	The step height should be between 15-16 cm.	OBJ.	1-1-1, 2-2-1	AGT, UDH EVOLVE
	The risers of the stairs should be covered to prevent people from walking under them.	OBJ.	2-1-2	AGT, UDH EVOLVE, LHD

Related QOL Domains:

1-1-1:ability to be mobile; 2-1-4: sense of peaceful sleep and rest; 2-2-1:suitable equipment size and height

Abbreviations:

SBJ: Subjective OBJ: Objective, SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-V: Vertical Circulation

Table 5.23 The ramps design considerations and related quality of life domains

Design Element: BE-R: RAMP				
Design Element	Design consideration	Type of D. C.	QOL Domains	Resources
SE-HE SE-BE SC-HV	The net width of the ramps should be at least 100 cm.	OBJ.	1-1-1	AGT
	There should be a 150 x 150 cm landing every 9 meters.	OBJ.	1-1-1, 2-1-4	AGT
	There should be a landing of at least 150x150 cm at the beginning and end of the ramps	OBJ.	1-1-1, 2-1-4	AGT
	The slope of the building entrance ramps should be at most 8%.	OBJ.	1-1-1	AGT

Related QOL Domains:

1-1-1:ability to be mobile; 2-1-4: sense of peaceful sleep and rest; 2-2-1:suitable equipment size and height

Abbreviations:

SBJ: Subjective OBJ: Objective, SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-V: Vertical Circulation

Walls: The design guides include design considerations for bedroom and bathroom walls. Except for bathroom walls made of solid masonry or concrete, other walls around the sink, toilet and shower unit need to be reinforced enough to support the grab bars and safety bars. All design guidelines except AGT draw attention to the importance of reinforced bathroom walls. This design consideration is related to *(4-2-2) structural supports* within *technology support*. Mounting the grab bars and safety bars to a strong wall creates a *(2-1-2) sense of security and safety* in the older adult. OPHD states that the bedroom walls should have good sound insulation for a healthy sleep. This design consideration is related to *(2-2-3) suitable environmental comfort*. A well-insulated environment contributes to the *(2-1-4) sense of peaceful sleep and rest* (Table 5.24).

Table 5.24 The walls design considerations and related quality of life domains

Design Element: BE-WL: WALL				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SL-RBT	Bathroom walls should be strong and durable enough to support grab bars and safety bars.	OBJ.	1-1-1, 1-1-2 1-1-3, 1-1-4 2-1-2, 2-1-5 4-2-2	UDH OPHD EVOLVE LHD, LTH
SL-RB	The bedroom should have good sound insulation.	SBJ	2-1-4, 2-2-3	OPHD

Related QOL Domains:

1-1-1:ability to be mobile; 1-1-2: ability to self-transfer; 1-1-3: ability to take care of one's own body; 1-1-4: ability to go to the toilet; 2-1-4: sense of peaceful sleep and rest; 2-1-5: sense of self-esteem; 2-2-3: suitable environmental comfort; 4-2-2: structural support.

Abbreviations:

SBJ: Subjective OBJ: Objective, SL-RB: Bedroom, SL-RBT: Bathroom

Table 5.25 The floors design considerations and related quality of life domains

Design Element: BE-FL: FLOOR				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SL-RBT SL-RB	The bathroom and bedroom ceiling construction should be strong and durable to support the installation of any possible ceiling mounted rail (for transfer lift) mechanism.		1-1-1, 1-1-2 1-1-3, 1-1-4 4-2-2	UDH LTH AGT

Related QOL Domains:

1-1-1:ability to be mobile; 1-1-2: ability to self-transfer; 1-1-3: ability to take care of one's own body; 1-1-4: ability to go to the toilet; 4-2-2: structural support.

Abbreviations:

SBJ: Subjective OBJ: Objective, SL-RB: Bedroom, SL-RBT: Bathroom

Floors: Transfer lift are used for people who can be transferred from the bedroom to the bathroom with an assistant because they cannot move. According to AGT, UDH and LHD, the bathroom and bedroom ceiling construction should be strong and durable to support the installation of any possible ceiling mounted rail (for transfer lift) mechanism. This design consideration is related to *(4-2-2) structural supports* (Table 5.25).

5.2.2.3 Service Systems

Service systems, which are design elements that operate spaces, are divided into nine: lifts, electrical installations, ventilation, heating, lighting, and water supply systems, safety and alarm systems, communication systems and assisted living technologies.

Lifts: Multi-story buildings should have elevators to ensure accessibility. LTH and UDH recommend leaving space for future provision of a through-floor lift in multi-story houses without lift. This design consideration is related to *(4-2-2) structural supports and (1-1-1) ability to be mobile*. According to AGT, the lift cabin dimensions should be at least 120 x 150 cm. The lift cabin door width should be at least 90 cm. The lift should be located adjacent to the stairs and should be easily found. There should be a maneuvering area in front of the lift door. The elevator door should open and close automatically. These design considerations are related to *(1-1-1) ability to be mobile*. Call and control buttons of the elevator should be placed within the height limits between 90 cm and 110 cm. This design consideration is related to *(2-2-1) suitable equipment size and height.* In cases where it is not possible to build a ramp at the entrance of the housing/building due to technical reasons, one of the solutions such as elevator, platform elevator, hydraulic elevator should be applied (Table 5.26).

Electrical Installations: All switches, sockets and controls in all spaces should be at a height between 40 and 100 cm from the ground, and can be operated with one hand. The bedroom light should be able to be switched on and off directly from the bed position. This design consideration is related to *(2-2-1) suitable equipment size and height*. Controlling the electrical installation with the on/off keys allows the setting of *(2-2-3) suitable environmental comfort* (Table 5.27).

Table 5.26 The lifts design considerations and related quality of life domains

Design Element: SS-L: LIFTS				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SE-HE SE-BE	In cases where it is not possible to build a ramp at the entrance of the housing/building due to technical reasons, one of the solutions such as elevator, platform elevator, hydraulic elevator should be applied.	OBJ.	1-1-1 4-2- 2	AGT
SC-HV	There should have a 100 x 150 cm aperture for future provision of a through-floor lift in multi-story housing.	OBJ.	1-1-1 4-2-2	LTH UDH
	The lift cabin dimensions should be at least 120x150 cm.	OBJ.	1-1-1	AGT
	The lift cabin door width should be at least 90 cm.	OBJ.	1-1-1	AGT
	The elevator should be located adjacent to the stairs and should be easily found.	OBJ.	1-1-1	AGT
	There should be a maneuvering area in front of the lift door.	OBJ.	1-1-1	AGT
	The elevator door should open and close automatically.	OBJ.	1-1-1	AGT

Related QOL Domains:
1-1-1:ability to be mobile; 2-2-1:suitable equipment size and height; 4-2-2: structural support.
Abbreviations:
SBJ: Subjective OBJ: Objective, SE:HE: Housing Entrance, SE-BE: Building Entrance, SC-V: Vertical Circulation

Table 5.27 The electrical installations design considerations and related quality of life domains

Design Element: SS-E: ELECTRICAL INSTALLATIONS				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SC-HC, SC-HH SL-RL, SL-RK SL-RB, SL-RBT	All switches, sockets and controls in all spaces should be at a height of 40 - 100 cm from the ground and can be operated with one hand.	OBJ.	2-2-1 2-2-3	UDH, LTH AGT, LHD EVOLVE
SL-RB	The bedroom light should be able to be switched on and off directly from the bed position.	OBJ.	1-1-1 2-2-3	EVOLVE OPHD

Related QOL Domains:
1-1-1:ability to be mobile; 2-2-1:suitable equipment size and height; 2-2-3: suitable environmental comfort
Abbreviations:
SBJ: Subjective OBJ: Objective, SC-HC: Corridor, SC-HH: Hall, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL-RBT: Bathroom

Ventilation: EVOLVE and UDH indicates that fresh air flow should be provided in all spaces with a window or ventilation system. This design consideration is related to *(2-2-3) suitable environmental comfort* (Table 5.28).

Heating: EVOLVE and UDH indicates that all spaces should have radiators or underfloor heating. This design consideration is related to *(2-2-3) suitable environmental comfort* (Table 5.29).

Table 5.28 The ventilation design considerations and related quality of life domains

Design Element: SS-V: VENTILATION				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SC-HC; SC-HH SL-RL; SL-RK SL-RB; SL-RBT	Fresh air flow should be provided in all spaces with a window or ventilation system.	OBJ	2-2-3	UDH EVOLVE

Related QOL Domains:

2-2-3: suitable environmental comfort

Abbreviations:

SBJ: Subjective OBJ: Objective, SC-HC: Corridor, SC-HH: Hall, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL-RBT: Bathroom

Table 5.29 The heating design considerations and related quality of life domains

Design Element: SS-H: HEATING				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SC-HC; SC-HH; SL-RL; SL-RK; SL-RB; SL-RBT	All spaces should have radiators or underfloor heating.	OBJ	2-2-3	UDH EVOLVE

Related QOL Domains:

2-2-3: suitable environmental comfort

Abbreviations:

SBJ: Subjective OBJ: Objective, SC-HC: Corridor, SC-HH: Hall, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL-RBT: Bathroom

Lighting: Natural lighting has a tangible effect on the quality of life. The need for artificial light can be reduced if the windows are positioned appropriately so that older adults get enough natural light. This design consideration is related to *(2-2-3) suitable environmental comfort*. EVOLVE and UDH indicates that all spaces should be well lit with natural and artificial lighting systems. The bedroom, bathroom and kitchen should have task lighting systems for some activities. This design consideration is related to *(3-2-1) continuing familiar activities at home, (1-2-1) ability to prepare meals* and *(1-1-3) ability to take care of one's own body*. The bedroom contains different design considerations from other spaces. According to EVOLVE and OPHD, the bedroom should be completely dark for a good night's sleep. OPHD state that the bedroom should have windows that provide adequate natural light in case older adults stay in the room

during the day. This design consideration is related to *(2-2-3) suitable environmental comfort* and *(2-1-4) sense of peaceful sleep and rest* (Table 5.30).

Table 5.30 The lighting design considerations and related quality of life domains

Design Element: SS-LT: LIGHTING				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SC-HC, SC-HH SL-RL, SL-RK SL-RB, SL-RBT SL-OPG, SL-OBT	All spaces should be well lit with a natural and artificial lighting system.	OBJ.	2-2-3	UDH EVOLVE
SL-RB	The bedroom should be completely dark for a good night's sleep.	OBJ.	2-2-3, 2-1-4	OPHD
	The bedroom should have windows that provide adequate natural light in case older adults stay in the room during the day.	OBJ.	2-2-3, 2-1-4	OPHD
SL-RB, SL-RBT SL-RK	There should have task lighting for some activities.	OBJ.	1-1-3, 1-2-1 3-2-1	UDH EVOLVE LHD
BE-S	The stairs should be properly lit with natural and artificial light.	OBJ.	1-1-1, 2-2-3	UDH EVOLVE OPHD
BE-R	The ramps should be properly lit with natural and artificial light.	OBJ.	1-1-1, 2-2-3	UDH EVOLVE OPHD
SE-BE SE-HE	The entrance should be well lit both during the day and at night with a natural and artificial lighting system.	OBJ.	1-1-1, 2-2-3	UDH EVOLVE OPHD
SC-HP	Adequate lighting should be provided on all pathways.	OBJ.	1-1-1, 2-2-3	UDH OPHD
SCO-OPG SCO-OPL	Parks and gardens, parking lot should be adequately illuminated at night.	OBJ.	1-1-1 2-2-3	UDH OPHD

Related QOL Domains:

1-1-1:ability to be mobile; 1-1-3: ability to take care of one's own body; 1-2-1: ability to prepare meals; 2-1-4: sense of peaceful sleep and rest; 2-2-3: suitable environmental comfort; 3-2-1: continuing familiar activities at home.

Abbreviations:

SBJ: Subjective OBJ: Objective, SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HC: Corridor, SC-HH: Hall, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL-RBT: Bathroom, SL-OBT: Balcony/ Terrace, SL-OPG: Private Garden, SC-OPL: Parking Lot, SCO-OPG: Park and Garden, BE-S: Stairs, BE-R: Ramps

Water Supply Systems: There are design considerations regarding the taps and other controllers of the bathroom and kitchen fittings. According to all design guides, taps and other controllers should be in the form and size to be easily used by older adults. This design consideration is related to *(2-2-1) suitable equipment size and height.* The accessibility of the taps and other controllers allows the older adult to do activities in the bathroom and kitchen such as (*1-1-3) ability to take care of one's own body, (1-2-1) ability*

to prepare meals, (1-1-4) ability to go to the toilet and (1-2-2) ability to do housework. According to UDH and OPHD, there should be a tap and a hose for watering and cleaning works in the garden. A simple automatic watering system should be installed in the garden. This design consideration is related to *(3-2-2) looking after plants/flowers* (Table 5.31).

Table 5.31 The water supply systems design considerations and related quality of life domains

Design Element: SS-WS: WATER SUPPLY SYSTEMS				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SL-OPG	There should be a tap and a hose for watering and cleaning works in the garden.	OBJ.	3-2-2 1-2-2	UDH
	A simple automatic watering system should be installed in the garden.	OBJ.	3-2-2	OPHD
FT-TO	The toilet flush button should be able to be operated with the whole hand with little force.	SBJ.	1-1-3, 1-1-4 2-2-1	EVOLVE OPHD,LHD UDH, AGT
FT-SU	Taps and other controllers should be within accessible distance from the shower seat.	OBJ.	1-1-3 2-2-1	AGT
	The shower head should be at least 160 cm long and with a hose.	OBJ.	1-1-3 2-2-1	AGT
FT-SK	Taps and other controllers should be one-handed, easy to use, and not require much force.	SBJ.	1-1-3, 1-2-1 1-2-2; 2-2-1	SBJ.

Related QOL Domains:

1-1-1:ability to be mobile; 1-1-3: ability to take care of one's own body; 1-1-4: ability to go to the toilet; 1-2-1:ability to prepare meals; ; 1-2-2 ability to do housework; 2-2-1:suitable equipment size and height; 3-2-2:looking after plants/flowers and pets;

Abbreviations:

SBJ: Subjective OBJ: Objective , SL-OPG: Private Garden, FT-SU: Shower Unit, FT-SK: Sink, FT-TO: Toilet

Safety and Alarm Systems: EVOLVE and UDH state that all spaces should have an emergency call alarm. There should be smoke detectors in the circulation areas, bedrooms and living rooms. The kitchen should have a heat detector instead of a smoke detector to distinguish between burning food and real fire. Also, any gas appliance in the kitchen should have a carbon monoxide/gas detector alarm unit near it. According to AGT, there should be an alarm pull cord at a height that can be easily reached by someone lying on the floor in the bathroom. These design considerations are related to *(4-2-1) alarm systems* within *technology support*. Access to *(4-1-1) caregiver support* and (4-1-2) on-site staff support is accelerated thanks to alarm and security systems. The presence of alarm systems creates a *(2-1-2) sense of security and safety* in older adults (Table 5.32).

Communication Systems: According to UDH and OPHD, the entrance door should be monitored with camera and phone systems to be able to see and communicate with anyone at the door. AGT states that the intercom and doorbell panels should be placed at a height between 90 cm and 140 cm. These design considerations are related to *(4-2-1) alarm systems* and *(2-1-2) sense of security and safety* (Table 5.33).

Table 5.32 The safety and alarm systems design considerations and related quality of life domains

Design Element: SS-SA: SAFETY AND ALARM SYSTEMS				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SC-HC, SC-HH; SL-RL, SL-RK; SL-RB, SL-RBT	There should have an emergency call alarm.	OBJ.	4-1-1, 4-1-2 4-2-1; 2-1-2	EVOLVE UDH
SC-HC, SC-HH SL-RL, SL-RB	There should have a smoke detector.	OBJ.	4-1-1, 4-1-2 4-2-1	EVOLVE UDH
SL-RK	The kitchen should have a heat detector.	OBJ.	4-1-1, 4-1-2 4-2-1, 2-1-2	EVOLVE UDH
	The kitchen should have a carbon monoxide / gas detector alarm unit	OBJ.	4-1-1, 4-1-2 4-2-1, 2-1-2	EVOLVE UDH
SL-RBT	There should be an alarm pull cord at a height that can be easily reached by someone lying on the floor in the bathroom.	OBJ.	4-1-1, 4-1-2 4-2-1, 2-1-2	AGT

Related QOL Domains:

2-1-2:sense of security and safety; 4-1-1: caregiver support; 4-1-2: on-site staff support; 4-2-1: alarm systems

Abbreviations:

SBJ: Subjective OBJ: Objective, SC-HC: Corridor, SC-HH: Hall, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL-RBT: Bathroom

Assisted Living Technologies: The effects of technology from housing to urban design are increasing day by day. According to UDH, all spaces should have infrastructure for assisted living technologies such as health, environment, communication and entertainment technologies. This design consideration offers possibilities for the older adults to live longer independently. Telehealth and monitoring equipment, such as fall detectors, pulse oximeters, and asthma monitors that can be added anywhere in housing, are related to assisted health technologies. These systems in the housing of the older person ensure that health workers, family members and friends are notified in case of an emergency. This design consideration is related to *(4-1-1) caregiver support, (4-1-2) on-site staff support* and *(1-2-4) ability to manage one's own health*. Devices that regulate indoor and outdoor environmental conditions are also part of the assisted environment technologies. Remote-controlled lighting and heating systems, and

door and window opening systems help older adults with reduced mobility to set up *(2-2-3) suitable environmental comfort*. According to UD, communication and entertainment devices help older adults maintain their autonomy and social connectedness. These systems increase *(2-1-5) sense of self-esteem* by helping the older adult form meaningful relationships and pursue meaningful activities. All of these design considerations also match *(1-2-6) ability to manage technological devices* and *(4-2-3) assisted living technologies* (Table 5.34).

Table 5.33 The communication systems design considerations and related quality of life domains

Design Element: SS-CS: COMMUNICATION SYSTEMS				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SE-BE SE-HE	The entrance door should be monitored with camera and phone systems due to see and communicate with anyone at the door.	OBJ.	2-1-2, 4-2-1	UHD OPHD
	The intercom and doorbell panel should be placed between 90 cm and 140 cm.	OBJ.	2-1-2, 4-2-1	AGT

Related QOL Domains:

2-1-2:sense of security and safety; 4-2-1: alarm systems

Abbreviations:

SBJ: Subjective OBJ: Objective, SE-HE: Housing Entrance, SE-BE: Building Entrance

Table 5.34 The assisted living technologies design considerations and related quality of life domains

Design Element: SS-AL: ASSISTED LIVING TECHNOLOGIES				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SC-HC, SC-HH SC-HP, SL-RK, SL-RB, SL-RBT SL-RL, SE-BE, SE-HE, SCO-OPG SCO-OPL	All spaces should have infrastructure for assisted living technologies such as health, environment, communication and entertainment.	OBJ.	1-2-4, 1-2-6 2-1-2, 2-1-5 2-2-3, 3-1-2 3-1-4, 3-2-1 4-1-1, 4-1-2 4-2-3	UDH OPHD

Related QOL Domains:

1-2-4: ability to manage one's own health; 1-2-6: ability to manage technological devices; 2-1-2: sense of security and safety; 2-1-5: sense of self-esteem; 3-1-2: relations with family and friends; 3-1-4: relations with the wider community; 3-2-1: continuing familiar activities at home; 3-2-5: doing recreational activities with others; 4-1-1: caregiver support; 4-1-2: on-site staff support; 4-2-3: assisted living technologies.

Abbreviations:

SBJ: Subjective OBJ: Objective, SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HC: Corridor, SC-HH: Hall, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL-RBT: Bathroom, SL-OBT: Balcony/ Terrace, SL-OPG: Private Garden, SC-OPL: Parking Lot, SCO-OPG: Park and Garden

5.2.2.4 Fittings

Fittings, which are fixed equipment, are divided into six as shower unit, toilet, sink, countertops, cupboards and furniture. The data in AGT are considered in the design issues related to the required design dimensions of the fittings.

Shower Unit : A shower unit should be preferred over a bathtub in the bathroom. There should be no level difference in front of the shower unit that will prevent the entrance to the unit. There should be enough space for the older adult using a wheelchair or walking aid to transfer to the shower seat from the front or side. At the same time, this area should be large enough to allow the presence of the caregiver in the case of an assisted bath. According to AGT, the dimensions of the shower unit should be at least 76 x 150 cm. There should be a clean area having a 90 cm width and 150 cm length in front of the shower unit for transition to the shower seat and caregiver assistance. There should be no fixed elements that will prevent the transfer to the shower unit from the side or the front. These design considerations match five domains: *(1-1-1) ability to be mobile, (1-1-2) ability to self-transfer, (1-1-3) ability to take care of one's own body, (2-1-5) sense of self-esteem, (4-1-1) caregiver support,* and *(4-2-4) social robots.* A shower curtain can be used considering the presence of the caregiver. This design consideration contributes to *(2-1-1) sense of privacy.* However, shower enclosure/curtains should not prevent access to the shower seat, caregiver assistance, or use of water control devices (Table 5.35).

Toilet: The toilet should be positioned according to the maneuvering area in the bathroom. There should be enough space in front of or next to the toilet for transferring from a wheelchair. According to OPHD and EVOLVE, there should be at least 60 cm space for the caregiver on the sides of the toilet. AGT states that the seat height of the toilet bowls should be between 43 cm and 48 cm. These design considerations are related to *(1-1-1) ability to be mobile, (1-1-2) ability to self-transfer, (1-1-4) ability to go to the toilet, (4-1-1) caregiver support,* and *(4-2-4) social robots.* Meeting these design considerations increases the older adult's *(2-1-5) sense of self-esteem* (Table 5.36).

Table 5.35 The shower unit design considerations and related quality of life domains

Design Element: FT-SU: SHOWER UNIT				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SL-RBT	A shower unit should be preferred over a bathtub in the bathroom.	OBJ.	1-1-1, 1-1-2 1-1-3, 2-1-5 4-1-1	AGT EVOLVE OPHD
	There should be no level difference in front of the shower unit.	OBJ.	1-1-1, 1-1-2 1-1-3, 2-1-5	AGT, UDH, OPHD EVOLVE
	The dimensions of the shower unit should be at least 76 x 150 cm	OBJ.	1-1-1, 1-1-2 1-1-3, 2-1-5 4-1-1	AGT
	There should be a clean area 90 cm wide and 150 cm long in front of the shower.	OBJ.	1-1-1, 1-1-2 1-1-3, 2-1-5 4-1-1, 4-2-4	AGT
	There should be no fixed elements that will prevent the transfer to the shower unit from the side or the front.	OBJ.	1-1-1, 1-1-2 1-1-3, 2-1-5 4-1-1	AGT
	Shower enclosure/curtains, if any, should not prevent access to the shower seat, caregiver assistance, or use of water control devices.	OBJ.	2-1-1	OPHD EVOLVE

Related QOL Domains:

1-1-1: ability to be mobile; 1-1-2: ability to self-transfer; 1-1-3: ability to take care of one's own body; 2-1-1: sense of privacy; 2-1-5: sense of self-esteem; 4-1-1: caregiver support; 4-2-4: social robots

Abbreviations:

SBJ: Subjective OBJ: Objective, SL-RBT: Bathroom

Table 5.36 The toilet design considerations and related quality of life domains

Design Element: FT-TO: TOILET				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SL-RBT	The seat height of the toilet bowls should be between 43 cm and 48 cm	OBJ.	1-1-1, 1-1-2 1-1-4, 2-1-5 2-2-1	AGT
	There should be enough space in front of or next to the toilet for transfer from a wheelchair.	OBJ.	1-1-1, 1-1-2 1-1-4, 2-1-5 4-1-1, 4-2-4	AGT,UDH OPHD EVOLVE
	There should be at least 60 cm space for the caregiver on the sides of the toilet.	OBJ.	1-1-1, 1-1-2 1-1-4, 2-1-5 4-1-1, 4-2-4	OPHD EVOLVE

Related QOL Domains:

1-1-1: ability to be mobile; 1-1-2: ability to self-transfer; 1-1-4: ability to go to the toilet; 2-1-5: sense of self-esteem; 4-1-1: caregiver support; 4-2-4: social robots

Abbreviations:

SBJ: Subjective OBJ: Objective, SL-RBT: Bathroom

Sink: The sink is used in bathrooms and kitchens. The most important design issue regarding the sink in the kitchen is the knee space. According to AGT, a clear knee-space of 80 cm wide and 49 cm deep should be left under the sink. The height of the sink from

the floor should be no more than 86 cm. The depth of the sink should be a maximum of 16.5 cm. These design considerations support the older adult's *(1-2-1) ability to prepare meals* and *(1-2-2) ability to do housework,* and increase *(2-1-5) sense of self-esteem*. The sink in the bathroom should be wall-mounted and its width should be between 43 cm and 49 cm. According to AGT, there should be a clean activity area of 76 x 122 cm in front of the sink. EVOLVE and OPHD recommend at least 60 cm of space for the caregiver on the sides of the sink. These design considerations are related to *(1-1-1) ability to be mobile, (1-1-3) ability to take care of one's own body, (4-1-1) caregiver support, (4-2-4) social robots,* and support the older adult's *(2-1-5) sense of self-esteem* (Table 5.37).

Table 5.37 The sink design considerations and related quality of life domains

Design Element: FT-SK: SINK				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SL-RK	A clear knee-space of 80 cm wide and 49 cm deep should be left under the sink.	OBJ.	1-1-1, 1-2-1 1-2-2, 2-1-5	AGT
	The depth of the sink should be a maximum of 16.5 cm.	OBJ.	1-1-1, 1-2-1 1-2-2, 2-1-5	AGT
SL-RK SL-RBT	The height of the sink from the floor should be no more than 86 cm.	OBJ.	1-1-1, 1-1-3 1-2-1, 1-2-2 2-1-5	AGT
SL-RBT	There should be at least 60 cm space for the caregiver on the sides of the sink.	OBJ.	1-1-1, 1-1-3 2-1-5, 4-1-1	OPHD EVOLVE
	There should be a clean activity area of 76x122 cm in front of the sink.	OBJ.	1-1-1, 1-1-3 2-1-5, 4-1-1 4-2-4	AGT
	The sink should be wall-mounted.	OBJ.	1-1-1, 1-1-3 2-1-5, 4-1-1 4-2-4	AGT

Related QOL Domains:

1-1-1:ability to be mobile; 1-1-3: ability to take care of one's own body; 1-2-1: ability to prepare meals; 1-2-2: ability to do housework; 2-1-5: sense of self-esteem; 4-1-1: caregiver support; 4-2-4: social robots

Abbreviations:

SBJ: Subjective OBJ: Objective, SL-RK: Kitchen, SL-RBT: Bathroom

Countertops: Countertop design is important for the older adults to perform basic activities in the kitchen. According to AGT, at least 90 cm long part of the kitchen countertop should be arranged as a work surface. A clear knee-space of 75 cm high, 90 cm wide and 49 cm deep should be left below the countertop. The upper surface of the countertop should be at a maximum height of 86 cm from the ground. Countertops that can be adjusted at different heights can increase the accessibility. These design considerations match four domains: *(1-1-1) ability to be mobile, (1-2-1) ability to prepare meals and (1-2-2) ability to do housework , (2-1-5) sense of self-esteem,* and *(2-2-2)*

enough storage/worktop space. According to UDH, the edges of the countertop should be raised slightly to prevent spills. This design consideration increases the *(2-1-2) sense of security and safety* by protecting the older adult from dangers such as spilling hot food or falling of utensils (Table 5.38).

Cupboards: There are design considerations about kitchen cupboards wardrobes and fixed shelves in the design guides. According to AGT, at least 50% of the shelves in the cupboards in a kitchen should be accessible. The height of the cupboards should be no more than 137 cm. OPHD and UDH recommend using electronically or mechanically elevating/lowering systems if the kitchen shelves are higher than 137 cm. AGT states that the depth of the kitchen shelves should be no more than 30 cm. According to UDH, EVOLVE and AGT, drawers and cabinets handles should be D-shaped. Cupboards should be equipped with sliding doors with movable mechanisms. These design considerations are directly related to *(2-2-1) suitable equipment size and height*, and *(2-2-2) enough storage.* An accessible kitchen supports the older adult's *(1-1-1) ability to be mobile, (1-2-1) ability to prepare meals,* and *(1-2-2) ability to do housework.* Being able to perform all these functions independently increases the older adult's *(2-1-5) sense of self-esteem* (Table 5.39).

Table 5.38 The countertops design considerations and related quality of life domains

Design Element: FT-CT: COUNTERTOP				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SL-RK	At least 90 cm long part of the kitchen countertop should be arranged as a work surface.	OBJ.	1-1-1, 1-2-1 1-2-2, 2-1-5 2-2-2	AGT
	A clear knee-space of 75 cm high, 90 cm wide and 49 cm deep should be left below the countertop.	OBJ.	1-1-1, 1-2-1 1-2-2, 2-1-5	AGT
	The upper surface of the countertop should be at a maximum height of 86 cm from the ground.	OBJ.	1-1-1, 1-2-1 1-2-2, 2-1-5	AGT
	The edges of the countertop should be raised slightly to prevent spills.	OBJ.	2-1-2, 2-1-5	UDH

Related QOL Domains:

1-1-1:ability to be mobile; 1-2-1: ability to prepare meals; 1-2-2: ability to do housework;
2-1-2: sense of security and safety; 2-1-5: sense of self-esteem; 2-2-2 : enough storage/worktop space

Abbreviations:

SBJ: Subjective OBJ: Objective, SL-RK: Kitchen

Table 5.39 The cupboards design considerations and related quality of life domains

Design Element: FT-CB: CUPBOARDS				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SL-RK	At least 50% of the shelves in the cupboards in kitchen should be accessible.	OBJ.	1-1-1, 1-2-1 1-2-2, 2-1-5 2-2-1, 2-2-2	AGT
	The height of the cupboards should be no more than 137 cm. If the kitchen shelves are 137 cm higher, an electronically or mechanically elevating / lowering system should be used.	OBJ.	1-1-1, 1-2-1 1-2-2, 2-1-5 2-2-1, 2-2-2	AGT OPHD UDH
	Cupboards should be equipped with sliding doors with movable mechanisms.	OBJ.	1-1-1, 1-2-1 1-2-2, 2-1-5 2-2-1, 2-2-2	OPHD UDH
	The depth of the kitchen shelves should be no more than 30 cm.	OBJ.	1-1-1, 1-2-1 1-2-2, 2-1-5	AGT
	Cupboards handles (drawer, cabinet) should be D-shaped.	OBJ.	1-1-1, 1-2-1 1-2-2, 2-1-5 2-2-1, 2-2-2	AGT EVOLVE UDH
SL-RB	The dress hangers in wardrobe should be at a height of 137 cm from the floor. If the dress hangers are 137 cm higher, an electronically or mechanically elevating / lowering system should be used	OBJ.	1-1-1, 1-1-6 2-1-2, 2-1-5 2-2-1, 2-2-2	AGT OPHD UDH
	The wardrobe depth should be maximum 53 cm from the front of the wardrobe.	OBJ.	1-1-1, 1-1-6 2-1-2, 2-1-5 2-2-1, 2-2-2	AGT
	Wardrobe should have easy-to-open doors, such as sliding doors.	OBJ.	1-1-1, 1-1-6 2-1-2, 2-1-5 2-2-1, 2-2-2	OPHD UDH
SE-BE SE-HE	There should be shelves at the entrance where you can put heavy objects so that you can open the door easily.	OBJ.	1-1-1	OPHD

Related QOL Domains:

1-1-1:ability to be mobile; 1-1-6: ability to self-dress; 1-2-1: ability to prepare meals; 1-2-2: ability to do housework; 2-1-1: sense of privacy; 2-1-5: sense of self-esteem; 2-2-1: suitable equipment size and height; 2-2-2 :enough storage/worktop space.

Abbreviations:

SBJ: Subjective OBJ: Objective, SE-HE: Housing Entrance, SE-BE: Building Entrance, SL-RK: Kitchen, SL-RBT: Bathroom

The dress hangers in wardrobe should be at a height of 137 cm from the floor according to AGT. If the dress hangers are 137 cm higher, electronically or mechanically elevating/lowering systems should be used. The wardrobe depth should be maximum of 53 cm from the front of the wardrobe. Wardrobe should have easy-to-open doors, such as sliding doors. These design considerations are related to the *(1-1-1) ability to be mobile, (1-1-6) ability to self-dress, (2-2-1) suitable equipment size and height,* and *(2-2-2) enough storage.* Wardrobes that allow older adults to dress by themselves reinforce the (2-1-1) sense of privacy. The OPHD recommends having shelves next to entry doors

where the older adult can put down items to open the door easily. This design consideration supports *(1-1-1) ability to be mobile* (Table 5.39).

Furniture: The guidelines include design considerations for outdoor furniture, shower seats and beds. According to OPHD, sitting areas with armrests in parks, gardens and pathways should be at a height between 40 cm and 45 cm from the ground. The seat in the shower unit should be at least 45 x 45 cm in size, and also should be foldable and perforated. The height of the shower seat from the ground should be between 43 cm and 48 cm according to AGT. According to AGT, the bed height should be between 45 cm and 50 cm for transfer from wheelchair to bed or vice versa. These design considerations are related to three domains: *(1-1-1) ability to be mobile, (1-1-2) ability to self-transfer, (2-1-5) sense of self-esteem,* and *(2-2-1) suitable equipment size and height* (Table 5.40).

Table 5.40 The furniture design considerations and related quality of life domains

Design Element: FT-FR: FURNITURE				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SC-HP SCO-OPG	Sitting areas with armrests in parks , gardens and pathways should be at a height of 45- 50 cm.cm from the ground.	OBJ.	1-1-1, 1-1-2 2-1-5, 2-2-1	AGT
FT-SU	The shower unit should have a foldable, perforated shower seat with a grab bar, at least 45x45 cm in size.	OBJ.	1-1-1, 1-1-2 2-1-5, 2-2-1	AGT
	The height of the shower seat from the floor should be between 43-48 cm.	OBJ.	1-1-1, 1-1-2 2-1-5, 2-2-1	AGT
SL-RB	Bed height should be between 45- 50 cm.	OBJ.	1-1-1, 1-1-2 2-1-5, 2-2-1	AGT

Related QOL Domains:
1-1-1:ability to be mobile; 1-1-2: ability to self-transfer; 2-1-5: sense of self-esteem; 2-2-1: suitable equipment size and height
Abbreviations:
SBJ: Subjective OBJ: Objective, SC-HP: Pathways, SL-RB: Bedroom, SCO-OPG: Park and Garden, FT-SU: Shower Unit

5.2.2.5. Appliances

There are design considerations in the guidelines for washing machines, refrigerators and cookers, which are the three main appliances used in residential buildings. The accessible dimensions of the devices increase the (*2-1-5) sense of self-esteem* of older adults. The data in AGT are considered in the design issues related to the dimensions.

Washing Machine: There should be a washing machine in the bathroom or somewhere connected to the bathroom. The washing machine should be located close to the wash basin. According to UDH, the washing machine must be on a 25 cm plinth for wheelchair users. These design considerations are related to *(1-1-1) ability to be mobile.* There should be an area where dirty laundry will be stored. There should be a wall-mounted, folding laundry rack near the washing machine. These design considerations are about *(1-2-2) ability to do housework* (Table 5.41).

Table 5.41 The washing machines design considerations and related quality of life domains

Design Element: AP-WM: WASHING MACHINE				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SL-RBT	There should be a washing machine in the bathroom or somewhere connected to the bathroom.	OBJ.	1-1-1, 1-2-2 2-1-5	UDH
	The washing machine should be located close to the wash basin.	OBJ.	1-1-1, 1-2-2 2-1-5	UDH
	The washing machine must be on a 25 cm plinth.	OBJ.	1-1-1, 1-2-2 2-1-5	UHD
	There should be an area where dirty laundry will be stored.	OBJ.	1-1-1, 1-2-2 2-1-5	OPHD UHD
	There should be a wall-mounted, folding laundry rack near the washing machine.	OBJ.	1-1-1, 1-2-2 2-1-5	OPHD

Related QOL Domains:
1-1-1:ability to be mobile; 1-2-2: ability to do housework; 2-1-5: sense of self-esteem
Abbreviations:
SBJ: Subjective OBJ: Objective, SL-RBT: Bathroom

Refrigerator/Freezer: According to AGT, at least 50% of the refrigerators/freezers usable area should be at a maximum height of 137 cm from the floor. This design consideration is about *(2-2-1) suitable equipment size and height*, and *(2-2-2) enough storage.* An accessible refrigerator/freezer supports the older adults' *(1-1-1) ability to be mobile* and *(1-2-1) ability to prepare meals.* According to OPHD, refrigerators should have automatic defrosting feature. This design consideration is about *(1-2-2) ability to do housework* (Table 5.42).

Cooker: A clear knee-space of 75 cm high, 90 cm wide and 49 cm deep should be left under the cooktops according to AGT. Ovens should be adjacent to the countertop that has knee-space or can be adjusted. Oven control buttons should be on the front panel.

Ovens should be of the self-cleaning type. These design considerations are about *(1-2-2) ability to do housework, (1-1-1) ability to be mobile* and *(1-2-1) ability to prepare meals* (Table 5.43).

Table 5.42 The refrigerator/freezer design considerations and related quality of life domains

Design Element: AP-RF: REFRIGERATOR / FREEZER				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SL-RK	The refrigerator/freezer's should be placed at least 30 cm from the inside corners.	OBJ.	1-1-1, 1-2-1 2-2-1, 2-2-2 2-1-5	AGT
	At least 50% of the refrigerator/freezer's usable area should be at a maximum height of 137 cm from the floor.	OBJ.	1-1-1, 1-2-1 2-2-1, 2-2-2 2-1-5	AGT
	Refrigerators should have automatic defrosting feature.	OBJ.	1-2-2	UDH

Related QOL Domains:

1-1-1:ability to be mobile; 1-2-1: ability to prepare meals; 1-2-2: ability to do housework; 2-1-5: sense of self-esteem; 2-2-1: suitable equipment size and height; 2-2-2 :enough storage/worktop space

Abbreviations:

SBJ: Subjective OBJ: Objective, SL-RK: Kitchen

Table 5.43 The cookers design considerations and related quality of life domains

Design Element: AP-CK: COOKER				
Design Element	Design consideration	Type of D.C.	QOL Domains	Resources
SL-RK	Cooker should be placed at least 30 cm from the inside corners.	OBJ.	1-1-1, 1-2-1 2-1-5	AGT
	A clear knee-space of 75 cm high, 90 cm wide and 49 cm deep should be left under the cooktops.	OBJ.	1-1-1, 1-2-1 2-1-5	AGT
	Ovens should be adjacent to the countertop that has knee-space or can be adjusted.	OBJ.	1-1-1, 1-2-1 2-1-5	AGT
	Ovens should be of the self-cleaning type.	OBJ.	1-2-2	AGT
	Oven control buttons should be on the front panel.	OBJ.	1-1-1, 1-2-1 2-1-5	AGT

Related QOL Domains:

1-1-1:ability to be mobile; 1-2-2: ability to do housework; 2-1-5: sense of self-esteem

Abbreviations:

SBJ: Subjective OBJ: Objective, SL-RK: Kitchen

5.3 Use of The Assessment Approach

The housing design assessment approach consists of five assessment modules: housing scale, building scale, immediate surroundings scale, community scale and urban context scale. Each assessment module created according to the design scales consists of sub-modules created according to the spaces. Each space module includes design considerations, type of design considerations and quality of life domains related to space and design elements detailed in Chapter 5.2. The 5 main assessment modules and their sub-modules are as follows.

- ***Housing Scale Assessment Module (DS100)*** consists of nine sub-modules which are the *Housing Entrance Assessment Module (DS101), Hall Assessment Module (DS102), Corridor Assessment Module (DS103), Living Room Assessment Module (DS104), Kitchen Assessment Module (DS105), Bedroom Assessment Module (DS106), Bathroom Assessment Module (DS107), Balcony/Terrace Assessment Module (DS108),* and *Private Garden Assessment Module (DS109).*
- ***Building Scale Assessment Module (DS200)*** consists of four sub-modules which are the *Building Entrance Assessment Module (DS201), Building Hall Assessment Module (DS202), Building Corridor Assessment Module (DS203),* and *Building Vertical Circulation Assessment Module (DS204).*
- ***Immediate Surroundings Scale Module (DS300)*** consists of three sub-modules that are *Immediate Surroundings Pathways Assessment Module (DS301), Immediate Surroundings Parking Lot Assessment Module (DS302),* and *Immediate Surroundings Park / Garden Assessment Module (DS303).*
- ***Community Scale Module (DS400)*** consists of four sub-modules including the *Community Scale Pathways Assessment Module (DS401), Community Scale Parking Lot Assessment Module (DS402), Community Scale Park / Garden Assessment Module (DS403), and Community Scale Facilities Assessment Module (DS404).*
- ***Urban Context Scale Module (DS500)*** consists of four sub-modules including the *Parking Lot Assessment Module (DS502), Urban Context*

Scale Park / Garden Assessment Module (DS503), and Urban Context Scale Facilities Assessment Module (DS504).

The housing design assessment approach, which consists of five assessment modules, includes design issues that are evaluated objectively and subjectively. Objective design considerations are the considerations that can be evaluated through the architectural project of the house. The house does not need to be in use for this. Subjective design considerations, on the other hand, are those that require direct occupant knowledge. In order for subjective design considerations to be evaluated, the house must be in use. In summary, the housing design assessment approach is used in two phases, depending on the type of occupancy:

- **Design Phase**: Housing at this phase are those that are in design phase, under construction or delivered, but not in use yet. At this stage, the objective design considerations in the assessment approach are considered.
- **Use Phase**: Housing at this phase are those that are exists, have been officially authorized to be occupied and are occupied. At this stage, the objective design considerations and subjective design considerations in the assessment approach are considered.

The housing design assessment approach is used by architects and related professional groups. As a result of the evaluation of each objective and subjective design consideration in the five assessment modules, one of the four results is determined; yes, no, not applicable and no information. These are described below.

- **(Y) Yes:** A design consideration is present and implemented correctly.
- **(N) No:** No relevant design considerations or present but unsuitable for use. In this case, minor and major changes to be made are determined and the occupant is informed.
- **(N/A) Not applicable:** The relevant design consideration does not apply to the relevant design scale.

- **(N/I) No information:** There is no definite information about whether the design consideration exists or not.

Chapter 6

Application of The Assessment Approach

The aim of this section is to explain how the proposed housing design approach will be applied through selected housing cases from Turkey. The housing design assessment approach has been applied on two housing cases selected from Turkey. The constraints listed below have been considered while selecting housing cases for this assessment.

- The housing should be designed for persons aged 60 and over.
- The housing should be located in a community designed for older adults.
- The housing should not be isolated from the city center.
- The housing should have a historical significance among the housing designed for older adult in Turkey.

There are two housing examples in Turkey that meet these criteria: Retirement Houses in Nilüfer, Bursa and Small Houses in Çukurova, Adana.

Small Houses in Çukurova, Adana (SH) are the first example of housing built within a community for older adults in 1997. These housing is the suggestion of teacher Müyesser Gürtürk, who settled in Adana Nursing Home with her husband in 1994 after she retired. With the contributions of non-governmental organizations and philanthropists, 6 twin housing consisting of 12 independent units were built in the first stage on the land allocated within the borders of the nursing home (Figure 6.1). The number of twin housing reached 50, with the addition of 8 housing in 2015. Each independent unit, consisting of a bedroom, a living area with an open kitchen, a bathroom, and an entrance terrace, is 45 m2. Small houses produced as a result of an older adult's demand for a housing of her own in a neighborhood environment have also become a model for nursing homes in Turkey. In the statement made by the Ministry of Family and Social Services in 2020, it was stated that the "Small House Type Project" architectural

model will be expanded in nursing homes across Turkey. These housing, which has a historical place in terms of being an initial idea of housing design for older adults, are located in an area with a high density of housing, close to the city center (Gülpınar, 2003; Özgüven, 2022).

Figure 6.1 Small Houses in Çukurova, Adana (SH) (Özgüven, 2022)

Retirement Houses in Nilüfer, Bursa (RH) are the first housing built for older adults by the government as a result of the decision taken in the 10th National Development Plan's Aging Specialization Commission Report. TOKİ announced in 2015 that it will receive the preliminary demands of retirees for a total of 4340 houses, called as "Second Spring for Pensioners", to be built in 17 provinces. The first of these retirement houses was built by TOKİ between 2016 and 2018 in Bursa, Nilüfer, Hasanağa. Retirement houses are in a large community of 52 five-floor buildings (Figure 6.2). Each independent housing in a five-floor building consists of a kitchen, a living room, two bedrooms, a WC, a bathroom and a balcony. The rapid increase in older population in Turkey and the need for affordable housing are the main factors that led to this decision. Considering the cost of nursing homes to the government, it has become one of the country's housing policies for older adults to live in their own homes (Bursa Hakimiyet, 16 June 2018; TRT News, 16 June 2018).

RH and SH are housing in use. Within the scope of the thesis, objective design issues in five assessment modules were evaluated. Subjective design issues were

excluded. In the *Urban Context Scale Module (DS500)*, three sub-modules other than the *Urban Context Scale Facilities Module (DS504)* module were excluded from the evaluation.

Figure 6.2 Retirement Houses in Nilüfer, Bursa (RH) (Sansarlıoğlu, 31 September 2018).

6.1 The Housing Scale Assessment Module

The Housing Scale Assessment Module (DS100), which consists of nine sub-modules, is the most comprehensive module of the assessment approach. The data obtained as a result of the application of nine subsections to two housing examples SH and RH are explained below, respectively.

The Housing Entrance Assessment Module

The Housing Entrance Assessment Module (DS101) includes a total of 44 design considerations for five main design element groups: the *entrance space* from *spaces*, and *materials and components, building element system, service systems, fittings* from *design elements*. The *housing entrance space*, which is one of the sub-spaces of the *entrance space* within *spaces*, consist of *doors, windows, stairs* and *ramps*, which are the sub-design elements of the *building element systems*; and *finishes*, one of the sub-design

elements of the *materials and components*; and *lighting, lift, communication systems*, which are the sub-design elements of the *service systems*; and *cupboards*, one of the sub-design elements of the *fittings*. On the other hand, these sub-design elements belonging to the building element systems include design considerations of both their own and other design elements. Some of the design considerations for *doors* and *windows* relate to *finishes*, one of the sub-design elements of the *materials and components*. *Ramps* and *stairs* include design considerations related to *lighting*, which is the sub-design element of *service systems*, and the *finishes* and *complementary components*, which are the sub-design elements of *materials and components.* Design considerations of stairs and ramps are evaluated if there is a level difference between the housing and its immediate surroundings. The data obtained as a result of the evaluations of SH and RH's housing entrance spaces are discussed below (Appendix A).

SH: The first evaluated design considerations are those of the entrance to the housing. The DS101.2 design consideration is not available in SH (Figure 6.4). There is a level difference between the housing entrance of SH and the main travel route reaching the housing. The entrance to the housing is reached by *stairs*, which is one of the sub-design elements of the *building element systems*. The entrance to the housing is accessed by 3 stair steps with a length of 120 cm and a width of 30 cm. At the entrances of houses with elevation difference, there must be either a *ramp*, which is one of the sub-design elements of the *building element systems*, or a *lift*, which is one of the sub-design elements of the *service systems*, together with the stairs. Considering the difficulty in walking seen in most of older adults, the housing entrance of SH with no ramps or lifts negatively impacts quality of life.

The DS101.5 design consideration is not available in SH. The housing entrance of SH has a customizable space with a length of 350 cm and a width of 150 cm separated from main travel route (Figure 6.4). The width of the customizable space must be at least 180 cm in order to allow many activities to take place. However, the customizable space has a canopy providing protection from the weather. In front of the customized space there is a width of 50 cm area for growing plants and flowers. The fact that SH has a canopy and area for growing plants and flowers affects the quality of life positively (Figure 6.4).

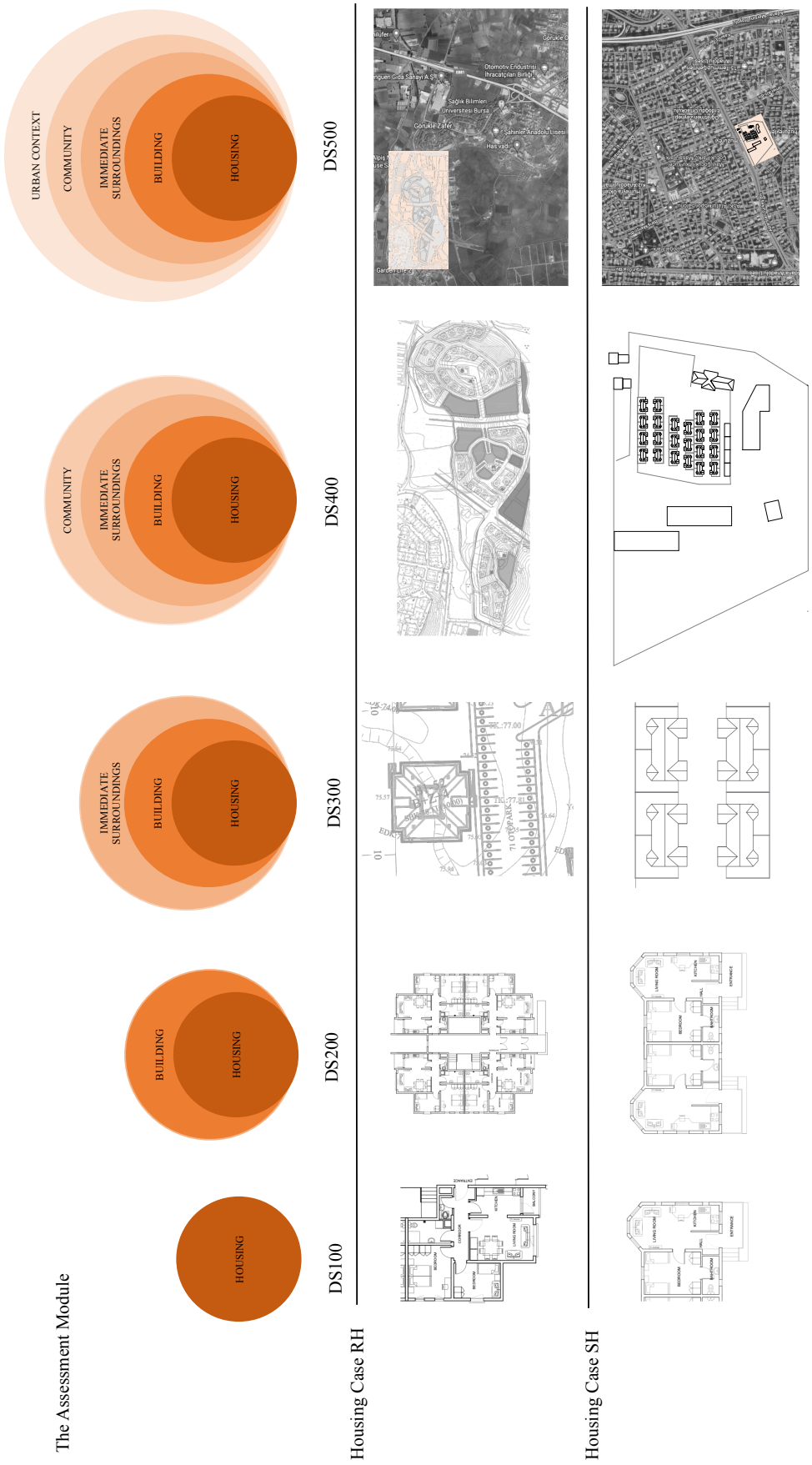


Figure 6.3 Evaluation scales of Retirement Houses (RH) and Small Houses (SH)

Another design consideration regarding the entrance area are related to the *doors* and *windows*, which are the sub-design elements of the *building element systems.* The entrance door of SH is width of 100 cm and height of 210, and provides the minimum dimensions required for the door. The door color related to the *finishes*, which is one of the sub-design elements of the *materials and components*, is dark brown and visually contrasts with the adjacent white walls. Providing the necessary design considerations of the door increases the quality of life. There is a window on the front facade of SH overlooking the housing entrance. It positively impacts quality of life as it allows older adults to dominate the outside from the inside of the housing. However, the white color of the window frame does not create a visual contrast with the adjacent white walls. This situation negatively affects the visual well-being of older adults and reduces their quality of life (see Appendix A, Table A.1).

RH: The first evaluated design considerations are those of the entrance to the housing. The housing entrance of RH is in visible and recognizable location inside the building. The housing entrance of RH is at the same level as the main travel route reaching the housing. *Stairs* and *ramps*, which are the sub-design elements of the *building element systems*, and *lift*, which is one of the sub-design elements of the *service systems* are not applied at the entrance of this housing. Another design consideration is related customizable space in the housing entrance. The DS101.4 and DS101.5 design considerations are not available in RH (Figure 6.4). There is no customizable space in front of the entrance of the housing, and the entrance door opens directly to the main corridor of the building. The absence of a retracted space from the main travel route at the entrance may result in passenger traffic in the corridor. Since there is no private area, household items such as refuse container and shoes are placed in the corridor. This negatively affects the sense of belonging. The creation of an appropriately sized entrance niche in apartments, as in detached houses, is an important design issue in terms of quality of life.

Another design consideration regarding the entrance area are related to the *doors* and *windows*, which are the sub-design elements of the *building element systems.* The entrance door of RH is width of 100 cm and height of 210. One of the sub-design elements of the *materials and components*, the door color related to the *finishes* is dark brown and creates a striking visual contrast with the nearby white walls. This situation positively

affects the visual health of older adults and improves their quality of life. There is no window adjacent to the entrance door. Since there is a housing in the building, the design consideration regarding the window is not applied (see Appendix A, Table A.1).

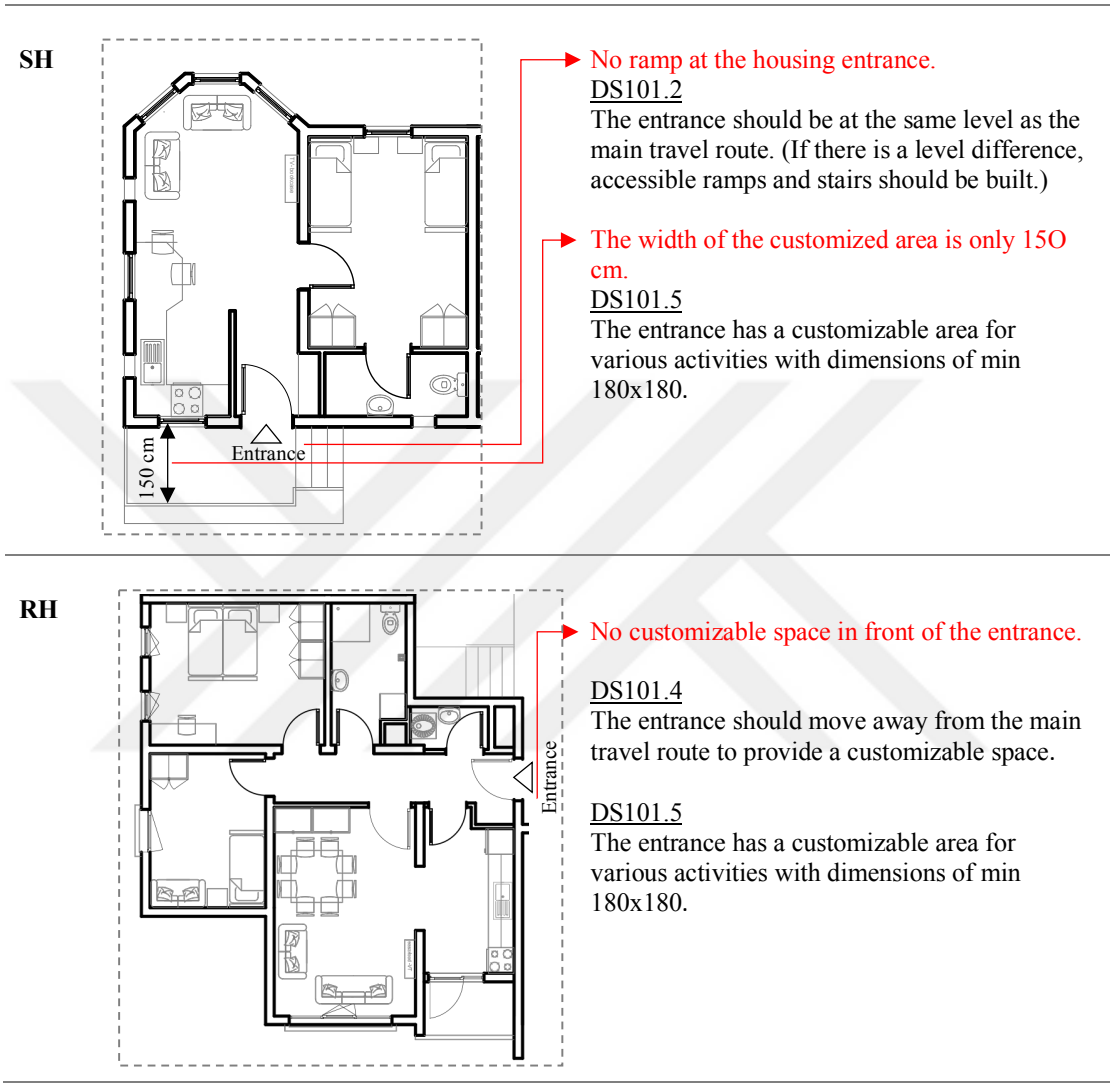


Figure 6.4 The Housing Entrance Assessment Module (DS101) of SH and RH

The Hall Assessment Module

The Hall Assessment Module (DS102) includes a total of 13 design considerations for three main design element groups: the *circulation spaces* from *spaces*, and *materials and components, service systems* from *design elements.* The data obtained as a result of the evaluations of SH and RH's hall spaces are discussed below.

SH: The design considerations first considered are related to the dimensions of the hall. The DS102.1, DS102.2 and DS102.3 design considerations are not available in SH (Figure 6.5). The width of the entrance hall is 120 cm and the length of it is 200 cm. The width of the entrance hall must be at least 180 cm for the transfer and maneuver of the older adults from the wheelchair. The wheelchair user must move towards the open living area to maneuver. If the occupant uses different wheelchairs at home and outdoors, he/she will need to clean up after each entry and exit. It is an insufficient space not only for maneuver, but also for welcoming guests, receiving caregivers, and storing wheelchairs and other items. The fact that the entrance hall does not provide the necessary design considerations negatively affects the quality of life (see Appendix A, Table A.2)

RH: The entrance hall's proportions are one of the first design considerations to be considered. The DS102.1, DS102.2 and DS102.3 design considerations are not available in RH (Figure 6.5). The entrance hall is corridor of the housing and is 110 cm in width. The 110 cm width of the hall is not sufficient for the maneuvering area, it does not even meet the minimum dimensions required for the corridor. The width of the entrance hall must be at least 180 cm. In addition, the door of the kitchen and toilet is very close to the hall. This may cause heavy traffic in the hall. In other words, the housing hall is the place where various activities such as hosting guests, going to the toilet, carrying food to the kitchen are carried out. The lack of necessary design considerations in the entrance hall has a negative impact on older adults' quality of life (see Appendix A, Table A.2).

The Corridor Assessment Module

The Corridor Assessment Module (DS103) includes a total of 13 design considerations for three main design element groups: the *circulation spaces* from *spaces*, and *materials and components, service systems* from *design elements.* The data obtained as a result of the evaluations of SH and RH's corridor spaces are discussed below.

SH: There is no specific corridor space in SH. After the entrance hall, users reach the open living area and an "undefined corridor space " where the bedroom entrance is located. Although this was done to create a feeling of spaciousness, the narrowness of the entrance hall causes the activities here to be moved to the "undefined corridor space".

This situation negatively affects the ADLs and IADLs of older adults and reduces their quality of life. To avoid confusion in this corridor, the entrance hall needs to be enlarged (see Appendix A, Table A.3).

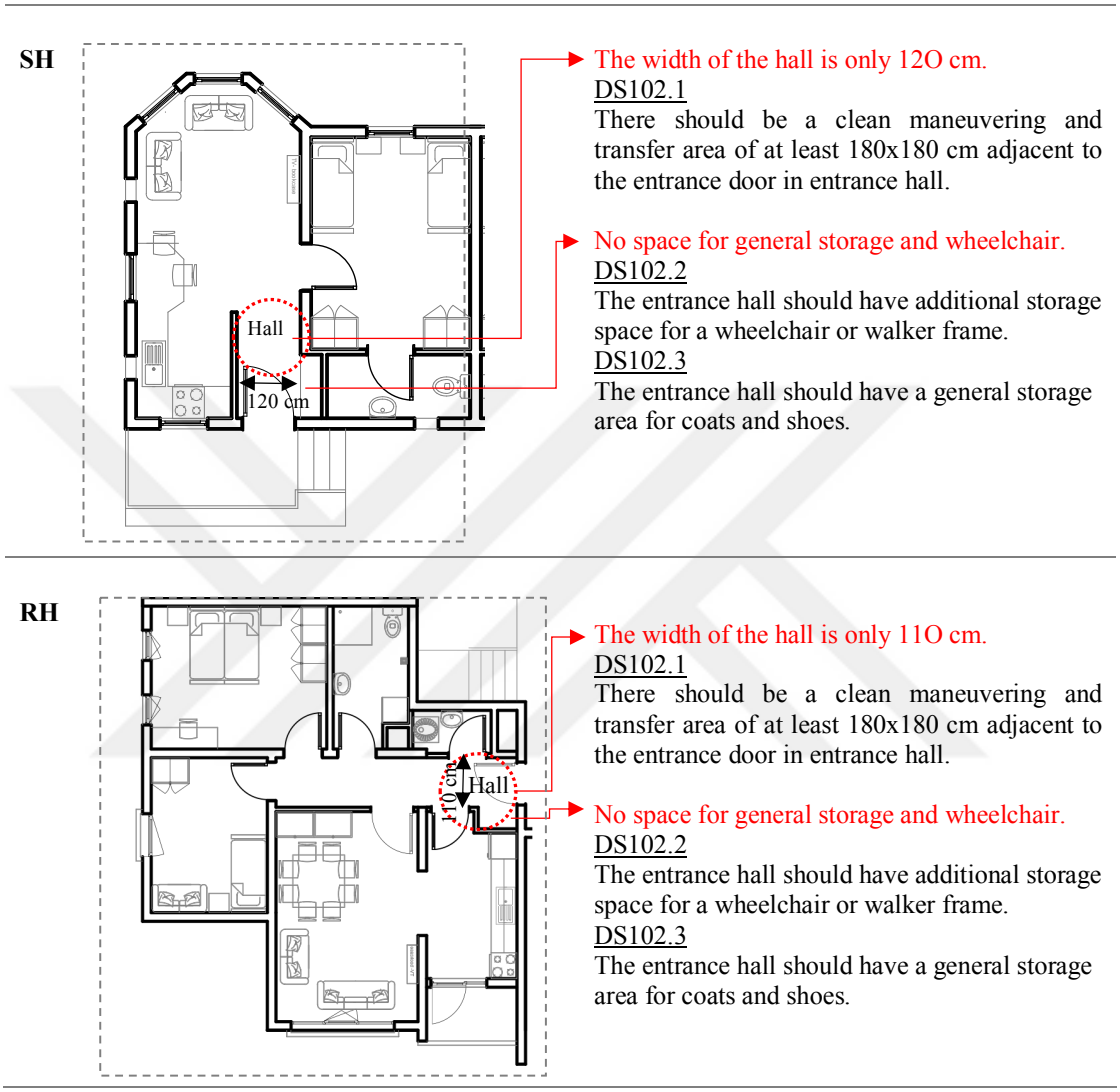


Figure 6.5 The Housing Hall Assessment Module (DS102) of SH and RH

RH: The design considerations first considered are related to the dimensions of the corridor. The DS103.1 design consideration is not available in RH (see Appendix A Table A.3). RH has a 110 cm in width corridor that is accessible from all of the rooms, and also is used as the hall in front of the entrance door. However, the width of the entrance hall must be at least 120 cm. On the other hand, the corridor, which doubles as an entrance hall, has no space for a wheelchair to maneuver. The older adult in a wheelchair is forced to use one of the rooms to maneuver. Older adults' ADLs and IADLs

are negatively impacted by this condition, which also lowers their quality of life. Another design consideration is the length of the corridor. All of the rooms in RH are connected by a single 560 cm in length corridor. As a result of the shorter walking distance, this design consideration improves the quality of life. However, the corridor needs to be wider in order to be functional.

The Living Room Assessment Module

SH: The first evaluated design considerations relate to the general layout of the living room. The DS104.2, DS104.3, DS104.4 and DS104.6 design considerations are not available in SH (Figure 6.6). The dimensions of the living room, which is part of the open living area, are 310 x 312 cm. The current dimensions of the hall is not sufficient for the activities that take place there. For an older adult to continue their familiar activities and host their guests, the living room's width must be at least 350 cm. The social engagement domain of quality of life is particularly badly impacted by this condition. Similarly, the DS104.5 is not available in SH. The caregiver should be able to sleep in the living room, but there isn't an area for them to do so. In conclusion, there is not enough area in this housing, which is designed for two older adults, for a variety of activities that enhance quality of life. Another design consideration evaluated is related to the *windows*, which is the sub-design elements of the *building element systems.* The DS104.35 and DS104.36 design considerations are not available in SH (Figure 6.6). The windows in the living room overlook the back garden of the housing. But it is strongly recommended that the windows in the living room overlook the open activity areas and the view. Even in the current position of the windows, it is very difficult for older adults to sit and look out due to the diagonal plan of the living room. Lack of these design considerations has a negative effect on quality of life domains (see Appendix A, Table A.4).

RH: The first evaluated design considerations relate to the general layout of the living room. The living room consists of three parts: the dining area, the seating area and the transition area connecting the kitchen and dining area. The DS104.2, DS104.3, DS104.4 and DS104.6 design considerations for the seating area are not available in RH (Figure 6.6). Despite the fact that living room's dimensions are 330 x 485 cm, the seating area only has a 330 x 200 cm area. This area is too small for older adults to carry out their daily activities, let alone welcoming guests. This situation has an especially negative

influence on the quality of life domain related to social engagement. Similarly, the DS104.5 is not available in RH. The caregiver cannot use the living room as a bed area. However, the caretaker can utilize the extra bedroom in the house.

The DS104.8 and DS104.15 design considerations are not available in RH for the dining area. The dining area occupies an area of approximately 220 x 250 cm in the living room. The dining area has an eight-seater dining table and two cabinets for dinnerware. But the dining table is large enough to occupy half of the living room and is located in an unusable place. Since the table is adjacent to the wall, the table has to be pulled towards the middle of the hall for eight people to use the table at the same time. Although there is sufficient maneuvering space for the wheelchair user to approach the table, there is not enough knee-space under the table. Under the table, there should be a 90 cm wide 49 cm deep knee space free of obstacles such as table legs, chair legs, and cables. Wheelchair passage distance, which must be at least 90 cm between the table and the cabinets, is zero, and also the chair and the cabinets are adjacent. The connection of the dining area with the kitchen is one of the positive situations. Using a four-person table instead of an eight-person table, reducing the number of cabinets, removing the cabinets if necessary, leaving knee-space under the table can make the dining area more functional.

Another design consideration regarding the entrance area are related to the *doors* and *windows*, which are the sub-design elements of the *building element systems.* The DS104.24 design consideration is not available in RH for *door*. Although the opening edge of the living room door is 30 cm from the side wall, the available distance is 10 cm. The transit of a wheelchair through the door may be negatively impacted by insufficient distance. The DS104.30 and DS104.36 design consideration is not available in RH for *window.* The 240 x 240 cm window of the room is positioned to face open spaces and the view. The guides require the window sills to be 80 cm above the floor to prevent accidents. However, the window sill in the room is level with the floor. This is a design issue that facilitates access to landscape and nature and enriches visual well-being. These windows can be used as long as they are made of unbreakable glass and have a railing that is the right height and shape. Despite these advantages of the window, the furniture is placed in such a way as to block the view. The area in front of the window is one of the few places to set a seat because of the table and other furniture in the living room. A comfortable single seat can be placed next to the window, where the older adult can

comfortably watch TV, look at the view, and at the same time see the door (see Appendix A, Table A.4).

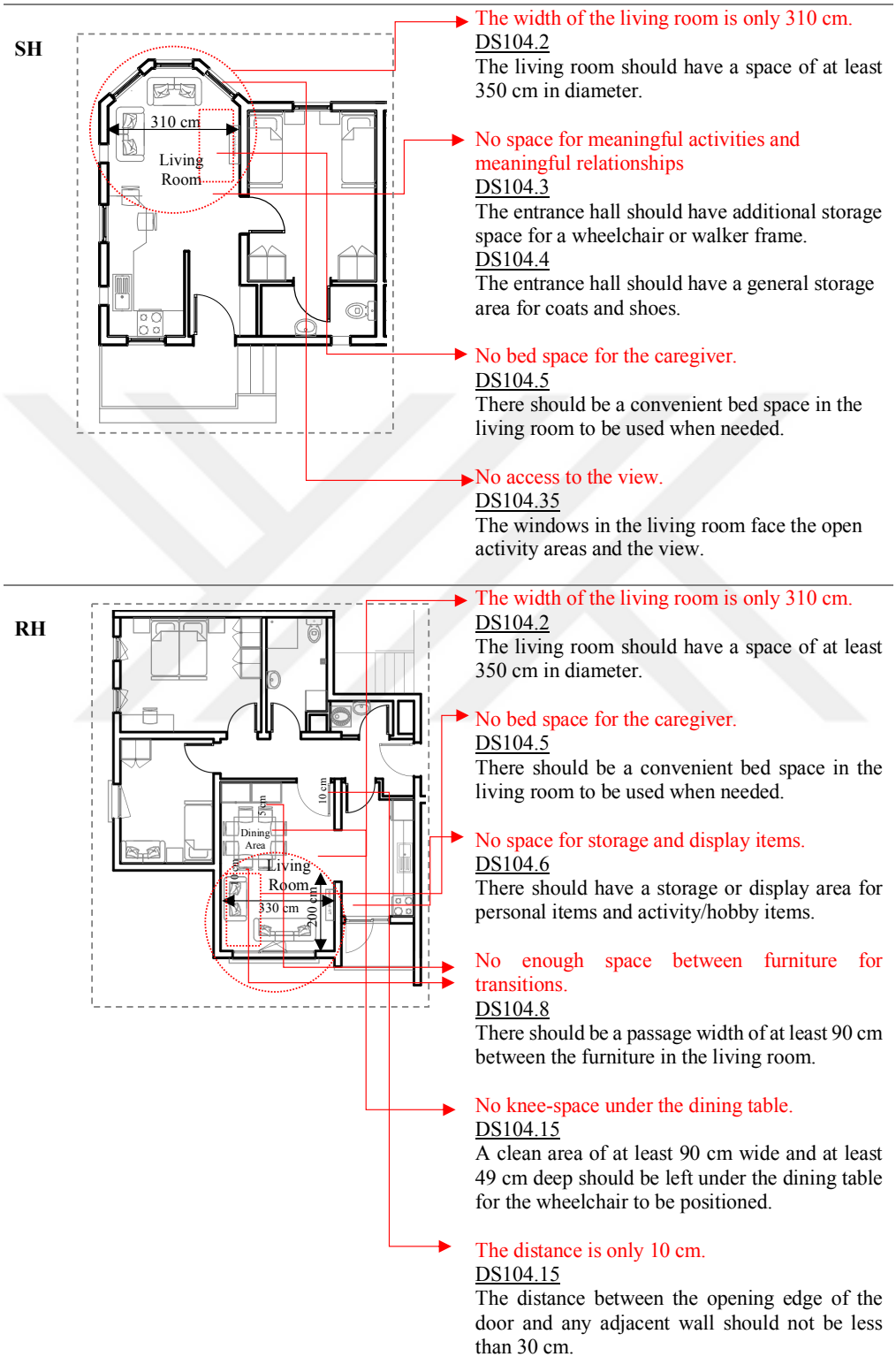


Figure 6.6 The Living Room Assessment Module (DS104) of SH and RH

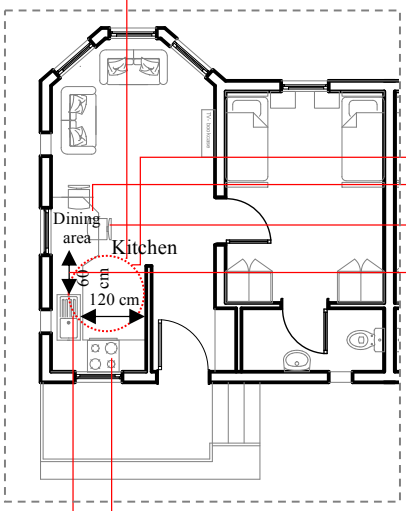
The Kitchen Assessment Module

SH: The first evaluated design considerations relate to the general layout of the kitchen. The house has an open kitchen area that is physically separated from other spaces. The DS105.2, DS105.3, DS105.5 and DS105.7 design considerations are not available in SH (Figure 6.7). The dimensions of kitchen are 200 x 180 cm, and a dining area is located next to the countertop. The width of the clean circulation area in the kitchen is 120 cm. This kitchen must have a 150 x150 cm space for wheelchair users to maneuver, as well as assistance from caregivers and social robots. The older adult's ability to move around and get assistance from others is restricted by the kitchen's narrowness, which has a detrimental effect on their quality of life.

Other design considerations evaluated are related to the *countertop, sink* and *cupboard,* which are the sub-design elements of the *fittings.* The DS105.36, DS105.37 and DS105.40 design considerations are not available in SH (Figure 6.7). A large part of the kitchen counter is occupied by the cooker and sink. Therefore, the older adult is forced to use the dining area adjacent to the counter as a work surface. There is no knee-space for positioning the wheelchair under the sink. Many older adults, not just wheelchair users, have difficulty standing for long periods of time. Therefore, a clear knee-space of 90 cm wide and 49 cm deep must be left under the sink. The kitchen cabinets are positioned under the counter. The fact that all cabinets at reachable height is an advantage. But, the older adult's quality of life is adversely impacted by the kitchen's decreased functionality as a result of the lack of knee space under the countertop.

The last design considerations evaluated are related to the *refrigerator/freezer* and *cooker*, which are the sub-design elements of the *appliances.* The DS105. 48, DS105.49, DS105.50, DS105.52 and DS105.53 design considerations are not available in SH. There is no area for a refrigerator/freezer in the kitchen. The cooker is not located next to a countertop with knee space. The refrigerator, cooker and sink form the three corner points of the space known as the kitchen work triangle. Unfortunately, there is no adequate working triangle in this kitchen for older adults (see Appendix A, Table A.5).

SH



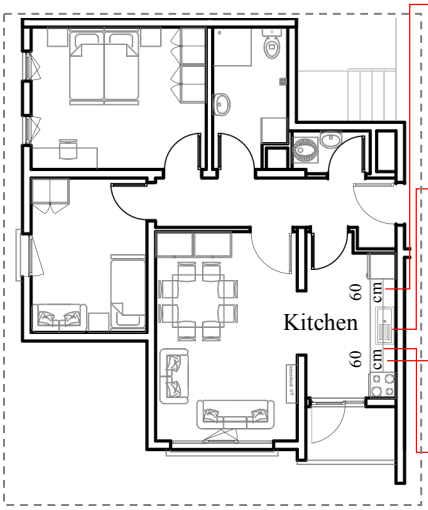
No space to maneuver a wheelchair.
DS105.2
There should be a maneuvering area of at least 150 cm diameter circle in front of fixed countertops and appliances.

No space for multiple people to prepare, and eat food at once.
DS105.3
There should be space for more than one person in the kitchen for family members, friends or caregivers to be involved in preparing the older person's meals.
DS105.5
The dining area should be large enough for at least four people to eat together.

No enough work space on the countertop.
DS105.36
At least 90 cm long part of the kitchen countertop should be arranged as a work surface.

No knee-space under any fittings.
DS105.37
A clear knee-space of 75 cm high, 90 cm wide and 49 cm deep should be left below the countertop.
DS105.40
A clear knee-space of 90 cm wide and 49 cm deep should be left under the sink.
DS105.7
A clean area of at least 90 cm wide and at least 49 cm deep should be left under the dining table for the wheelchair to be positioned.

RH



No enough work space on the countertop.
DS105.37
A clear knee-space of 75 cm high, 90 cm wide and 49 cm deep should be left below the countertop.

No knee-space under any fittings.
DS105.37
A clear knee-space of 75 cm high, 90 cm wide and 49 cm deep should be left below the countertop.
DS105.40
A clear knee-space of 90 cm wide and 49 cm deep should be left under the sink.

Too few cupboards that are reachable.
DS105.44
At least 50% of the shelves in the cupboards in kitchen should be accessible.
DS105.45
The height of the cupboards should be no more than 137 cm. If the kitchen shelves are 137 cm higher, an electronically or mechanically elevating / lowering system should be used.

Figure 6.7 The Kitchen Assessment Module (DS105) of SH and RH

RH: The first evaluated design considerations relate to the general layout of the kitchen. The kitchen, which is 210 x 338 cm in size, is physically separated from the other rooms. The kitchen has a multi-user capacity, meaning older adult, caregiver or social robot can work simultaneously. The refrigerator, stove, and sink are placed near to one another. The large balcony window provides enough light for the kitchen. The quality of life is improved by having these design considerations.

Other design considerations evaluated are related to the *countertop, sink* and *cupboard,* which are the sub-design elements of the *fittings.* The DS105.36, DS105.37, DS105.40, DS105.44, DS105.45 and DS105.46 design considerations are not available in RH (Figure 6.7). There isn't a work surface that is 90 cm wide, 75 cm high, and 49 cm deep on the countertop. Likewise, there is no clean knee space 90 cm wide and 49 cm deep under the sink. Despite being situated in a maneuver space that is 150 x 150 cm, the countertop and sink's utility is limited by the absence of a knee space below them. On the countertop, there are cupboards that are 30 cm deep. These cupboards do, however, have fixed shelves that are higher than the 137 cm accessible height. The quality of life is harmed by cupboards that are not at the suitable height.

The last design considerations evaluated are related to the *refrigerator/freezer* and *cooker*, which are the sub-design elements of the *appliances.* The DS105. 47, DS105.50, DS105.51 and DS105.52 design considerations are not available in RH. The appliances are not placed 30 cm away from the adjacent corners. The cooker is not located next to a countertop with knee space. It is possible to create a kitchen work triangle, which is better for older adults. This requires replacing the sink and cooker and moving the cooker nearer to the refrigerator. This creates a clean work surface with knee space under the countertop. The storage area lost under the counter can be solved by making the upper cabinets more accessible with a mechanical system (see Appendix A, Table A.5).

The Bedroom Assessment Module

SH: The first evaluated design considerations relate to the general layout of the bedroom. There is a 300 x 400 cm bedroom independent from other rooms. The bedroom has two single beds, two bedside tables and two wardrobes. In the middle of the space, there is a maneuvering area to provide access to beds and wardrobes. The distance

between the two beds is 120 cm, which is the recommended distance for caregiver support. There is a bathroom inside the bedroom. The window sills are 80 cm above the floor. The quality of life is improved by having these design considerations. Another design consideration evaluated is related to the *wall*, which is the sub-design elements of the *building element systems.* The DS106.32 design consideration is not available in SH (Figure 6.8). It is clear from the architectural plan that the bedroom's walls are not soundproofed. There should be sound insulation on the walls since how well older adults sleep affects how well they live (see Appendix A, Table A.6).

RH: The first evaluated design considerations relate to the general layout of the bedroom. The 338 x 410 cm bedroom is separate from the other rooms, and is located close to the bathroom. The bedroom has a double bed, two bedside table, a wardrobe and a dresser. There is a 90 cm transition distance between the bed and the dresser. At the foot of the bed, there is a 150 x 150 maneuvering area required for transitioning from a wheelchair to a bed or vice versa. However, the DS106.6 and DS106.7 design considerations are not available in RH (Figure 6.8). A caregiver support or social robot should have 120 cm of clear space on either side of a double bed. However, at RH, this distance is 90 cm (Figure 6.8). Likewise, there is not enough maneuvering space to get dressed and use the closet in front of the wardrobe. The independence and support domains of quality of life are significantly impacted by the lack of these two design considerations (see Appendix A, Table A.6).

The Bathroom Assessment Module

SH: The first evaluated design considerations relate to the general layout of the bathroom. The bathroom having the dimensions of 270 x 120 cm is inside the bedroom and on the same floor with the bedroom. The DS107.3, DS107.4, DS107.5, DS107.6 and DS107.7 design considerations are not available in SH (Figure 6.9). There is no maneuvering space of 150 x 150 cm due to the bathroom's dimensions. However, all bathroom activities, including using the toilet, taking a shower, and caring for one's self, are performed by maneuvering. Similarly, older adults and their caregivers cannot use the bathroom at the same time because of space limitations. The absence of these design considerations has a major negative impact on the quality of life domains of independence and support (see Appendix A, Table A.7).

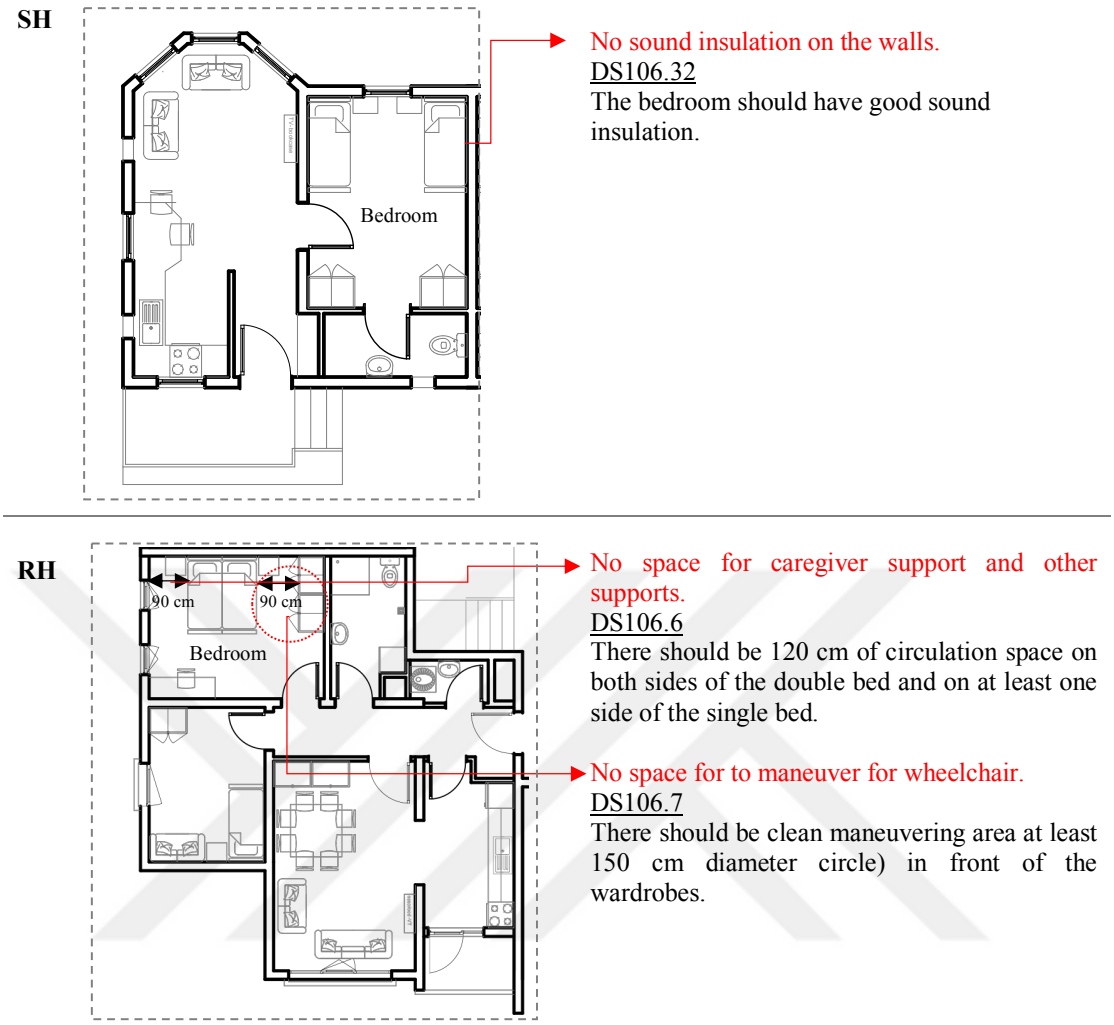


Figure 6.8 The Bedroom Assessment Module (DS106) of SH and RH

Another design consideration evaluated is related to the *door*, which is the sub-design elements of the *building element systems.* The DS107.15 design consideration is not available in SH. The bathroom door that opens inward and is situated directly in the center of the room opens toward the sink. The quality of life domains of independence and support are significantly harmed by the absence of the design consideration.

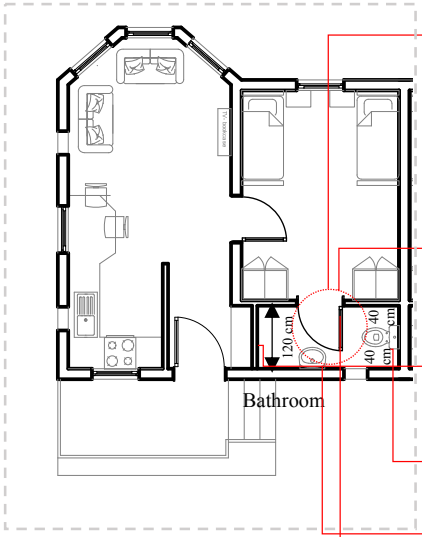
Other design considerations evaluated are related to the *shower unit, sink* and *toilet,* which are the sub-design elements of the *fittings.* The DS107.34, DS107.35, DS107.36, DS107.37, DS107.38, DS107.39 and DS107.40 design considerations are not available in SH for shower unit (Figure 6.9). There is no shower unit with the dimensions of 76 x 150 cm with its grab bars and a shower seat. After, the DS107.45, DS107.46, DS107.47 and DS107.48 design considerations are not available in SH for toilet. To move

from a wheelchair to the toilet, there is not enough room in front of or next to the toilet. Additionally, the toilet does not have 60 cm of space on either side for the support of caregivers or social robots. Lastly, the DS107.51, DS107.52 and DS107.54 design considerations are not available in SH for sink. There is no 76x122 cm clean activity space in front of the sink because the door opens inward. There aren't fixed grab bars that need to be on both sides of the sink. For the support of caregivers or social robots, the sink lacks 60 cm of area on either side. The absence of these design considerations has a significant negative impact on the quality of life domains of independence psychological well-being and support (see Appendix A, Table A.7).

RH: The first evaluated design considerations relate to the general layout of the bathroom. The bathroom with a 175 x 272 cm size is nearby the bedroom and is on the same level as the corridor. The DS107.3, DS107.4, DS107.5, DS107.6 and DS107.7 design considerations are not available in RH. There is no 150 x 150 cm maneuvering area in the bathroom due to the positioning and size of the appliances and fittings. Likewise, the bathroom is not an area where caregivers or social robots can assist. The absence of these design considerations has a significant negative impact on the quality of life domains of independence psychological well-being and support. Another design consideration evaluated is related to the *door*, which is the sub-design elements of the *building element systems.* The DS107.15 design consideration is not available in RH. The bathroom door opens inward, and a sink is located in the door's opening direction. There is a distance of 40 cm between the open door and the sink. The minimum required passage distance from the door to the inside of the bathroom is reduced from 90 cm to 72 cm due to the location of the sink. The quality of life domains of independence is significantly harmed by the absence of the design consideration.

Other design considerations evaluated are related to the *shower unit, sink* and *toilet,* which are the sub-design elements of the *fittings.* The DS107.34, DS107.35, DS107.36, DS107.37, DS107.38, DS107.39 and DS107.40 design considerations are not available in RH for shower unit. The bathroom's shower unit is a high-floor tub. There is no shower area with the dimensions of 76 x 150 cm with its grab bars and a shower seat. Then, the DS107.45, DS107.46, DS107.47 and DS107.48 design considerations are not available in RH for toilet. Transferring from a wheelchair to the toilet is not possible due to a lack of space in front of or next to the toilet.

SH



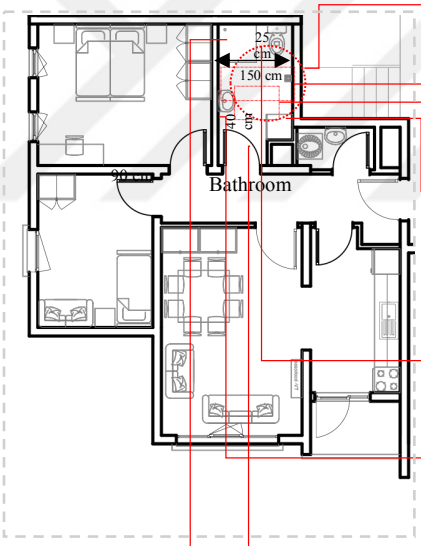
No space to maneuver for wheelchair.
DS107.3
The bathroom should be large enough to accommodate fittings such as shower area, washbasins, and toilets.
DS107.7
The bathroom should have a clean maneuvering area of at least 150 cm diameter to cover access to the toilet, washbasin and shower area.

No space for caregiver support.
DS107.5
The bathroom should be large enough for the caregiver and the older person to find it at the same time

No movable or fixed grab bars on the any fittings.
DS107.38
The height of the grab bars on the shower unit should be between 80-95 cm
DS107.48
Depending on the position of the toilet, there should be movable or fixed grab bars on both sides.
DS107.54
There should be fixed grab bars at a height of 90 cm from the floor on both sides of the sink.

The door opens inward.
DS107.15
The bathroom door should open outwards or be a sliding door.

RH



No space to maneuver for wheelchair.
DS107.7
The bathroom should have a clean maneuvering area of at least 150 cm diameter to cover access to the toilet, washbasin and shower area.
DS107.35
There should be a clean area 90 cm wide and 150 cm long in front of the shower.
DS107.46
There should be enough space in front of or next to the toilet for transfer from a wheelchair.
DS107.52
There should be a clean activity area of 76x122 cm in front of the sink.

No space for caregiver support.
DS107.47
There should be at least 60 cm space for the caregiver on the sides of the toilet.
DS107.51
There should be at least 60 cm space for the caregiver on the sides of the sink.

No movable or fixed grab bars on the any fittings.
DS107.38
The height of the grab bars on the shower unit should be between 80-95 cm
DS107.48
Depending on the position of the toilet, there should be movable or fixed grab bars on both sides.
DS107.54
There should be fixed grab bars at a height of 90 cm from the floor on both sides of the sink.

The door opens inward.
DS107.15
The bathroom door should open outwards or be a sliding door.

Figure 6.9 The Bathroom Assessment Module (DS107) of SH and RH

Furthermore, there is not 60 cm of space on either side of the toilet for the support of caregivers or social robots. There are neither permanent nor movable grab bars that must be present on either side of the toilet. Lastly, the DS107.51, DS107.52 and DS107.53 design considerations are not available in RH for sink. The 76x122 cm clean activity space in front of the sink is not present. The sink does not have fixed grab bars that must be installed on both sides. Additionally, the sink does not have 60 cm of space on either side for the support of caregivers or social robots. The independence, psychological well-being, and support quality of life domains are significantly harmed by the absence of these design considerations (see Appendix A, Table A.7).

The Balcony/ Terrace Assessment Module

RH: The design considerations evaluated relate to the general layout of the balcony. The 210 x 125 cm balcony is accessible from the kitchen. The DS108.2, DS108.3, DS108.4, DS108.5, DS108.6 and DS108.8 design considerations are not available in RH (Figure 6.10). There is not enough space to maneuver on the balcony. Because of this, many activities, like looking at flowers, getting some fresh air, or eating on the balcony, might not be feasible for an older adult using a wheelchair or other mobility device. The balcony lacks additional furniture and storage space for these activities. The absence of these design considerations has a strong negative impact on the quality of life domains of independence, psychological well-being, and social engagement (see Appendix A, Table A.8).

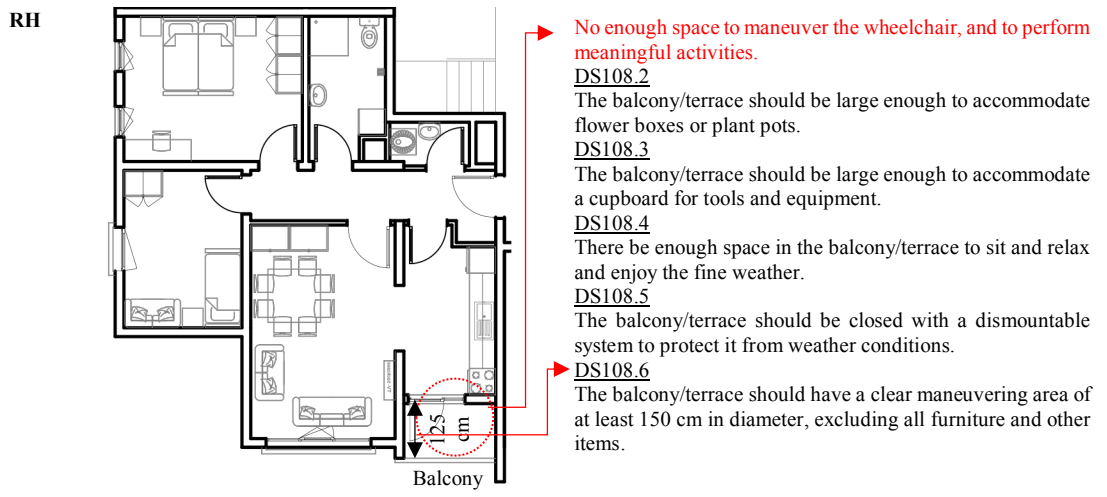


Figure 6.10 The Balcony/ Terrace Assessment Module (DS108) of RH

6.2 The Building Scale Assessment Module

The Building Scale Assessment Module (DS200) is consists of four sub-modules: *Building Entrance Assessment Module (DS201), Building Hall Assessment Module (DS202), Building Corridor Assessment Module (DS203),* and *Building Vertical Circulation Assessment Module (DS204)*. This module is be used to evaluate RH from two housing cases.

The Building Entrance Assessment Module

RH: The first evaluated design considerations relate to the general layout of the building entrance. The landing in front of the building entrance is 260 cm in width and 354 cm in length, providing enough room for a 26- housing unit at the building. There is a 230 x 260 cm canopy at the entrance landing. The entrance door is 150 cm wide and visually contrasts with the adjacent surface. There is a 150 x 150 cm maneuver area in front of and behind the entrance door. Adjacent to the entrance door, there is a window/display panel suitable for use by people at eye level. All of these design considerations are positive aspects of the entrance space. However, the DS201.2 design consideration is not available in RH (Figure 6.11). There is a level difference between the building entrance of RH and the main travel route reaching the building. The entrance to the building is reached by *stairs* and *ramp*, which are the sub-design elements of the *building element systems.*

The DS201.21, DS201.22, DS201.23, DS201.24 and DS201.25 design considerations aren't available in RH for stairs. The material of the stairs is marble. But, flooring materials must be flat, solid, durable, non-slip in wet and dry conditions. There are no handrails on either side of the stairs. Since the stairs is angular, there must be handrails on both corners and on both sides. Then, the DS201.31 and DS201.32 design considerations aren't available in RH for ramp. The slope of the ramp is 6% and is below the maximum limit of 8%. But its material is marble. The absence of these design considerations has a strong negative impact on independence, which is quality-of-life domain (see Appendix B, Table B.1).

RH

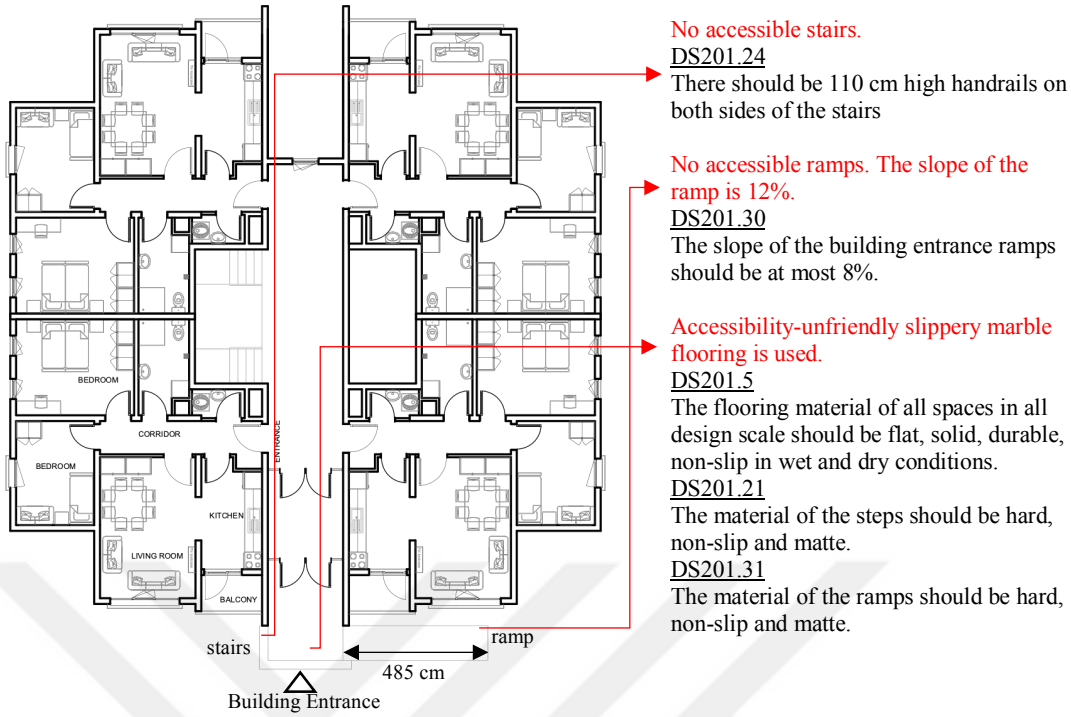


Figure 6.11 The Building Entrance Assessment Module (DS201) of RH, (Photo taken from the official TOKİ website in 2020)

The Building Hall Assessment Module

RH: The first evaluated design considerations relate to the general layout of the building hall. The DS202.1, DS202.2 and DS202.3 design considerations aren't available

in RH (Figure 6.12). There is a hall measuring 300 x 260 cm behind the entrance door. The dimensions of the hall must be at least 280 x 350 cm. The building hall, which is used by many every day and is a space for many activities such as pushing wheelchairs, carrying luggage, shopping or talking to neighbors, must provide the required minimum dimensions. In buildings designed for the older adults, there must be a caretaker in the hall. There is not enough space for this in the building hall. In addition, the floor material of the hall is marble. But, flooring materials must be flat, solid, durable, non-slip in wet and dry conditions. The absence of these design considerations has a strong negative impact on the quality of life domains of independence, psychological well-being, and social engagement (see Appendix B, Table B.2).

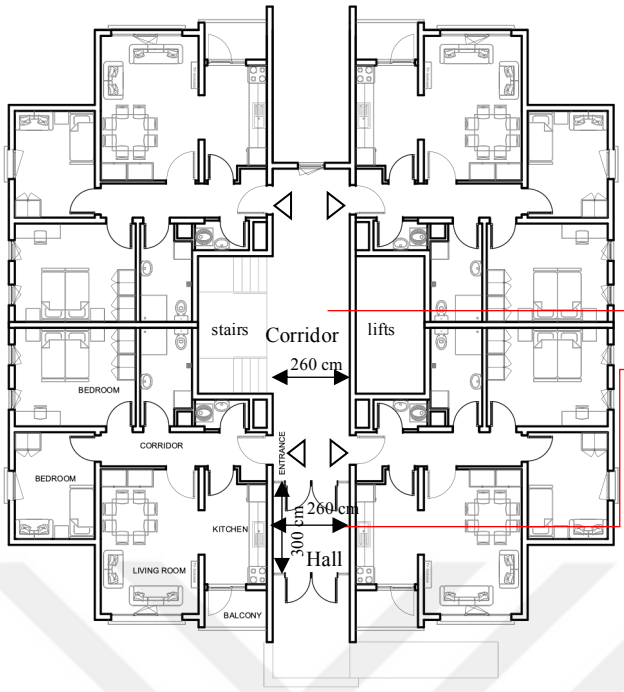
The Building Corridor Assessment Module

RH: The first evaluated design considerations relate to the general layout of the corridor. The width of the corridor is 260 cm. There are stairs, two elevators and 4 housing entrances in the corridor. Although the width of the corridor is more than the minimum dimensions, direct opening of the housing entrances to the corridor may cause more intense traffic in this area. The fact that there is no specialized area at the entrance of the housing may cause the items belonging to the housing such as refuse container and shoes to be located in the corridor (Figure 6.12). These reduce the functionality of the corridor (see Appendix B, Table B.3).

The Building Vertical Circulation Assessment Module

RH: Vertical circulation areas in the building are stairs and lifts. The DS204.7, DS204.9 and DS204.11 design considerations aren't available in RH for stairs (Figure 6.12). The riser height of the stairs is more than 16 cm. There is no handrails in the direction of the wall of the stairs. The material of the stairs is marble and this is an undesirable situation. The absence of these design considerations has a negative impact on the independence domain of quality of life. The lift is suitable in terms of design considerations (see Appendix B, Table B.4).

RH



Accessibility-unfriendly slippery marble flooring is used.
DS202.5
The flooring material of all spaces in all design scale should be flat, solid, durable, non-slip in wet and dry conditions.
DS203.4
The flooring material of all spaces in all design scale should be flat, solid, durable, non-slip in wet and dry conditions.

260 x 300 cm is an insufficient area for the hall.
DS202.1
There should be an area in the building hall that allows the presence of caretaker.
DS202.2
If there is a lobby in the entrance hall, its dimensions should be at least 280x350 cm.

Figure 6.12 The Building Entrance Assessment Module (DS201) of RH, (Photos taken from the official TOKİ website in 2020)

6.3 The Immediate Surroundings Scale Assessment Module

The Immediate Surroundings Module (DS300) is consists of three sub-modules: *Immediate Surroundings Pathways Assessment Module (DS301), Immediate Surroundings Parking Lot Assessment Module (DS302),* and *Immediate Surroundings Park / Garden Assessment Module (DS303).* The data obtained as a result of the

application of three sub-modules to two housing cases SH and RH are explained below, respectively.

The Immediate Surroundings Pathways Assessment Module

SH: The first evaluated design considerations relate to the general layout of the pathways. There are no steps and an uninterrupted pathway runs from the property's boundary to the housing's entrance. The pathway has a width that is wider than the minimum permitted width of 120 cm. The pathway is made of fixed paving stone, not of loose, slick materials like gravel. However, the DS301.7 design consideration isn't available in SH (Figure 6.13). The pathway that leads up to the housing's entrance is made up of only one type of material and one color. There is no visual contrast because the housing's white exteriors and the pathway's gray stone are so near to one another. To promote accessibility and safety on the pathways, contrasting materials and colors should be used. The psychological well-being domain of quality of life suffers when these design considerations are absent (see Appendix C, Table C.1).

RH: The first evaluated design considerations relate to the general layout of the pathways. The DS301.1, DS301.2 and DS301.5 design considerations aren't available in RH (Figure 6.14). On a fairly sloped piece of land, the RH is situated. The pathways from the property's edge to the RH's entrance therefore have steps and steep climbs. The slope of the pathways is more than 5%. There are stairs rather than ramps on pathways with a slope of more than 5%. For wheelchair users and older adults who have trouble walking, the ladder is not a good option. Absence of these design considerations has a negative impact on the independence domain of quality of life. The material of the pathways is paving stone which is not loose and slippery. Contrasting colors are used on the pathways on the travel route. These design considerations improve life quality in the psychological well-being domain (see Appendix C, Table C.1).

The Immediate Surroundings Parking Lot Assessment Module

SH: There are no individual parking lots for the housing units because they are situated on nursing home property. There is a common parking lot in the community.

However, the pathways in front of the housing units are wide and made of a material that allows for parking. In any circumstance that necessitates a car, such as emergencies or on-site support, it can be used as a parking lot in front of the housing (Figure 6.1, and Figure 6.13).

RH: There is a parking lot not far from the building's entrance. The DS302.3, DS302.4 and DS302.5 design considerations aren't available in RH. This 26-flat building must have at least three accessible parking lot (Figure 6.14). There is no accessible parking lot with a width of 400 cm and a length of 600 cm. Additionally, there is a height differential between the building's access pathways and the parking lot. The wheelchair user must take the road with a height difference after exiting the car in order to enter the building. Older adults with limited mobility will require assistance entering the building owing to the level difference, even though three parking spaces are designated as accessible parking lots. The absence of these design considerations has a strong negative impact on the quality of life domains of independence and support (see Appendix C, Table C.2).

The Immediate Surroundings Park / Garden Assessment Module

SH: The first evaluated design considerations relate to the general layout of the park/garden. In the immediate surroundings of the housing, there are various sizes and species of trees (Figure 6.1). Small plant-growing spaces are also present in front of each house. It is simple to tell apart similarly styled housing because to the variety of green spaces. It facilitates these housing becoming noticeable and visible. These design considerations raise life quality in the domain of psychological wellbeing (see Appendix C, Table C.3).

RH: The first evaluated design considerations relate to the general layout of the park/garden. The DS303. design consideration isn't available in RH (Figure 6.14). With the exception of the grassy space near the building's entrance, there are no plants in the immediate surroundings. A distinction should be made between different green space designs and similarly designed the buildings. To differentiate between identical buildings, it may be advantageous to differentiate the building entrance with landscape design. The

absence of these design consideration has a negative impact on the quality of life domains of psychological wellbeing (see Appendix C, Table C.3).

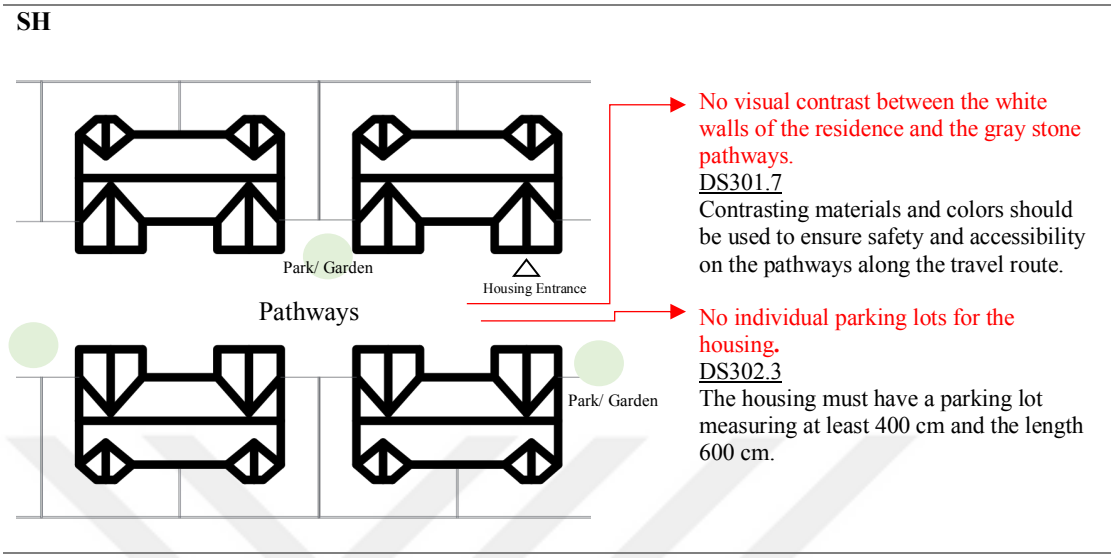


Figure 6.13 The Building Entrance Assessment Module (DS201) of SH

6.4 The Community Scale Assessment Module

The Immediate Surroundings Module (DS300) is consists of three sub-modules: *Immediate Surroundings Pathways Assessment Module (DS301), Immediate Surroundings Parking Lot Assessment Module (DS302),* and *Immediate Surroundings Park / Garden Assessment Module (DS303).* The data obtained as a result of the application of three sub-modules to two housing cases SH and RH are explained below, respectively.

The Community Scale Pathways Assessment Module

SH: The community, which consists of 50 twin homes, is situated on level terrain. The community's pathways, which follow a linear layout, have a distinct, orderly, and simple road hierarchy from the main road to minor streets. There are resting areas "without seating areas" in between the housing along the cruise route. Older adults will have the chance to spend more time here and this will help to create neighborly relations when seating areas are added to the resting areas that are near to the entry terrace of the housing. However, the DS401.7 design consideration isn't available in SH. The material

of the pathways is paving stone, which is not loose and slippery. The housing in the community and the pathways are extremely similar in terms of color. However, contrasting materials and colors should be used to ensure safety and accessibility on the pathways along the travel route. The quality of life domain of psychological well-being is adversely affected by the lack of this design consideration (Figure 6.15, and Appendix D Table D.1)

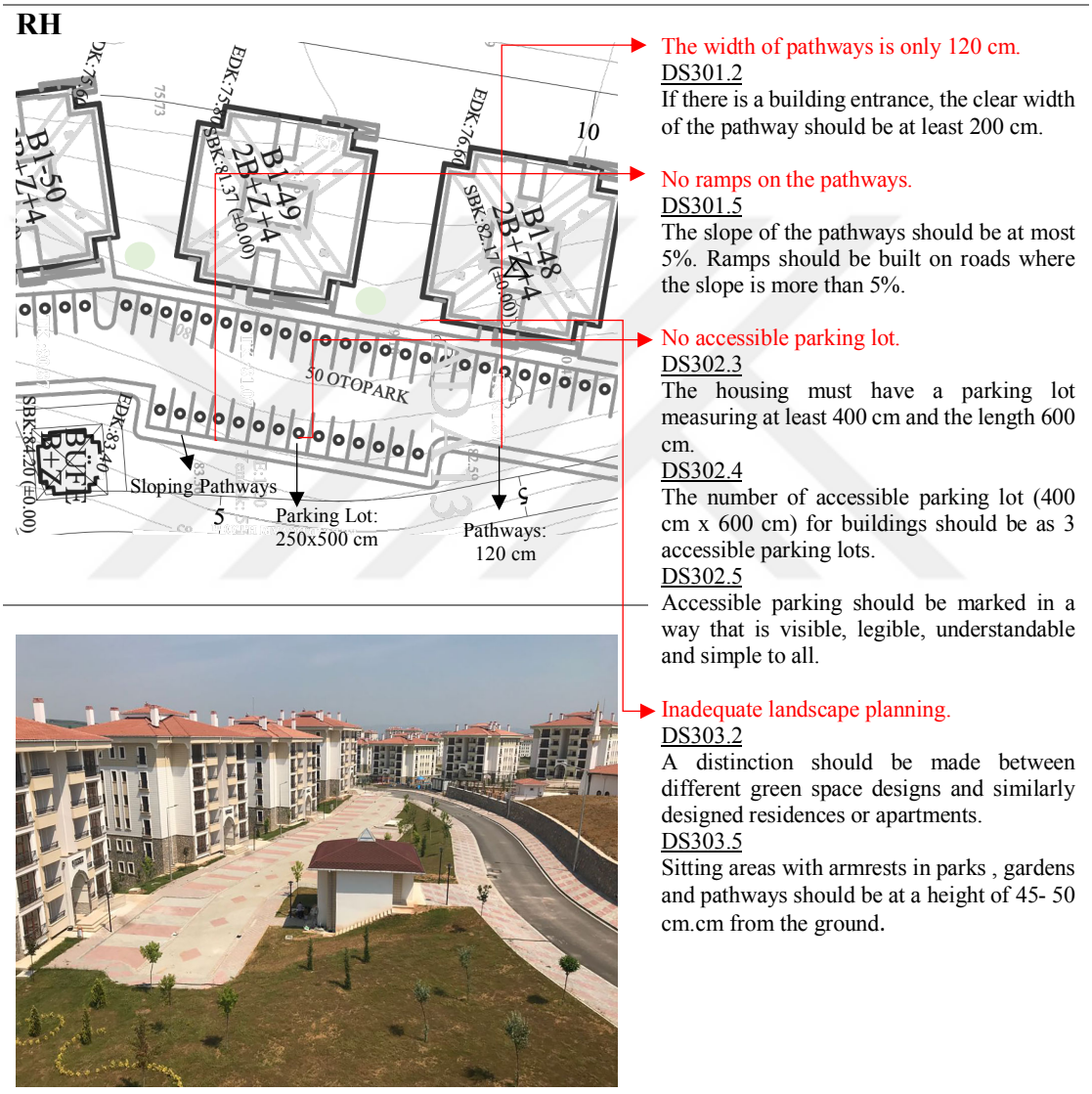


Figure 6.14 The Building Entrance Assessment Module (DS201) of RH, (Photo taken from the official TOKİ website in 2020)

RH: The community is built on extremely sloping terrain and has 56 five-story buildings. The DS401.2, DS401.4 and DS401.5 design consideration aren't available in RH for pathways (Figure 6.16). The pathways throughout the community are stepped and

inclined since there is a variation in level between the buildings. There are obstacles on roads with a slope of more than 5% that will lead to tripping and falling because of poor design. The width for pathways is 120 cm, despite the requirement that they be at least 200 cm in width. On the sloping terrain, there should be 150 x 150 cm-sized resting areas every 30 m. There are no sitting or resting areas along the various walking pathways of the community. The fact that older adults cannot find a resting place when they go for a walk reduces their motivation to do this activity. The absence of these design considerations has a strong negative impact on the quality of life domains of independence, psychological well-being, and social engagement (see Appendix D Table D.1)

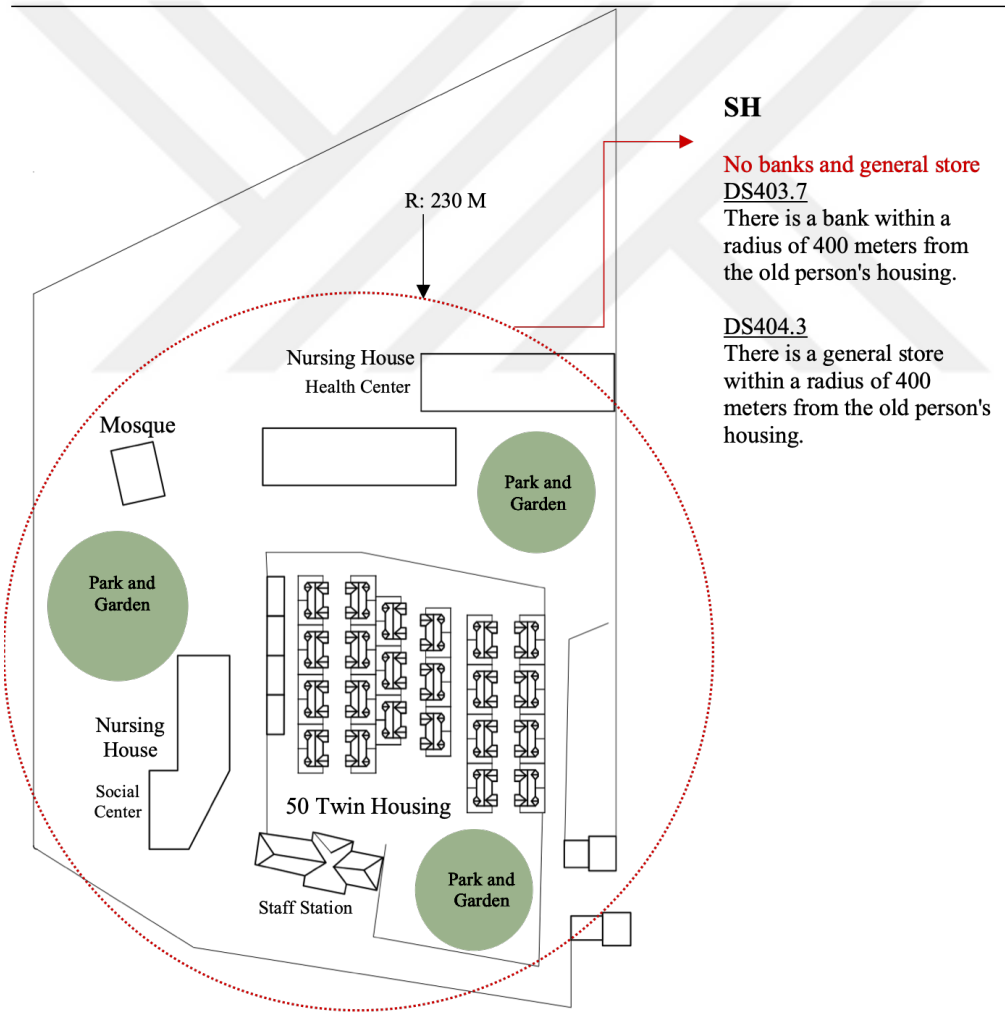


Figure 6.15 The Community Assessment Module (DS400) of SH, which consists of 50 twin homes.

The Community Scale Parking Lot Assessment Module

SH: The community has parking lots near to the facilities. However, no information is available on the number of accessible parking lots. There is a decent possibility that the on-site staff will take care of the occupants' transportation needs in the homes situated on the nursing home property (Figure 6.15, and Appendix D Table D.2).

RH: The community, which consists of 56 five-story buildings, offers parking lot for about 700 cars. However, the DS402.1, DS402.2 and DS402.3 design considerations aren't available in RH for parking lot (Figure 6.16). At least three accessible parking lots are required for each five-story building in the community. 168 accessible parking lots should be available in total (see DS302.4 in Chapter 6.3.2). There should be accessible parking lots in 5% of the facilities' parking lots in the community. However, there are no accessible parking lot in the community. The independence domain of quality of life is negatively affected by the lack of these design considerations (see Appendix D Table D.2)

The Community Scale Park / Garden Assessment Module

SH: The community, which is approximately 230 m width and 360 m length, includes a large amount of green space, from small gardens in front of homes to expansive parks and gardens Figure 6.15). All occupants have access to the expansive parks and gardens in the community. There are resting areas and a variety of plants in the community gardens and parks. Parks and gardens are designed to allow older adults to socialize, form meaningful relationships, and engage in meaningful activities. The psychological well-being, independence, and social engagement domains are all improved by these design considerations (see Appendix D Table D.3)

RH: The community, which is approximately 400 m width and 1 km length, has large, sloping green spaces. The DS403.1 and DS402.3 design considerations aren't available in RH (Figure 6.16). There aren't any landscape design elements present in the community 's green spaces, such as garden furniture, different fountains, the usage of diverse colors and smells, and varied types and sizes of plants and trees. Additionally, there are no sitting areas that can be used in sunny and shady weather conditions all year

round. The absence of these design considerations has a strong negative impact on the quality of life domains of independence, psychological well-being, and social engagement (see Appendix D Table D.3).

The Community Scale Facilities Assessment Module

SH: The community, which is approximately 230 m width and 360 m length, includes four facilities belonging to a nursing home and a mosque, as well as 50 twin housing (Figure 6.15). These facilities in the nursing home include a doctor, staff support and a pharmacy. Both within the community and 400 m away from the older adults' housing are social centers. The SH allows older adults to walk to all necessary facilities. Additionally, there is a public transport stops within a radius of 400 meters from the old person's housing. The community with facilities within accessible distance improves the quality of life in independence, psychological well-being, social engagement, and support domains (see Appendix D Table D.4)

RH: The community, which is approximately 400 m width and 1 km length, includes three mosques and three general stores, as well as 56 five-story building. The DS404.1, DS404.2, DS404.5, DS404.6 and DS404.7 design considerations aren't available in RH (Figure 6.16). The community with a length of 1 km must have at least two health centers, two pharmacies, two banks, social centers, and two on-site staffs. However, this community has none of these facilities. All of these facilities ought to be present in sufficient numbers to maintain a good quality of life in this community with a large older population. The absence of these design considerations has a strong negative impact on the quality of life domains of independence, psychological well-being, social engagement, and support (see Appendix D Table D.4).

6.5 The Urban Scale Assessment Module

There is an ambivalent relationship between older adults and the urban context. Older adults desire to maintain connections with the urban context that served as the backdrop to their earlier recollections. However, they feel vulnerable and insecure about maintaining this connection due to adverse environmental conditions, which are such as

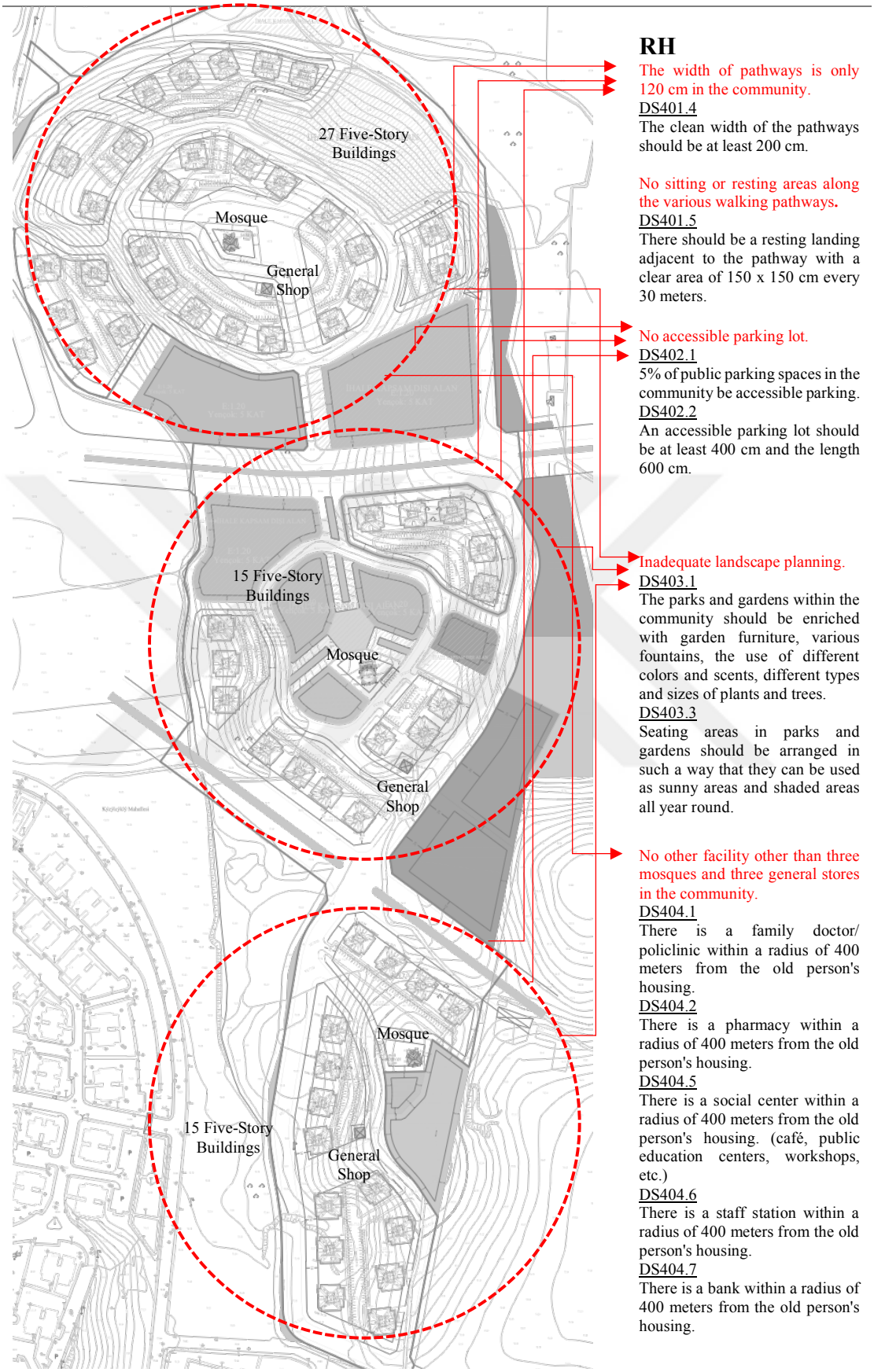


Figure 6.16 The Community Assessment Module (DS400) of RH, which consists of 56 five-story building.

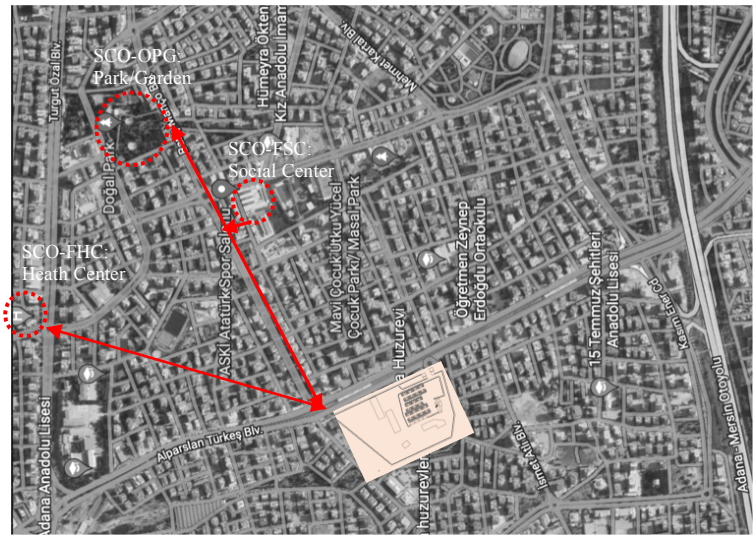
limited public transportation, dangerous green places, traffic-heavy streets, air pollution, social isolation, and inaccessible building. For this reason, the urban context that is attractive, safe and healthy, socially and culturally diverse, offering superior public services and open to everyone, is a necessity of democracy for quality life in old age. The New Urban Agenda, endorsed by the UN in 2016, the Sustainable Development Goals, adopted by the UN in 2015, and the Age Friendly Cities and Communities, adopted by the WHO in 2007, all strive to improve the relationship between older adults and urban context.

The Urban Scale Assessment Module (DS500) is the last assessment module of the assessment approach, and consist of four sub-modules including the *Urban Context Scale Pathways Assessment Module (DS501), Urban Context Scale Parking Lot Assessment Module (DS502), Urban Context Scale Park / Garden Assessment Module (DS503), and Urban Context Scale Facilities Assessment Module (DS504).* The design considerations in the Urban Scale Assessment Module should be evaluated by a multi-person assessment team that includes older adult (Figure 6.17, and see Appendix E Table E.1).

6.6 Discussions

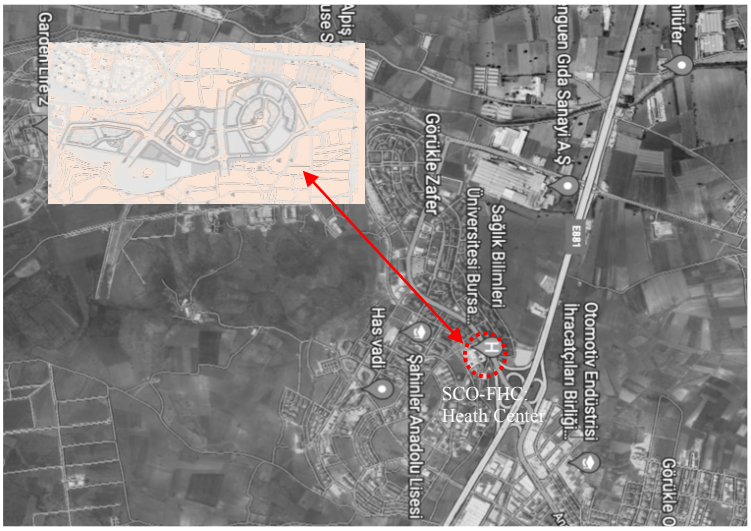
The housing design assessment approach is based on the interrelationship of 223 design considerations derived from the comparative analysis of LHT, LHD, OPHD, EVOLVE, UDH and AGT design guidelines, and 40 domains derived from the comparative analysis of 14 quality of life approaches from pioneers, official institutions and researchers in architecture, gerontology and sociology. This assessment approach includes design considerations to the quality of life of older adults so that they can live independently in their existing or newly designed housing for as long as possible. The approach, which deals with the housing design process in five scales as housing, building, community, immediate surrounding and urban context, has been applied for two houses RH and SH in Turkey in this study. There are practices that will negatively affect the quality of life of older adults at all design scales of RH and SH.

SH



There is access from the community to all facilities in urban context.

RH



There is no access from the community to all facilities in urban context.

DS504.2
Access from the community to necessary but not indispensable facilities such as social centers, cultural and religious centers, post offices and banks should be unobstructed and reliable.

Figure 6.17 The Urban Context Assessment Module (DS500) of SH and RH

As a result of the evaluation, it has been determined that RH and SH have serious constraints in terms of the operation of ADLs and IADLs at the housing and building scale. The entrance halls of the residences do not allow many operations such as maneuvering with a wheelchair, transferring the wheelchair from the outside to the inside, storing the belongings and wheelchairs or walking aids, and hosting guests. The inadequacy of the entrance hall of the residence, which creates a buffer zone between the exterior and interior, adversely affects the domains of psychological well-being, social engagement and support, especially independence. For example, in an emergency, it can be quite difficult to carry the older adult on a stretcher or similar because the hall is so narrow. Or, the older adult who have difficulty transitioning from indoor to outdoor

wheelchair may stop participating in social life activities, which can negatively affect their self-esteem.

Similarly, the living room, where older adults spend most of their time, does not provide the necessary space for both individual activities and collective activities.

The narrow side of the living room in RH and SH is less than 350 cm, and the wrong arrangement of furniture reduces the level of comfort. In RH and SH, the windows are positioned to see the garden or open area, but the furniture is arranged to cover the window. While it is necessary to have a suitable bed area for possible caregiver assistance, especially in the living room, this is not the case in two residences. This misapplication and deficiencies in the living room negatively affect all domains of quality of life, including independence, psychological well-being, social engagement and support.

There is no wheelchair maneuvering area, which is one of the most basic requirements, in the bathrooms of both residences. For the old adult who cannot enter the bathroom, the existence of other design considerations does not mean anything. Bathroom designs are also not suitable for the caregiver-assisted bathroom that every older adult may need at any time. However, in both bathroom designs, there are no grab handles that help many activities such as being mobile, getting on the shower seat, going to the toilet, and doing personal care. The wrong design of the bathroom, which is a constantly used space, affects the psychological well-being of the older adults by not allowing them to fulfill their most basic needs independently.

Kitchens in RH and SH do not meet the design considerations for an accessible kitchen. Not only for wheelchair users, but also for older adults who cannot stand for a long time, there is no knee space that should be required on the benches. Even if there is room for maneuver in the kitchen, the lack of knee space on the counters and the sink does not allow basic activities such as cooking and washing dishes to take place.

Caregiver support is an important quality of life area in old age that affects all space designs. But it is seen that this is not considered in the design of two houses. The design of all spaces in the residence should create spaces where the caregiver can accompany the older adult's ADLs and IADLs.

It is determined that there are serious design problems to adversely affect the quality of life, especially in RH, at the immediate surroundings and community scale. There are no ramps, which are the main accessibility tool, on the pathways of RH, which consists of 56 five-story buildings and is located on a rather sloping land. It has been determined that the transportation between the levels is made by means of stairs. The inaccessibility of roads can reduce the motivation of older adults to go out even for basic needs such as shopping, going to the doctor, let alone activities such as walking and dog walking. The older adult who goes out also needs accessible rest areas besides accessible roads. However, rest areas, which should be every 30 meters, have not been arranged anywhere on the travel route of RH, which reaches 1km. Likewise, there is no sitting area in the green areas placed on the sloping land. While it can be enriched with trees of different sizes, colorful plants, fountains and sheltered sitting areas, green areas covered with only inaccessible grasses do not prevent access to nature, which is important for the psychological well-being of older adults. In addition, it is important to create a difference between the buildings with the help of landscaping so that the old adult can find their own house easily in the community where the housing density is high and all the buildings are exactly the same.

In terms of access to facilities, it can be seen that design considerations are not provided in RH. In RH, which consists of three small community with a diameter of 400 meters, has no facilities other than a mosque and a small market. Whereas the older adult must reach any facility within a maximum of 400 meters from their housing. Caregiver support is an important requirement for quality of life in old age, at the community level as well as at home and, this community of 56 buildings should also have at least three staff stations. The absence of these facilities for cleaning, home repairs, support for older adults in the absence of caregivers can cause many of the older adults' jobs in RH to flow and become burdensome. Located on the nursing home land, SH is more advantageous than RH in this regard. The design of the communities that occupy an important part of the social life to include all facilities is of great importance in terms of the quality of life of older adults.

Design considerations of lighting, heating, safety and alarm systems, communication systems, water supply systems and assisted living technologies in service

systems could not be evaluated in RH and SH. There should be notes on the architectural plan about the service systems that are a part of the design, especially in housing designed for older adults. The status of design considerations about lighting and heating, which have an important place in terms of environmental comfort, can be determined by subjective evaluation. The intensity of lighting, which has an important role in visual well-being, may differ from person to person. therefore, although windows are designed to provide sufficient natural lighting, the user's opinion may be required for artificial lighting decisions. In particular, task lighting should be placed where the user needs it. It is necessary to produce a solution according to the comfort of the older adult in design issues related to glare and reflection that may occur due to light.

It is a system that affects personal comfort such as lighting in heating. Although electrical and mechanical projects have been developed for these two systems during the design phase, it is important for quality of life that they are systems that can be adjusted according to the needs of older adults during use. However, for older adults with limited mobility or sensory loss, these systems will be difficult to control. At this stage, it is useful to take advantage of assisted living technologies. In line with the UN's Sustainable Cities and Communities Goal, providing the infrastructure of living technologies, starting from the housing to the city, makes a significant contribution to the quality of life.

There is no information about the dimensions of the fittings and appliances in the architectural project of the two residential buildings. 50% of the cabinets in the kitchen and bedroom should be accessible. There should be detailed drawings on the project that will show the working mechanism of the cabinet shelves. Similarly, there should be detailed drawings showing the heights of the sink, toilet and shower. There is not enough information about material information in two housing projects. The material is a design consideration that affects mobility and visual well-being in older adults. It is necessary to give information about the material of all the building elements in the architectural project. Appliances used in the kitchen and bathroom should be accessible to older adults. It may be useful to note the features that devices should have in architectural projects.

The two housing which are briefly evaluated, are not sufficient to increase the quality of life of older adults and allow them to live independently for a long time. It is inevitable that these houses, which do not provide even the most basic design

considerations, become completely unusable in the later years of old age. RH and SH include aspects that may reduce the quality of life of the older adults that may be suitable for a healthy teenager. The fact that these two houses, designed according to the Zoning Plan in Turkey, are not suitable for older adults , shows that there are deficiencies in the regulation. It is clear that housing to be designed for older adults will require different aspects than the design considerations required for each building in the regulation. It is necessary to consider the needs of older adults at every design scale, from the housing to the urban context, even from the doorknob to the height of the socket. It is obvious that when designing housing for older adults, it is necessary to go beyond certain standards or rote knowledge. Considering the rapidly increasing older population in Turkey, studies should be started as soon as possible to add standards for older adults in the current regulations. These standards to be determined will ensure that the newly built houses will last longer in terms of use. Determining macro and micro scale interventions in existing residences and improving the quality of life will prevent building waste.

Chapter 7

Conclusions and Future Prospect

7.1 Conclusions

The population of people aged 60 and over who prefer to live independently in Turkey is increasing rapidly with the change in household structure and dependency brought about by aging-related losses. In response to the impact of this demographic change on the housing market, both government and private institutions began to explore how to accommodate the elderly. The vulnerability of the elderly to environmental problems increases with the time they spend in their homes, parks and social environments. Therefore, improving the quality of life of residents should be a top priority in housing for older adults. The primary goal of this thesis is to provide a housing design assessment approach for Turkey in order to enhance older adults' quality of life. The proposed assessment strategy aims to be complete enough to take into account all design factors at the housing, building, nearby neighborhood, and urban scales. The evaluation method seeks to determine what needs to be done to enhance the quality of life for older persons while they are living in housing, both during the design and use stages. In addition to other experts, the assessment approach is meant to be used by researchers, architects, and housing industry participants. The assessment approach proposed in this thesis aims to set the necessary standards for older adults housing design. The assessment approach maps each design consideration to one or more areas, showing that architectural design has a major impact on quality of life. it clearly shows that the decision of each line on the architectural project should be made by scrutiny. Subjective design considerations in the assessment approach show that the older adults should be included in the housing design process.

7.2 Societal Impact and Contribution to Global Sustainability

The results obtained from this thesis study and the framework produced as a result of the thesis study serve three of the Sustainable Development Goals. The contributions of the study to these goals are explained below:

- ***(3) Good Health and Well-being:*** The main purpose of this goal is to provide a life of prosperity and health for everyone of all ages. Determining the necessary areas for quality of life in old age, which is the main goal of the thesis study, serves this goal. The functional characteristics that older adults should have for a quality life are discussed in detail within the scope of the thesis.
- ***(10) Reduce Inequality:*** Older adults are more vulnerable to other people in the face of environmental challenges. This situation negatively affects their independent activities at home as well as their participation in city life. Within the scope of the thesis, the necessary design issues for older adults were determined and contributed to the understanding of inequalities.
- ***(11) Sustainable Cities and Communities:*** In this study, not only the housing scale, but also a design framework from housing to city scales has been proposed. It is aimed to ensure that the quality of life for older adults is sustainable from the residence to the urban.

7.3 Future Prospects

The prospects for the future with this thesis are listed below:

- Contributing to studies on older adults.
- In the thesis study, the design parameters and relevant domain of QOL where assisted living technologies will be applied in the housing project

for the older adults are specified. In the future, it can be used as a basis for technology-oriented housing design, especially for older adults.

- It contributes to the accessibility studies in Turkey and will facilitate the analysis of accessibility in residences for older adults.
- The future goal of the thesis work is to develop a software program tool to analyze the QOL areas that it manually controls through the architectural project. For this, it is aimed to cooperate with software engineers as well as architectural project stakeholders in the future.

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CURRICULUM VITAE

2009 – 2014 B.Sc., Architecture, Erciyes University, Kayseri, TURKEY

2019 – Present M.Sc., Architecture, Abdullah Gul University, Kayseri, TURKEY

C1) Görez, A., & Metin, B. (2022). Cognitive Buildings as A Proposal for Housing Demand of Increasing Older Population in Turkey. *VII. Congress on Urban Studies*, (s. 819-824). Ankara, Turkey.

APPENDIX

Appendix A

The Housing Scale Assessment Module (DS100)

Housing Scale Assessment Module (DS100) consists of nine sub-modules which are the Housing Entrance Assessment Module (DS101), Hall Assessment Module (DS102), Corridor Assessment Module (DS103), Living Room Assessment Module (DS104), Kitchen Assessment Module (DS105), Bedroom Assessment Module (DS106), Bathroom Assessment Module (DS107), Balcony/Terrace Assessment Module (DS108), and Private Garden Assessment Module (DS109). The modules in which RH and SH are evaluated are below. Any housing is evaluated in the same way as these modules.

Table A.1 The Housing Entrance Assessment Module (DS101) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Housing Entrance Assessment Module (DS101)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SE-HE	DS101.1	The entrance should be in visible and recognizable location.	OBJ.	2-1-3, 2-1-2	Y	Y
	DS101.2	The entrance should be at the same level as the main travel route. (If there is a level difference, accessible ramps and stairs should be built.)	OBJ.	1-1-1	N	Y
	DS101.3	The entrance landing and the house should be at the same floor level. The entrance threshold cannot exceed 1,3 cm.	OBJ.	1-1-1	Y	Y
	DS101.4	The entrance should move away from the main travel route to provide a customizable space.	OBJ.	2-1-1, 2-1-3	Y	N
	DS101.5	The entrance has a customizable area for various activities with dimensions of min 180x180.	OBJ.	3-2-2, 3-1-3	N	N/A
	DS101.6	There should be an entrance landing with a canopy providing protection from the weather.	OBJ.	2-2-3	Y	N/A
	DS101.7	Dimensions of the canopy: min 120 cm deep, 150 cm wide and max 230 cm high.	OBJ.	2-2-3	Y	N/A
MC-F	DS101.8	The flooring material of all spaces in all design scale should be flat, solid, durable, non-slip in wet and dry conditions.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-4	N/I	N
	DS101.9	The wall and floor material in spaces should be easy to clean.	OBJ.	1-2-2, 2-1-5	N/I	N
BE-D	DS101.10	The clean width of the entrance door should be at least 100 cm.	OBJ.	1-2-22-1-5	Y	Y
	DS101.11	The clean height of the housing entrance door should be at least 210 cm.	OBJ.	1-1-1	Y	Y
	DS101.12	There should be maneuvering area (at least 150 cm diameter circle) in front and behind the entrance door for a wheelchair.	OBJ.	1-1-1	Y	Y
	DS101.13	The entrance door should give a sense of security.	SBJ.	1-1-1	-	-
	DS101.14	Doorbells should be 120 cm high from the floor to the middle of the bell.	OBJ.	2-1-2	N/I	N/I

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations:
SBJ: Subjective OBJ: Objective; (Y) Yes; (N) No, (N/A) Not applicable; (N/I) No information; (-) Out of evaluation

Table A.1 (continued) The Housing Entrance Assessment Module (DS101) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Housing Entrance Assessment Module (DS101)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
MC-F	DS101.15	The door should contrast visually with adjacent walls in terms of color and material	OBJ.	2-1-2, 2-2-4	Y	Y
BE-W	DS101.16	A window/view panel suitable for use by people at all eye level should be built adjacent to the door.	OBJ.	2-1-1, 2-1-2	Y	N
MC-F	DS101.17	The window should contrast visually with adjacent walls in terms of color and material	OBJ.	2-1-1, 2-1-2	N	N/A
BE-S	DS101.18	The step length should be at least 120 cm.	OBJ.	1-1-1	Y	N/A
	DS101.19	Stairs should have a landing every 12 steps.	OBJ.	1-1-1, 2-1-4	Y	N/A
	DS101.20	The width of the landings must be at least 120 cm.	OBJ.	1-1-1, 2-1-4	Y	N/A
	DS101.21	The landing with door entrance should be at least 150 cm x 150 cm.	OBJ.	1-1-1, 2-1-4	Y	
	DS101.22	There should be a landing of at least 120x150 cm at the beginning and end of the stairs.	OBJ.	1-1-1, 2-1-4	Y	N/A
	DS101.23	The heights and widths of stair steps inside and outside should be equal.	OBJ.	1-1-1, 2-2-1	N/I	N/A
	DS101.24	The step height should be between 15-16 cm.	OBJ.	1-1-1, 2-2-1	N/I	N/A
MC-F	DS101.25	The material of the steps should be hard, non-slip and matte.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-4	N/I	N/A
	DS101.26	Visual contrast should be provided at the beginning and end of the stair.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-4	N	N/A
MC-C	DS101.27	There should be 110 cm high handrails on both sides of the stairs	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-1	N	N/A
	DS101.28	Handrails should be designed to prevent people and objects from falling.	OBJ.	1-1-1, 2-1-2 2-1-5	N	N/A
	DS101.29	The handrails color should visually contrast to adjacent surfaces.	OBJ.	1-1-1, 2-2-5	Y	N/A
SS-LT	DS101.30	The stairs should be properly lit with natural and artificial light.	OBJ.	1-1-1, 2-2-3	N/I	N/A
BE-R	DS101.31	The net width of the ramps should be at least 100 cm.	OBJ.	1-1-1	N	N/A
	DS101.32	There should be a 150 x 150 cm landing every 9 meters.	OBJ.	1-1-1, 2-1-4	N	N/A

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations:
SBJ: Subjective OBJ: Objective,

Table A.1 (continued) The Housing Entrance Assessment Module (DS101) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Housing Entrance Assessment Module (DS101)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
BE-R	DS101.33	There should be a landing of at least 150x150 cm at the beginning and end of the ramps	OBJ.	1-1-1; 2-1-4	N	N/A
	DS101.34	The slope of the building entrance ramps should be at most 8%.	OBJ.	1-1-1	N	N/A
	DS101.35	The net width of the ramps should be at least 100 cm.	OBJ.	1-1-1	N	N/A
MC-F	DS101.36	The material of the ramps should be hard, non-slip and matte.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-4	N	N/A
	DS101.37	Visual contrast should be provided at the beginning and end of the ramp.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-4	N	N/A
MC-C	DS101.38	There should be 110 cm high handrails on both sides of the stairs.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-1	N	N/A
	DS101.39	Handrails should be designed to prevent people and objects from falling.	OBJ.	1-1-1, 2-1-2 2-1-5	N	N/A
	DS101.40	The handrails color should visually contrast to adjacent surfaces.		1-1-1, 2-2-5	N/I	N/A
SS-L	DS101.41	In cases where it is not possible to build a ramp at the entrance of the housing/building due to technical reasons, one of the solutions such as elevator, platform elevator, hydraulic elevator should be applied.	OBJ.	1-1-1, 4-2- 2	N/I	N/I
SS-LT	DS101.42	The entrance should be well lit both during the day and at night with a natural and artificial lighting system.	OBJ.	1-1-1, 2-2-3	N/I	Y
SS-CS	DS101.43	The entrance door should be monitored with camera and phone systems due to see and communicate with anyone at the door.	OBJ.	2-1-2, 4-2-1	N	N
FT-CB	DS101.44	There should be shelves at the entrance where you can put heavy objects so that you can open the door easily.	OBJ.	1-1-1	N	N/A

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers

Abbreviations: SBJ: Subjective OBJ: Objective.

Table A.2 The Housing Hall Assessment Module (DS102) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Housing Hall Assessment Module (DS102)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SC-HH	DS102.1	There should be a clean maneuvering and transfer area of at least 180x180 cm adjacent to the entrance door in entrance hall.	OBJ.	1-1-1, 1-1-2	N	N
	DS102.2	The entrance hall should have additional storage space for a wheelchair or walker frame.	OBJ.	2-2-2	N	N
	DS102.3	The entrance hall should have a general storage area for coats and shoes.	OBJ.	2-2-2	Y	N
MC-F	DS102.4	The flooring material of all spaces in all design scale should be flat, solid, durable, non-slip in wet and dry conditions.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-4	N/I	N
	DS102.5	The wall and floor material in spaces should be easy to clean.	OBJ.	1-2-2, 2-1-5	N/I	N/I
	DS102.6	Loose carpets or rugs should not be used in spaces.	OBJ.	1-1-1, 2-1-2 2-1-5	N/I	N/I
SS-E	DS102.7	All switches, sockets and controls in all spaces should be at a height of 40 - 100 cm from the ground and can be operated with one hand.	OBJ.	2-2-1, 2-2-3	N/I	N/I
SS-LT	DS102.8	There should be well lit with a natural and artificial lighting system.	OBJ.	2-2-3	N/I	N/I
SS-V	DS102.9	Fresh air flow should be provided with a window or ventilation system.	OBJ.	2-2-3	N/I	N/I
SS-H	DS102.10	There should have radiators or underfloor heating.	OBJ.	2-2-3	N/I	N/I
SS-SA	DS102.11	There should have an emergency call alarm.	OBJ.	4-1-1, 4-1-2 4-2-1, 2-1-2	N/I	N/I
	DS102.12	There should have a smoke detector.	OBJ.	4-1-1, 4-1-2 4-2-1	N/I	N/I
SS-AL	DS102.13	All spaces should have infrastructure for assisted living technologies such as health, environment, communication and entertainment.	OBJ.	1-2-4, 1-2-6 2-1-2, 2-1-5 2-2-3, 3-1-2 3-1-4, 3-2-1 4-1-1, 4-1-2 4-2-3	N/I	N/I

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations: SBJ: Subjective OBJ: Objective.

Table A.3 The Housing Corridor Assessment Module (DS103) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Housing Corridor Assessment Module (DS103)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SC-HC	DS103.1	The clean width of the corridors should be at least 120 cm.	OBJ.	1-1-1	Y	N
	DS103.2	The clean height of the corridors from the floor should be at least 220 cm.	OBJ.	1-1-1	Y	Y
	DS103.3	The floors of all rooms and the floor of the circulation area should be at the same level.	OBJ.	1-1-1	Y	Y
MC-F	DS103.4	The flooring material of all spaces in all design scale should be flat, solid, durable, non-slip in wet and dry conditions.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-4	N/I	N
	DS103.5	The wall and floor material in spaces should be easy to clean.	OBJ.	1-2-2, 2-1-5	N/I	N
	DS103.6	Loose carpets or rugs should not be used in spaces.	OBJ.	1-1-1, 2-1-2 2-1-5	N/I	N/I
SS-E	DS103.7	All switches, sockets and controls in all spaces should be at a height of 40 - 100 cm from the ground and can be operated with one hand.	OBJ.	2-2-1, 2-2-3	N/I	N/I
SS-LT	DS103.8	There should be well lit with a natural and artificial lighting system.	OBJ.	2-2-3	N/I	N/I
SS-V	DS103.9	Fresh air flow should be provided with a window or ventilation system.	OBJ.	2-2-3	N/I	N/I
SS-H	DS103.10	There should have radiators or underfloor heating.	OBJ.	2-2-3	N/I	N/I
SS-SA	DS103.11	There should have an emergency call alarm.	OBJ.	4-1-1, 4-1-2 4-2-1, 2-1-2	N/I	N/I
	DS103.12	There should have a smoke detector.	OBJ.	4-1-1, 4-1-2 4-2-1	N/I	N/I
SS-AL	DS103.13	All spaces should have infrastructure for assisted living technologies such as health, environment, communication and entertainment.	OBJ.	1-2-4, 1-2-6 2-1-2, 2-1-5 2-2-3, 3-1-2 3-1-4, 3-2-1 4-1-1, 4-1-2 4-2-3	N/I	N/I

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers

Abbreviations: SBJ: Subjective OBJ: Objective.

Table A.4 The Living Room Assessment Module (DS104) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Living Room Assessment Module (DS104)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SL-RL	DS104.1	Living room should be level with the housing entrance on an accessible route.	OBJ.	1-1-1	Y	Y
	DS104.2	The living room should have a space of at least 350 cm in diameter.	OBJ.	1-1-1;	N	N
	DS104.3	The living room should be large enough to perform daily personal activities such as religious rituals, hobbies, and exercises.	OBJ.	3-2-1, 3-2-3 2-1-5, 2-1-6	N	N
	DS104.4	The living room should have enough space for guests to sit comfortably and chat.	OBJ.	3-1-2, 3-2-5	N	N
	DS104.5	There should be a convenient bed space in the living room to be used when needed.	OBJ.	4-1-1	N	N
	DS104.6	There should have a storage or display area for personal items and activity/hobby items.	OBJ.	2-1-3, 2-2-2	N	N
	DS104.7	There should be a clean maneuvering area (at least 150 cm diameter circle) at the entrance of the living room.	OBJ.	1-1-1	Y	Y
	DS104.8	There should be a passage width of at least 90 cm between the furniture in the living room.	OBJ.	1-1-1	N	N
	DS104.9	The living room should be decorated according to the occupant's taste.	SBJ.	2-1-3, 2-1-5 2-2-5	-	-
	DS104.10	The furniture in the living room should be arranged in such a way as to do the cleaning of the house sitting down.	SBJ.	1-2-2 2-1-5	-	-
	DS104.11	A comfortable and safe TV watching area should be provided facing the door and window to see if someone is calling.	OBJ.	2-1-2, 2-1-4 3-2-1	Y	Y
	DS104.12	There should be a dining area inside or immediately adjacent to the kitchen.	OBJ.	1-1-1, 1-1-5 2-1-2, 2-1-5	Y	Y
	DS104.13	The dining area should be large enough for at least four people to eat together.	OBJ.	3-1-1, 3-1-2 3-2-5, 4-1-1	N	Y
	DS104.14	There should be a clean maneuvering area (at least 150 cm diameter circle) when approaching the table with a wheelchair.	OBJ.	1-1-1, 1-1-5 2-1-5	Y	Y

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations: SBJ: Subjective OBJ: Objective.

Table A.4 (continued) The Living Room Assessment Module (DS104) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Living Room Assessment Module (DS104)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SL-RL	DS104.15	A clean area of at least 90 cm wide and at least 49 cm deep should be left under the dining table for the wheelchair to be positioned.	OBJ.	1-1-1, 1-1-5 2-1-5	Y	N
MC-F	DS104.16	The flooring material of all spaces in all design scale should be flat, solid, durable, non-slip in wet and dry conditions.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-4	N/I	Y
	DS104.17	The wall and floor material in spaces should be easy to clean.	OBJ.	1-2-2, 2-1-5	N/I	N/I
	DS104.18	Loose carpets or rugs should not be used in spaces.	OBJ.	1-1-1, 2-1-2 2-1-5	N/I	N/I
BE-D	DS104.19	The clear width of door should be at least 90 cm	OBJ.	1-1-1	N/A	Y
	DS104.20	The clean height of door from the floor should be at least 210 cm.	OBJ.	1-1-1	N/A	Y
	DS104.21	The height of the door threshold not exceed 1.3 cm	OBJ.	1-1-1	N/A	Y
	DS104.22	Mechanism that slows the closing of the door should be used on the door to extend the maneuvering time at the passages.	OBJ.	1-1-1, 2-1-2	N/A	N/I
	DS104.23	The opening direction of the door (hinge side) should be adjacent to the turning wall.	OBJ.	1-1-1	N/A	Y
	DS104.24	The distance between the opening edge of the door and any adjacent wall should not be less than 30 cm.	OBJ.	1-1-1	N/A	N
	DS104.25	The height of the door handle from the floor should be between 90 -110 cm.	OBJ.	1-1-1, 2-2-1	N/A	N/I
	DS104.26	Door handle should be used with one hand and should not require a grip.	OBJ.	1-1-1, 2-2-4	N/A	N/I
	DS104.27	Door should open with minimum pressure.	SBJ.	1-1-1, 2-1-2	-	-
MC-F	DS104.28	The door should contrast visually with adjacent walls in terms of color and material.	OBJ.	2-1-1, 2-1-2	N/A	Y
BE-W	DS104.29	The window sills should be 80 cm above the floor.		2-1-2; 2-2-1	Y	N
	DS104.30	Window handles should be placed at a height between 80 cm and 110 cm.		1-1-1; 2-2-1	N/I	N/I

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations:
SBJ: Subjective OBJ: Objective.

Table A.4 (continued) The Living Room Assessment Module (DS104) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Living Room Assessment Module (DS104)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
BE-W	DS104.31	Window handles should be used with one hand and should not require a grip.	OBJ.	1-1-1, 2-2-3	N/I	N/I
	DS104.32	Windows should open with minimum pressure.	OBJ.	1-1-1, 2-1-2	N/I	N/I
	DS104.33	The glass used in the windows should be of a feature to prevent the scattering of broken glass pieces in case of any impact.	OBJ.	2-1-2, 2-2-4	N/I	N/I
	DS104.34	S, E, W sided windows should have shading apparatus to reduce glare caused by direct sunlight.	SBJ.	2-2-3; 2-2-4 2-2-5	-	-
	DS104.35	The windows in the living room face the open activity areas and the view.	OBJ.	2-2-6; 3-2-1	N	Y
	DS104.36	There should be windows in the living room that allow old people to sit and look out.	OBJ.	2-1-4; 2-2-6 3-1-3; 3-2-1	N	N
MC-F	DS104.37	The window should contrast visually with adjacent walls in terms of color and material.	OBJ.	2-1-1; 2-1-2	N	Y
SS-E	DS104.38	All switches, sockets and controls in all spaces should be at a height of 40 - 100 cm from the ground and can be operated with one hand.	OBJ.	2-2-1, 2-2-3	N/I	N/I
SS-LT	DS104.39	There should be well lit with a natural and artificial lighting system.	OBJ.	2-2-3	N/I	N/I
SS-V	DS104.40	Fresh air flow should be provided with a window or ventilation system.	OBJ.	2-2-3	N/I	N/I
SS-H	DS104.41	There should have radiators or underfloor heating.	OBJ.	2-2-3	N/I	N/I
SS-SA	DS104.42	There should have an emergency call alarm.	OBJ.	4-1-1, 4-1-2 4-2-1, 2-1-2	N/I	N/I
	DS104.43	There should have a smoke detector.	OBJ.	4-1-1, 4-1-2 4-2-1	N/I	N/I
SS-AL	DS104.44	All spaces should have infrastructure for assisted living technologies such as health, environment, communication and entertainment.	OBJ.	1-2-4, 1-2-6 2-1-2, 2-1-5 2-2-3, 3-1-2 3-1-4, 3-2-1 4-1-1, 4-1-2 4-2-3	N/I	N/I

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
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Abbreviations:
SBJ: Subjective OBJ: Objective.

Table A.5 The Kitchen Assessment Module (DS105) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Kitchen Assessment Module (DS105)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SL-RK	DS105.1	The kitchen or kitchenette be physically separated from other areas of the home and not be part of the circulation path in the home.	OBJ.	1-1-1, 1-2-1 2-1-2, 2-1-5	Y	Y
	DS105.2	There should be a maneuvering area of at least 150 cm diameter circle in front of fixed countertops and appliances.	OBJ.	1-1-1,1-2-1 2-1-5, 3-1-1 3-1-2, 3-2-5 4-1-1, 4-2-4	N	Y
	DS105.3	There should be space for more than one person in the kitchen for family members, friends or caregivers to be involved in preparing the older person's meals.	OBJ.	1-1-1, 1-2-1 2-1-5, 3-1-1 3-1-2, 3-2-5 4-1-1, 4-2-4	N	Y
	DS105.4	There should be a dining area inside or immediately adjacent to the kitchen.	OBJ.	1-1-1, 1-1-5 2-1-2, 2-1-5	Y	Y
	DS105.5	The dining area should be large enough for at least four people to eat together.	OBJ.	3-1-1, 3-1-2 3-2-5, 4-1-1 4-2-4	N	Y
	DS105.6	There should be a clean maneuvering area (at least 150 cm diameter circle) when approaching the table with a wheelchair.	OBJ.	1-1-1, 1-1-5 2-1-5	Y	N/A
	DS105.7	A clean area of at least 90 cm wide and at least 49 cm deep should be left under the dining table for the wheelchair to be positioned.	OBJ.	1-1-1, 1-1-5 2-1-5	N	N/A
MC-F	DS105.8	The flooring material of all spaces in all design scale should be flat, solid, durable, non-slip in wet and dry conditions.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-4	N/I	Y
	DS105.9	The wall and floor material in spaces should be easy to clean.	OBJ.	1-2-2, 2-1-5	N/I	Y
	DS105.10	Loose carpets or rugs should not be used in spaces.	OBJ.	1-1-1, 2-1-2 2-1-5	N/I	N/I
BE-D	DS105.11	The clear width of door should be at least 90 cm	OBJ.	1-1-1	N/A	Y
	DS105.12	The clean height of door from the floor should be at least 210 cm.	OBJ.	1-1-1	N/A	Y
	DS105.13	The height of the door threshold not exceed 1.3 cm	OBJ.	1-1-1	N/A	Y

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
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Abbreviations:
SBJ: Subjective OBJ: Objective.

Table A.5 (continued) The Kitchen Assessment Module (DS105) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Kitchen Assessment Module (DS105)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
BE-D	DS105.14	Mechanism that slows the closing of the door should be used on the door to extend the maneuvering time at the passages.	OBJ.	1-1-1, 2-1-2	N/A	N/I
	DS105.15	The opening direction of the door (hinge side) should be adjacent to the turning wall.	OBJ.	1-1-1	N/A	Y
	DS105.16	The distance between the opening edge of the door and any adjacent wall should not be less than 30 cm.	OBJ.	1-1-1	N/A	N
	DS105.17	The height of the door handle from the floor should be between 90 -110 cm.	OBJ.	1-1-1, 2-2-1	N/A	N/I
	DS105.18	Door handle should be used with one hand and should not require a grip.	OBJ.	1-1-1, 2-2-4	N/A	N/I
	DS105.19	Door should open with minimum pressure.	SBJ.	1-1-1, 2-1-2	N/A	N/I
MC-F	DS105.20	The door should contrast visually with adjacent walls in terms of color and material.	OBJ.	2-1-1, 2-1-2	N/A	Y
BE-W	DS105.21	The window sills should be 80 cm above the floor.	OBJ.	2-1-2, 2-2-1	Y	N
	DS105.22	Window handles should be placed at a height between 80 cm and 110 cm.	OBJ.	1-1-1, 2-2-1	N/I	N/I
	DS105.23	Window handles should be used with one hand and should not require a grip.	OBJ.	1-1-1, 2-2-3	N/I	N/I
	DS105.24	Windows should open with minimum pressure.	SBJ.	1-1-1, 2-1-2	-	-
	DS105.25	The glass used in the windows should be of a feature to prevent the scattering of broken glass pieces in case of any impact.	OBJ.	2-1-2, 2-2-4	N/I	N/I
	DS105.27	S, E, W sided windows should have shading apparatus to reduce glare caused by direct sunlight.	OBJ.	2-2-3, 2-2-4 2-2-5	N/I	N/I
MC-F	DS105.28	The window should contrast visually with adjacent walls in terms of color and material.	OBJ.	2-1-1, 2-1-2	N	Y
SS-E	DS105.29	All switches, sockets and controls in all spaces should be at a height of 40 - 100 cm from the ground and can be operated with one hand.	OBJ.	2-2-1, 2-2-3	N/I	N/I

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
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Table A.5 (continued) The Kitchen Assessment Module (DS105) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Kitchen Assessment Module (DS105)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SS-LT	DS105.30	There should be well lit with a natural and artificial lighting system.	OBJ.	2-2-3	N/I	N/I
SS-V	DS105.31	Fresh air flow should be provided with a window or ventilation system.	OBJ.	2-2-3	N/I	N/I
SS-H	DS105.32	There should have radiators or underfloor heating.	OBJ.	2-2-3	N/I	N/I
SS-SA	DS105.33	There should have an emergency call alarm.	OBJ.	4-1-1, 4-1-2 4-2-1, 2-1-2	N/I	N/I
	DS105.34	The kitchen should have a heat detector.	OBJ.	4-1-1, 4-1-2 4-2-1, 2-1-2	N/I	N/I
	DS105.35	The kitchen should have a carbon monoxide / gas detector alarm unit	SBJ.	4-1-1, 4-1-2 4-2-1, 2-1-2	-	-
SS-AL	DS105.36	All spaces should have infrastructure for assisted living technologies such as health, environment, communication and entertainment.	OBJ.	1-2-4, 1-2-6 2-1-2, 2-1-5 2-2-3, 3-1-2 3-1-4, 3-2-1 4-1-1, 4-1-2 4-2-3	N/I	N/I
FT-CT	DS105.37	At least 90 cm long part of the kitchen countertop should be arranged as a work surface.	OBJ.	1-1-1, 1-2-1 1-2-2, 2-1-5 2-2-2	N	N
	DS105.38	A clear knee-space of 75 cm high, 90 cm wide and 49 cm deep should be left below the countertop.	OBJ.	1-1-1, 1-2-1 1-2-2, 2-1-5	N	N
	DS105.39	The upper surface of the countertop should be at a maximum height of 86 cm from the ground.	OBJ.	1-1-1, 1-2-1 1-2-2, 2-1-5	N/I	N/I
	DS105.40	The edges of the countertop should be raised slightly to prevent spills.	SBJ.	2-1-2, 2-1-5	-	-
FT-SK	DS105.41	A clear knee-space of 90 cm wide and 49 cm deep should be left under the sink.	OBJ.	1-1-1, 1-2-1 1-2-2, 2-1-5	N	N
	DS105.42	The depth of the sink should be a maximum of 16.5 cm.	OBJ.	1-1-1, 1-2-1 1-2-2, 2-1-5	N/I	N/I
	DS105.43	The height of the sink from the floor should be no more than 86 cm.	OBJ.	1-1-1, 1-1-3 1-2-1, 1-2-2 2-1-5	N/I	N/I
SS-WS	DS105.44	Taps and other controllers should be one-handed, easy to use, and not require much force.	OBJ.	1-1-3, 1-2-1 1-2-2, 2-2-1	N/I	N/I

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
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Abbreviations:
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Table A.5 (continued) The Kitchen Assessment Module (DS105) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Kitchen Assessment Module (DS105)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
FT-CB	DS105.44	At least 50% of the shelves in the cupboards in kitchen should be accessible.	OBJ.	1-1-1, 1-2-1 1-2-2, 2-1-5 2-2-1, 2-2-2	Y	N
	DS105.45	The height of the cupboards should be no more than 137 cm. If the kitchen shelves are 137 cm higher, an electronically or mechanically elevating / lowering system should be used.	OBJ.	1-1-1, 1-2-1 1-2-2, 2-1-5 2-2-1, 2-2-2	N	N
	DS105.46	Cupboards should be equipped with sliding doors with movable mechanisms.	OBJ.	1-1-1, 1-2-1 1-2-2, 2-1-5 2-2-1, 2-2-2	N/I	N/I
	DS105.47	The depth of the kitchen shelves should be no more than 30 cm.	OBJ.	1-1-1, 1-2-1 1-2-2, 2-1-5	N/I	Y
AP-RF	DS105.48	The refrigerator/freezer's should be placed at least 30 cm from the inside corners.	OBJ.	1-1-1, 1-2-1 2-2-1, 2-2-2 2-1-5	N	N
	DS105.49	At least 50% of the refrigerator/freezer's usable area should be at a maximum height of 137 cm from the floor.	OBJ.	1-1-1, 1-2-1 2-2-1, 2-2-2 2-1-5	N	N/I
	DS105.50	Refrigerators should have automatic defrosting feature.	SBJ.	1-2-2	-	-
AP-CK	DS105.51	Cooker should be placed at least 30 cm from the inside corners.	OBJ.	1-1-1, 1-2-1 2-1-5	Y	N
	DS105.52	A clear knee-space of 75 cm high, 90 cm wide and 49 cm deep should be left under the cooktops.	OBJ.	1-1-1, 1-2-1 2-1-5	N	N
	DS105.53	Ovens should be adjacent to the countertop that has knee-space or can be adjusted.	OBJ.	1-1-1, 1-2-1 2-1-5	N	N
	DS105.54	Ovens should be of the self-cleaning type.	OBJ.	1-2-2	N/I	N/I
	DS105.55	Oven control buttons should be on the front panel.	SBJ.	1-1-1, 1-2-1 2-1-5	-	-

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations:
SBJ: Subjective OBJ: Objective.

Table A.6 The Bedroom Assessment Module (DS106) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Bedroom Assessment Module (DS106)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SL-RB	DS106.1	The older adult's bedroom should be on the entry level.	OBJ.	1-1-1	Y	Y
	DS106.2	The bedroom should be independent from other rooms.	OBJ.	2-1-1, 2-1-4	Y	Y
	DS106.3	The bedroom should be with a bathroom or close to the bathroom.	OBJ.	1-1-1, 2-1-1 2-2-3	Y	Y
	DS106.4	The bedroom should be large enough to accommodate a bed (single or double), wardrobe, bedside, dressing table and maneuvering space.	OBJ.	1-1-1, 1-1-2 1-1-6, 4-1-1 3-1-1	Y	Y
	DS106.5	There should be clean maneuvering area (at least 150 cm diameter circle) around the bed (side edge and/or foot end).	OBJ.	1-1-1, 2-1-1 2-1-5	Y	Y
	DS106.6	There should be 120 cm of circulation space on both sides of the double bed and on at least one side of the single bed.	OBJ.	1-1-1, 2-2-2 4-1-1, 4-2-4	Y	N
	DS106.7	There should be clean maneuvering area at least 150 cm diameter circle) in front of the wardrobes.	OBJ.	1-1-1, 1-1-6 2-1-1, 2-1-5	Y	N
	DS106.8	The preferences of the resident should be considered in the selection of bed.	OBJ.	2-1-3, 2-1-4 2-1-5,	N/I	N/I
	DS106.9	The bed should not look like a hospital bed.	SBJ.	2-2-5	-	-
	DS106.10	The bed should be easily integrated with technical aids when along stay in bed necessary.	SBJ.	1-2-4, 1-1-4	-	-
	DS106.11	The distance between the bed and the bedside table should be minimized for ease of access to an object.	OBJ.	1-1-1	Y	Y
MC-F	DS106.12	The flooring material of all spaces in all design scale should be flat, solid, durable, non-slip in wet and dry conditions.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-4	N/I	Y
	DS106.13	The wall and floor material in spaces should be easy to clean.	OBJ.	1-2-2, 2-1-5	N/I	Y
	DS106.14	Loose carpets or rugs should not be used in spaces.	OBJ.	1-1-1, 2-1-2 2-1-5	N/I	N/I

QOL Domains:

1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots

Design Element:

SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers

Abbreviations:

SBJ: Subjective OBJ: Objective.

Table A.6 (continued) The Bedroom Assessment Module (DS106) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Bedroom Assessment Module (DS106)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
BE-D	DS106.15	The clear width of door should be at least 90 cm	OBJ.	1-1-1	Y	Y
	DS106.16	The clean height of door from the floor should be at least 210 cm.	OBJ.	1-1-1	Y	Y
	DS106.17	The height of the door threshold not exceed 1.3 cm	OBJ.	1-1-1	Y	Y
	DS106.18	Mechanism that slows the closing of the door should be used on the door to extend the maneuvering time at the passages.	OBJ.	1-1-1, 2-1-2	N/I	N/I
	DS106.19	The opening direction of the door (hinge side) should be adjacent to the turning wall.	OBJ.	1-1-1	Y	Y
	DS106.20	The distance between the opening edge of the door and any adjacent wall should not be less than 30 cm.	OBJ.	1-1-1	Y	N
	DS106.21	The height of the door handle from the floor should be between 90 -110 cm.	OBJ.	1-1-1, 2-2-1	N/I	N/I
	DS106.22	Door handle should be used with one hand and should not require a grip.	OBJ.	1-1-1, 2-2-4	N/I	N/I
	DS106.23	Door should open with minimum pressure.	SBJ.	1-1-1, 2-1-2	N/I	N/I
MC-F	DS106.24	The door should contrast visually with adjacent walls in terms of color and material.	OBJ.	2-1-1, 2-1-2	N/I	Y
BE-W	DS106.25	The window sills should be 80 cm above the floor.	OBJ.	2-1-2, 2-2-1	Y	Y
	DS106.26	Window handles should be placed at a height between 80 cm and 110 cm.	OBJ.	1-1-1, 2-2-1	N/I	N/I
	DS106.27	Window handles should be used with one hand and should not require a grip.	OBJ.	1-1-1, 2-2-3	N/I	N/I
	DS106.28	Windows should open with minimum pressure.	SBJ.	1-1-1, 2-1-2	-	-
	DS106.29	The glass used in the windows should be of a feature to prevent the scattering of broken glass pieces in case of any impact.	OBJ.	2-1-2, 2-2-4	N/I	N/I
	DS106.30	S, E, W sided windows should have shading apparatus to reduce glare caused by direct sunlight.	OBJ.	2-2-3, 2-2-4 2-2-5	N/I	N/I

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
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Table A.6 (continued) The Bedroom Assessment Module (DS106) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Bedroom Assessment Module (DS106)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
MC-F	DS106.30	The window should contrast visually with adjacent walls in terms of color and material.	OBJ.	2-1-1, 2-1-2	N	Y
BE-WL	DS106.31	The bedroom should have good sound insulation.	OBJ.	2-1-4, 2-2-3	N/I	N/I
BE-FL	DS106.32	The bedroom ceiling construction should be strong and durable to support the installation of any possible ceiling mounted rail (for transfer lift) mechanism.	OBJ.	1-1-1, 1-1-2 1-1-3, 1-1-4 4-2-2	N/I	N/I
SS-E	DS106.33	All switches, sockets and controls in all spaces should be at a height of 40 - 100 cm from the ground and can be operated with one hand.	OBJ.	2-2-1,2-2-3	N/I	N/I
SS-LT	DS106.34	There should be well lit with a natural and artificial lighting system.	OBJ.	2-2-3	Y	Y
	DS106.35	The bedroom should be completely dark for a good night's sleep.	OBJ.	2-2-3,2-1-4	N/I	N/I
	DS106.36	The bedroom should have windows that provide adequate natural light in case alder adults stay in the room during the day.	OBJ.	2-2-3,2-1-4	N/I	N/I
	DS106.37	There should have task lighting for some activities.	OBJ.	1-1-3, 1-2-1 3-2-1	N/I	N/I
SS-V	DS106.40	Fresh air flow should be provided with a window or ventilation system.	OBJ.	2-2-3	N/I	N/I
SS-H	DS106.41	There should have radiators or underfloor heating.	OBJ.	2-2-3	N/I	N/I
SS-SA	DS106.42	There should have an emergency call alarm.	OBJ.	4-1-1, 4-1-2 4-2-1, 2-1-2	N/I	N/I
	DS106.43	There should have a smoke detector.	OBJ.	4-1-1, 4-1-2 4-2-1	N/I	N/I
SS-AL	DS106.44	All spaces should have infrastructure for assisted living technologies such as health, environment, communication and entertainment.	OBJ.	1-2-4, 1-2-6 2-1-2, 2-1-5 2-2-3, 3-1-2 3-1-4, 3-2-1 4-1-1, 4-1-2 4-2-3	N/I	N/I

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
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Table A.6 (continued) The Bedroom Assessment Module (DS106) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Bedroom Assessment Module (DS106)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
FT-CB	DS106.45	The dress hangers in wardrobe should be at a height of 137 cm from the floor. If the dress hangers are 137 cm higher, an electronically or mechanically elevating / lowering system should be used	OBJ.	1-1-1, 1-1-6 2-1-2, 2-1-5 2-2-1, 2-2-2	N/I	N/I
	DS106.46	The wardrobe depth should be maximum 53 cm from the front of the wardrobe.	OBJ.	1-1-1, 1-1-6 2-1-2, 2-1-5 2-2-1, 2-2-2	N/I	N/I
	DS106.47	Wardrobe should have easy-to-open doors, such as sliding doors.	OBJ.	1-1-1, 1-1-6 2-1-2, 2-1-5 2-2-1, 2-2-2	N/I	N/I

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
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Table A.7 The Bathroom Assessment Module (DS107) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Bathroom Assessment Module (DS107)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SL-RBT	DS107.1	There should be a wheelchair accessible bathroom on the entry level. (There should be no level difference on the bathroom floor.)	OBJ.	1-1-1	Y	Y
	DS107.2	The bathroom should be inside or immediately adjacent to the master bedroom.	OBJ.	1-1-1, 2-1-1 2-2-3	Y	Y
	DS107.3	The bathroom should be large enough to accommodate fittings such as shower area, washbasins, and toilets.	OBJ.	1-1-1, 1-1-2 1-1-3, 1-1-4 4-2-4	N	N
	DS107.4	The bathroom should be large enough to accommodate storage areas such as wall cabinets, laundry boxes and towel racks.	OBJ.	2-2-2	N	N
	DS107.5	The bathroom should be large enough for the caregiver and the older person to find it at the same time.	OBJ.	1-1-1, 4-1-1 4-2-4	N	N
	DS107.6	The bathroom should have a dry area for dressing and undressing.	OBJ.	1-1-6, 2-1-1 2-2-3	N	N
	DS107.7	The bathroom should have a clean maneuvering area of at least 150 cm diameter to cover access to the toilet, washbasin and shower area.	OBJ.	1-1-1, 1-1-2 1-1-3, 1-1-4 1-1-6, 2-1-5	N	N
	DS107.8	The flooring material of all spaces in all design scale should be flat, solid, durable, non-slip in wet and dry conditions.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-4	N/I	N
	DS107.9	The wall and floor material in spaces should be easy to clean.	OBJ.	1-2-2, 2-1-5	N/I	N/I
	DS107.10	Loose carpets or rugs should not be used in spaces.	OBJ.	1-1-1, 2-1-2 2-1-5	N/I	N/I
	DS107.11	The distance between the bed and the bedside table should be minimized for ease of access to an object.	OBJ.	1-1-1	Y	Y
MC-F	DS107.12	The flooring material of all spaces in all design scale should be flat, solid, durable, non-slip in wet and dry conditions.	OBJ.	1-1-1, 2-1-1 2-2-3	Y	Y
	DS107.13	The wall and floor material in spaces should be easy to clean.	OBJ.	1-1-1, 1-1-2 1-1-3, 1-1-4	Y	Y
	DS107.14	Loose carpets or rugs should not be used in spaces.	OBJ.	2-2-2	N/I	N/I

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations:
SBJ: Subjective OBJ: Objective.

Table A.7 (continued) The Bathroom Assessment Module (DS107) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Bathroom Assessment Module (DS107)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
BE-D	DS107.1	The clear width of door should be at least 90 cm	OBJ.	1-1-1	Y	Y
	DS107.2	The clean height of door from the floor should be at least 210 cm.	OBJ.	1-1-1	Y	Y
	DS107.3	The height of the door threshold not exceed 1.3 cm	OBJ.	1-1-1	Y	Y
	DS107.4	Mechanism that slows the closing of the door should be used on the door to extend the maneuvering time at the passages.	OBJ.	1-1-1, 2-1-2	N/I	N/I
	DS107.5	The bathroom door should open outwards or be a sliding door.	OBJ.	1-1-1, 2-1-2 4-1-1	N/I	N/I
	DS107.6	The bathroom door should have locks that can be opened from the outside.	OBJ.	2-1-2, 4-1-1	N/I	N/I
	DS107.7	The height of the door handle from the floor should be between 90 -110 cm.	OBJ.	1-1-1, 2-2-1	N/I	N/I
	DS107.8	Door handle should be used with one hand and should not require a grip.	OBJ.	1-1-1, 2-2-4	N/I	N/I
	DS107.9	Door should open with minimum pressure.	SBJ.	1-1-1, 2-1-2	-	N/I
MC-F	DS107.10	The door should contrast visually with adjacent walls in terms of color and material.	OBJ.	2-1-1, 2-1-2	N/I	Y
BE-WL	DS107.11	Bathroom walls should be strong and durable enough to support grab bars and safety bars.	OBJ.	1-1-1, 1-1-2 1-1-3, 1-1-4 2-1-2, 2-1-5 4-2-2	N/I	Y
BE-FL	DS107.12	The bathroom ceiling construction should be strong and durable to support the installation of any possible ceiling mounted rail (for transfer lift) mechanism.	OBJ.	1-1-1, 1-1-2 1-1-3, 1-1-4 4-2-2	N/I	N/I
SS-E	DS107.13	All switches, sockets and controls in all spaces should be at a height of 40 - 100 cm from the ground and can be operated with one hand.	OBJ.	2-2-1, 2-2-3	N/I	N/I
SS-LT	DS107.14	There should be well lit with a natural and artificial lighting system.	OBJ.	2-2-3	Y	Y
		There should have task lighting for some activities.	OBJ.	1-1-3, 1-2-1 3-2-1	N/I	N/I

QOL Domains:
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Design Element:
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Table A.7 (continued) The Bathroom Assessment Module (DS107) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Bathroom Assessment Module (DS107)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SS-V	DS107.15	Fresh air flow should be provided with a window or ventilation system.	OBJ.	2-2-3	N/I	N/I
SS-H	DS107.16	There should have radiators or underfloor heating.	OBJ.	2-2-3	N/I	N/I
SS-SA	DS107.17	There should have an emergency call alarm.	OBJ.	4-1-1, 4-1-2 4-2-1, 2-1-2	N/I	N/I
	DS107.18	There should have a smoke detector.	OBJ.	4-1-1; 4-1-2 4-2-1	N/I	N/I
	DS107.19	There should be an alarm pull cord at a height that can be easily reached by someone lying on the floor in the bathroom.	OBJ.	4-1-1, 4-1-2 4-2-1, 2-1-2	N/I	N/I
SS-AL	DS107.20	All spaces should have infrastructure for assisted living technologies such as health, environment, communication and entertainment.	OBJ.	1-2-4, 1-2-6 2-1-2, 2-1-5 2-2-3, 3-1-2 3-1-4; 3-2-1 4-1-1, 4-1-2 4-2-3, 4-2-4	N/I	N/I
FT-SU	DS107.21	A shower unit should be preferred over a bathtub in the bathroom.	OBJ.	1-1-1, 1-1-2 1-1-3; 2-1-5 4-1-1, 4-2-4	Y	N
	DS107.22	There should be no level difference in front of the shower unit.	OBJ.	1-1-1, 1-1-2 1-1-3, 2-1-5	Y	N
	DS107.23	The dimensions of the shower unit should be at least 76 x 150 cm	OBJ.	1-1-1, 1-1-2 1-1-3, 2-1-5 4-1-1, 4-2-4	N	N
	DS107.24	There should be a clean area 90 cm wide and 150 cm long in front of the shower.	OBJ.	1-1-1, 1-1-2 1-1-3, 2-1-5 4-1-1, 4-2-4	N	N
	DS107.25	There should be no fixed elements that will prevent the transfer to the shower unit from the side or the front.	OBJ.	1-1-1, 1-1-2 1-1-3, 2-1-5 4-1-1, 4-2-4	N	N
	DS107.26	Shower enclosure/curtains, if any, should not prevent access to the shower seat, caregiver assistance, or use of water control devices.	OBJ.	2-1-1	N	N
MC-C	DS107.27	The height of the grab bars on the shower unit should be between 80-95 cm	OBJ.	1-1-1, 1-1-2 1-1-3, 2-1-2 2-1-5, 2-2-1	N	N
	DS107.28	The width/diameter of the grab bars should be between 32 mm and 40 mm	OBJ.	2-2-1	N	N

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
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Table A.7 (continued) The Bathroom Assessment Module (DS107) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Bathroom Assessment Module (DS107)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
MC-C	DS107.29	The width/diameter of the grab bars should be between 32 mm and 40 mm	OBJ.	2-2-1	N	N
	DS107.30	The grab bars should be on all walls of the shower unit except the surface where the seat is.	OBJ.	1-1-1, 1-1-2 1-1-3, 2-1-2 2-1-5	N	N
SS-WS	DS107.31	Taps and other controllers should be within accessible distance from the shower seat.	OBJ.	1-1-3, 2-2-1	N/I	N/I
	DS107.32	The shower head should be at least 160 cm long and with a hose.	OBJ.	1-1-3, 2-2-1	N/I	N/I
FT-F	DS107.33	The shower unit should have a foldable, perforated shower seat with a grab bar, at least 45x45 cm in size.	OBJ.	1-1-1, 1-1-2 2-1-5, 2-2-1	N	N
	DS107.34	The height of the shower seat from the floor should be between 43-48 cm.	OBJ.	1-1-1, 1-1-2 2-1-5, 2-2-1	N	N
FT-TO	DS107.35	The seat height of the toilet bowls should be between 43 cm and 48 cm	OBJ.	1-1-1, 1-1-2 1-1-4; 2-1-5 2-2-1	N	N
	DS107.36	There should be enough space in front of or next to the toilet for transfer from a wheelchair.	OBJ.	1-1-1, 1-1-2 1-1-4, 2-1-5 4-1-1, 4-2-4	N	N
	DS107.37	There should be at least 60 cm space for the caregiver on the sides of the toilet.	OBJ.	1-1-1, 1-1-2 1-1-4; 2-1-5 4-1-1, 4-2-4	N	N
MC-C	DS107.38	Depending on the position of the toilet, there should be movable or fixed grab bars on both sides.	OBJ.	1-1-1; 1-1-2 1-1-4; 2-1-2 2-1-5; 2-2-1	N	N
SS-WS	DS107.39	The toilet flush button should be able to be operated with the whole hand with little force.	OBJ.	1-1-3;1-1-4 2-2-1	N/I	N/I
FT-SK	DS107.40	The height of the sink from the floor should be no more than 86 cm.	OBJ.	1-1-1; 1-1-3 1-2-1; 1-2-2; 2-1-5	N/I	N/I
	DS107.41	There should be at least 60 cm space for the caregiver on the sides of the sink.	OBJ.	1-1-1; 1-1-3 2-1-5; 4-1-1 4-2-4	N	N
	DS107.42	There should be a clean activity area of 76x122 cm in front of the sink.	OBJ.	1-1-1; 1-1-3 2-1-5; 4-1-1 4-2-4	N	N

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
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Table A.7 (continued) The Bathroom Assessment Module (DS107) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Bathroom Assessment Module (DS107)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
FT-SK	DS107.43	The sink should be wall-mounted.	OBJ.	1-1-1; 1-1-3 2-1-5; 4-1-1	Y	Y
MC-C	DS107.44	There should be fixed grab bars at a height of 90 cm from the floor on both sides of the sink.	OBJ.	1-1-1; 1-1-3 2-1-2; 2-1-5; 2-2-1	N	N
AP- WM	DS107.45	There should be a washing machine in the bathroom or somewhere connected to the bathroom.	OBJ.	1-1-1; 1-2-2 2-1-5	N	Y
	DS107.46	The washing machine should be located close to the wash basin.	OBJ.	1-1-1; 1-2-2 2-1-5	N	Y
	DS107.47	The washing machine must be on a 25 cm plinth.	OBJ.	1-1-1; 1-2-2 2-1-5	N	N/I
	DS107.48	There should be an area where dirty laundry will be stored.	OBJ.	1-1-1; 1-2-2 2-1-5	N	N
	DS107.49	There should be a wall-mounted, folding laundry rack near the washing machine.	OBJ.	1-1-1; 1-2-2 2-1-5	N	N

QOL Domains:
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Table A.8 The Balcony/ Terrace Assessment Module (DS107) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Balcony/ Terrace Assessment Module (DS108)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SL-OBT	DS108.1	There should be direct access to the balcony/terrace from inside the house.	OBJ.	1-1-1, 2-2-6	N/A	Y
	DS108.2	The balcony/terrace should be large enough to accommodate flower boxes or plant pots.	OBJ.	2-1-3, 2-1-5 2-2-5, 3-2-2	N/A	N
	DS108.3	The balcony/terrace should be large enough to accommodate a cupboard for tools and equipment.	OBJ.	2-2-2	N/A	N
	DS108.4	There be enough space in the balcony/terrace to sit and relax and enjoy the fine weather.	OBJ.	2-1-4, 2-2-6 3-2-1	N/A	N
	DS108.5	There should be enough space for drying clothes in the balcony/terrace.	OBJ.	1-2-2	N/A	N
	DS108.6	The balcony/terrace should have a clear maneuvering area of at least 150 cm in diameter, excluding all furniture and other items.	OBJ.	1-1-1, 2-1-5 3-2-1, 3-2-2	N/A	N
	DS108.7	There should be a space in the balcony/terrace where privacy is provided.	OBJ.	2-1-1,3-1-3	N/A	Y
	DS108.8	The balcony/terrace should be closed with a dismountable system to protect it from weather conditions.	OBJ.	2-2-3	N/A	N
MC-F	DS108.9	The flooring material of all spaces in all design scale should be flat, solid, durable, non-slip in wet and dry conditions.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-4	N/A	N
	DS108.10	The wall and floor material in spaces should be easy to clean.	OBJ.	1-2-2, 2-1-5	N/A	N/I
	DS108.11	Loose carpets or rugs should not be used in spaces.	OBJ.	1-1-1, 2-1-2 2-1-5	N/A	N/I
MC-C	DS108.12	There should be a 110 cm high railing on the open side of the balcony/terrace.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-1	N/A	Y
SS-E	DS108.13	All switches, sockets and controls in all spaces should be at a height of 40 -100 cm from the ground and can be operated with one hand.	OBJ.	2-2-1,2-2-3	N/A	N/I

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations:
SBJ: Subjective OBJ: Objective.

Table A.8 (continued) The Balcony/ Terrace Assessment Module (DS107) of SH and RH

The Housing Scale Assessment Module (DS100)					Assessment Case	
The Balcony/ Terrace Assessment Module (DS108)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SS-LT	DS108.14	There should be well lit with a natural and artificial lighting system.	OBJ.	2-2-3	N/A	Y
SS-SA	DS108.15	There should have an emergency call alarm.	OBJ.	4-1-1; 4-1-2 4-2-1; 2-1-2	N/A	N/I

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations:
SBJ: Subjective OBJ: Objective.

Appendix B

The Building Scale Assessment Module (DS200)

Building Scale Assessment Module (DS200) consists of four sub-modules which are the Building Entrance Assessment Module (DS201), Building Hall Assessment Module (DS202), Building Corridor Assessment Module (DS203), and Building Vertical Circulation Assessment Module (DS204).The modules in which RH is evaluated are below. Any housing is evaluated in the same way as these modules.

Table B.1 The Building Entrance Assessment Module (DS201) of SH and RH

The Building Scale Assessment Module (DS200)					Assessment Case	
The Building Entrance Assessment Module (DS201						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SE-HE	DS201.1	The building entrance should be in visible and recognizable location.	OBJ.	2-1-3, 2-1-2	N/A	Y
	DS201.2	The entrance should be at the same level as the main travel route. If there is a level difference, accessible ramps and stairs should be made.	OBJ.	1-1-1	N/A	N
	DS201.3	There should be an entrance landing with a canopy providing protection from the weather. Dimensions of the canopy: min 150 cm deep and max 280 cm high.	OBJ.	1-1-1, 2-1-3	N/A	Y
	DS201.4	The building entrance should be a minimum of 240 x 240 cm for wheelchair access and various activities.	OBJ.	1-1-1, 3-1-3	N/A	Y
MC-F	DS201.5	The flooring material of all spaces in all design scale should be flat, solid, durable, non-slip in wet and dry conditions.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-4	N/A	N
BE-D	DS201.6	The clean width of the entrance door should be at least 150 cm.	OBJ.	1-1-1	N/A	Y
	DS201.7	The clean height of the housing entrance door should be at least 210 cm.	OBJ.	1-1-1	N/A	Y
	DS201.8	There should be maneuvering area (at least 150 cm diameter circle) in front and behind the entrance door for a wheelchair.	OBJ.	1-1-1	N/A	Y
	DS201.9	The entrance door should give a sense of security.	SBJ.	2-1-2	-	N/I
	DS201.10	Doorbells should be 120 cm high from the floor to the middle of the bell.	OBJ.	2-2-1	N/A	N/I
MC-F	DS201.11	The door should contrast visually with adjacent walls in terms of color and material.	OBJ.	2-1-2, 2-2-4	N/A	Y
BE-W	DS201.12	A window/view panel suitable for use by people at all eye level should be built adjacent to the door.	OBJ.	2-1-1, 2-1-2	N/A	Y
MC-F	DS201.13	The window should contrast visually with adjacent walls in terms of color and material	OBJ.	2-1-1, 2-1-2	N/A	Y

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations:
SBJ: Subjective OBJ: Objective.

Table B.1 (continued) The Building Entrance Assessment Module (DS201) of SH and RH

The Building Scale Assessment Module (DS200)					Assessment Case	
The Building Entrance Assessment Module (DS201						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
BE-S	DS201.14	The step length should be at least 120 cm.	OBJ.	1-1-1	N/A	Y
	DS201.15	Stairs should have a landing every 12 steps.	OBJ.	1-1-1, 2-1-4	N/A	Y
	DS201.16	The width of the landings must be at least 120 cm.	OBJ.	1-1-1, 2-1-4	N/A	Y
	DS201.17	The landing with door entrance should be at least 150 cm x 150 cm.	OBJ.	1-1-1, 2-1-4	N/A	Y
	DS201.18	There should be a landing of at least 120x150 cm at the beginning and end of the stairs.	OBJ.	1-1-1, 2-1-4	N/A	Y
	DS201.19	The heights and widths of stair steps inside and outside should be equal.	OBJ.	1-1-1, 2-2-1	N/A	Y
	DS201.20	The step height should be between 15-16 cm.	OBJ.	1-1-1, 2-2-1	N/A	Y
MC-F	DS201.22	The material of the steps should be hard, non-slip and matte.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-4	N/A	N
	DS201.21	Visual contrast should be provided at the beginning and end of the stair.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-4	N/A	N
MC-C	DS201.23	There should be 110 cm high handrails on both sides of the stairs	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-1	N/A	N
	DS201.24	Handrails should be designed to prevent people and objects from falling.	OBJ.	1-1-1, 2-1-2 2-1-5	N/A	N
	DS201.25	The handrails color should visually contrast to adjacent surfaces.	OBJ.	1-1-1, 2-2-5	N/A	N
SS-LT	DS201.26	The stairs should be properly lit with natural and artificial light.	OBJ.	1-1-1, 2-2-3	N/A	N/I
BE-R	DS201.27	The net width of the ramps should be at least 100 cm.	OBJ.	1-1-1	N/A	Y
	DS201.28	There should be a 150 x 150 cm landing every 9 meters.	OBJ.	1-1-1, 2-1-4	N/A	N/A
	DS201.29	There should be a landing of at least 150x150 cm at the beginning and end of the ramps	OBJ.	1-1-1; 2-1-4	N/A	N/A
	DS201.30	The slope of the building entrance ramps should be at most 8%.	OBJ.	1-1-1	N/A	Y
MC-F	DS201.31	The material of the ramps should be hard, non-slip and matte.	OBJ.	1-1-1, 2-1-2 2-1-5, 2-2-4	N/A	N

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations:
SBJ: Subjective OBJ: Objective.

Table B.1 (continued) The Building Entrance Assessment Module (DS201) of RH

The Building Scale Assessment Module (DS200)					Assessment Case	
The Building Entrance Assessment Module (DS201						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
MC-f	DS201.32	Visual contrast should be provided at the beginning and end of the ramp.	OBJ.	1-1-1; 2-1-2 2-1-5; 2-2-1	N/A	N
MC-C	DS201.33	There should be 110 cm high handrails on both sides of the stairs.	OBJ.	1-1-1; 2-1-2 2-1-5	N/A	Y
	DS201.34	Handrails should be designed to prevent people and objects from falling.	OBJ.	1-1-1; 2-2-5	N/A	N/I
	DS201.35	The handrails color should visually contrast to adjacent surfaces.	OBJ.	1-1-1; 4-2- 2	N/A	Y
SS-L	DS201.36	In cases where it is not possible to build a ramp at the entrance of the housing/building due to technical reasons, one of the solutions such as elevator, platform elevator, hydraulic elevator should be applied.	OBJ.	1-1-1 2-2-3	N/A	N/I
SS-LT	DS201.37	The entrance should be well lit both during the day and at night with a natural and artificial lighting system.	OBJ.	2-1-2 4-2-1	N/A	N/I
SS-CS	DS201.38	The entrance door should be monitored with camera and phone systems due to see and communicate with anyone at the door.	OBJ.	1-1-1	N/A	Y
FT-CB	DS201.39	There should be shelves at the entrance where you can put heavy objects so that you can open the door easily.	OBJ.	1-1-1; 2-1-2 2-1-5; 2-2-1	N/A	N

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations:
SBJ: Subjective OBJ: Objective.

Table B.2 The Building Hall Assessment Module (DS202) of RH

The Building Scale Assessment Module (DS200)					Assessment Case	
The Building Hall Assessment Module (DS202)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SC-HH	DS202.1	There should be an area in the building hall that allows the presence of caretaker.	OBJ.	4-1-2	N/A	N
	DS202.2	If there is a lobby in the entrance hall, its dimensions should be at least 280x350 cm.	OBJ.	1-1-1	N/A	N
MC-F	DS202.3	The flooring material of all spaces in all design scale should be flat, solid, durable, non-slip in wet and dry conditions.	OBJ.	1-1-1; 2-1-2 2-1-5; 2-2-4	N/A	N
	DS202.4	The wall and floor material in spaces should be easy to clean.	OBJ.	1-2-2; 2-1-5	N/A	N/I
SS-E	DS202.5	All switches, sockets and controls in all spaces should be at a height of 40 - 100 cm from the ground and can be operated with one hand.	OBJ.	2-2-1, 2-2-3	N/A	N/I
SS-LT	DS202.7	There should be well lit with a natural and artificial lighting system.	OBJ.	2-2-3	N/A	N/I
SS-V	DS202.8	Fresh air flow should be provided with a window or ventilation system.	OBJ.	2-2-3	N/A	N/I
SS-H	DS202.9	There should have radiators or underfloor heating.	OBJ.	2-2-3	N/A	N/I
SS-SA	DS202.10	There should have an emergency call alarm.	OBJ.	4-1-1, 4-1-2 4-2-1, 2-1-2	N/A	N/I
	DS202.11	There should have a smoke detector.	OBJ.	4-1-1, 4-1-2 4-2-1	N/A	N/I
SS-AL	DS202.12	All spaces should have infrastructure for assisted living technologies such as health, environment, communication and entertainment.	OBJ.	1-2-4, 1-2-6 2-1-2, 2-1-5 2-2-3, 3-1-2 3-1-4, 3-2-1 4-1-1, 4-1-2 4-2-3	N/A	N/I

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers

Abbreviations: SBJ: Subjective OBJ: Objective.

Table B.3 The Building Corridor Assessment Module (DS203) of RH

The Building Scale Assessment Module (DS200)					Assessment Case	
The Building Corridor Assessment Module (DS203)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SC-HC	DS203.1	The clean width of the corridors should be at least 180 cm.	OBJ.	1-1-1	N/A	Y
	DS203.2	The clean height of the corridors from the floor should be at least 220 cm.	OBJ.	1-1-1	N/A	Y
	DS203.3	The floors of all housing and the floor of the circulation area should be at the same level.	OBJ.	1-1-1	N/A	Y
MC-F	DS203.4	The flooring material of all spaces in all design scale should be flat, solid, durable, non-slip in wet and dry conditions.	OBJ.	1-1-1; 2-1-2 2-1-5; 2-2-4	N/A	N
	DS203.5	The wall and floor material in spaces should be easy to clean.	OBJ.	1-2-2; 2-1-5	N/A	N/I
SS-E		All switches, sockets and controls in all spaces should be at a height of 40 - 100 cm from the ground and can be operated with one hand.	OBJ.	2-2-1, 2-2-3	N/A	N/I
SS-LT	DS203.7	There should be well lit with a natural and artificial lighting system.	OBJ.	2-2-3	N/A	N/I
SS-V	DS203.8	Fresh air flow should be provided with a window or ventilation system.	OBJ.	2-2-3	N/A	N/I
SS-H	DS203.9	There should have radiators or underfloor heating.	OBJ.	2-2-3	N/A	N/I
SS-SA	DS203.10	There should have an emergency call alarm.	OBJ.	4-1-1, 4-1-2 4-2-1, 2-1-2	N/A	N/I
	DS203.11	There should have a smoke detector.	OBJ.	4-1-1, 4-1-2 4-2-1	N/A	N/I
SS-AL	DS203.12	All spaces should have infrastructure for assisted living technologies such as health, environment, communication and entertainment.	OBJ.	1-2-4, 1-2-6 2-1-2, 2-1-5 2-2-3, 3-1-2 3-1-4, 3-2-1 4-1-1, 4-1-2 4-2-3	N/A	N/I

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers

Abbreviations: SBJ: Subjective OBJ: Objective.

Table B.4 The Building Vertical Circulation Assessment Module (DS204) of RH

The Building Scale Assessment Module (DS200)					Assessment Case	
The Building Vertical Circulation Assessment Module (DS204)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
BE-S	DS204.1	The step length should be at least 120 cm.	OBJ.	1-1-1;	N/A	Y
	DS204.2	Stairs should have a landing every 12 steps.	OBJ.	1-1-1; 2-1-4	N/A	Y
	DS204.3	The width of the landings must be at least 120 cm.	OBJ.	1-1-1; 2-1-4	N/A	Y
	DS204.4	the landing with door entrance should be at least 150 cm x 150 cm.	OBJ.	1-1-1; 2-1-4	N/A	N/A
	DS204.5	There should be a landing of at least 120x150 cm at the beginning and end of the stairs.	OBJ.	1-1-1; 2-1-4	N/A	Y
	DS204.6	The heights and widths of stair steps inside and outside should be equal.	OBJ.	1-1-1; 2-2-1	N/A	Y
	DS204.7	The step height should be between 15-16 cm.	OBJ.	1-1-1; 2-2-1	N/A	N
	DS204.8	The risers of the stairs should be covered to prevent people from walking under them.	OBJ.	2-1-2	N/A	Y
MC-F	DS204.9	The material of the steps and ramps should be hard, non-slip and matte	OBJ.	1-1-1; 2-1-2 2-1-5; 2-2-4	N/A	Y
	DS204.10	Visual contrast should be provided at the beginning and end of the ramp and stair.	OBJ.	1-1-1; 2-1-2 2-1-5; 2-2-4	N/A	N/I
MC-C	DS204.11	There should be 110 cm high handrails on both sides of the stairs.	OBJ.	1-1-1; 2-1-2 2-1-5	N/A	Y
	DS204.12	Handrails should be designed to prevent people and objects from falling.	OBJ.	1-1-1; 2-1-2 2-1-5	N/A	N/I
	DS204.13	The handrails color should visually contrast to adjacent surfaces.	OBJ.	1-1-1; 2-2-5	N/A	N/I
SS-LT	DS204.14	The stairs should be properly lit with natural and artificial light.	OBJ.	1-1-1 2-2-3	N/A	N/I
BE-R	DS204.15	The net width of the ramps should be at least 100 cm.	OBJ.	1-1-1	N/A	N/A

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations:
SBJ: Subjective OBJ: Objective.

Table B.4 (continued) The Building Vertical Circulation Assessment Module (DS204) of RH

The Building Scale Assessment Module (DS200)					Assessment Case	
The Building Vertical Circulation Assessment Module (DS204)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
BE-R	DS204.16	There should be a 150 x 150 cm landing every 9 meters.	OBJ.	1-1-1; 2-1-4	N/A	N/A
	DS204.17	There should be a landing of at least 150x150 cm at the beginning and end of the ramps	OBJ.	1-1-1; 2-1-4	N/A	N/A
	DS204.18	The slope of the building entrance ramps should be at most 8%.	OBJ.	1-1-1	N/A	N/A
MC-F	DS204.19	The material of the ramps should be hard, non-slip and matte.	OBJ.	1-1-1; 2-1-2 2-1-5; 2-2-4	N/A	N/A
	DS204.20	Visual contrast should be provided at the beginning and end of the ramp.	OBJ.	1-1-1; 2-1-2 2-1-5; 2-2-4	N/A	N/A
MC-C	DS204.21	There should be 110 cm high handrails on both sides of the ramp.	OBJ.	1-1-1; 2-1-2 2-1-5; 2-2-1	N/A	N/A
	DS204.22	Handrails should be designed to prevent people and objects from falling.	OBJ.	1-1-1; 2-1-2 2-1-5	N/A	N/A
	DS204.23	The handrails color should visually contrast to adjacent surfaces.	OBJ.	1-1-1; 2-2-5	N/A	N/A
SS-L	DS204.24	There should have a 100 x 150 cm aperture for future provision of a through-floor lift in multi-story housing.	OBJ.	1-1-1 4-2-2	N/A	N/A
	DS204.25	The lift cabin dimensions should be at least 120x150 cm.	OBJ.	1-1-1	N/A	Y
	DS204.26	The lift cabin door width should be at least 90 cm.	OBJ.	1-1-1	N/A	Y
	DS204.27	The elevator should be located adjacent to the stairs and should be easily found.	OBJ.	1-1-1	N/A	Y
	DS204.28	There should be a maneuvering area in front of the lift door.	OBJ.	1-1-1	N/A	Y
	DS204.29	The elevator door should open and close automatically.	OBJ.	1-1-1	N/A	Y
	DS204.30	Call and control buttons of the elevator should be placed within the height limits of 80 cm and 110 cm.	OBJ.	2-2-1	N/A	N/I
SS-SA	DS204.31	There should have an emergency call alarm.	OBJ.	4-1-1; 4-1-2 4-2-1; 2-1-2	N/A	N/I
	DS204.32	There should have a smoke detector.	OBJ.	4-1-1; 4-1-2 4-2-1	N/A	N/I

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations:
SBJ: Subjective OBJ: Objective.

Appendix C

The Immediate Surrounding Scale Assessment Module (DS300)

The Immediate Surroundings Module (DS300) is consists of three sub-modules: Immediate Surroundings Pathways Assessment Module (DS301), Immediate Surroundings Parking Lot Assessment Module (DS302), and Immediate Surroundings Park / Garden Assessment Module (DS303).The modules in which RH is evaluated are below. Any housing is evaluated in the same way as these modules.

Table C.1 The Immediate Surroundings Pathways Assessment Module (DS301) of SH and RH

The Immediate Surroundings Module (DS300)					Assessment Case	
The Immediate Surroundings Pathways Assessment Module (DS301)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SC-HP	DS301.1	The pathway from the boundary of the property to the entrance of the residence should be continuous and without steps.	OBJ.	1-1-1	Y	N
	DS301.2	If there is a building entrance, the clear width of the pathway should be at least 200 cm.	OBJ.	1-1-1	N/A	Y
	DS301.3	If there is a housing entrance, the clear width of the pathway should be at least 120 cm.	OBJ.	1-1-1	Y	N/A
	DS301.4	The clean height of the pathways should be at least 220 cm.	OBJ.	1-1-1	Y	N
	DS301.5	The slope of the pathways should be at most 5%. Ramps should be built on roads where the slope is more than 5%.	OBJ.	1-1-1	Y	N
MC-F	DS301.6	Pathways should not be covered with loose and slippery materials such as gravel.	OBJ.	1-1-1; 2-1-2 2-1-5	Y	Y
	DS301.7	Contrasting materials and colors should be used to ensure safety and accessibility on the pathways along the travel route.	OBJ.	1-1-1; 2-1-2 2-1-5; 2-2-4	Y	Y
SS-LT	DS301.8	Adequate lighting should be provided on all pathways.	OBJ.	1-1-1 2-2-3	N/I	N/I
SS-AL	DS301.9	All spaces should have infrastructure for assisted living technologies such as health, environment, communication and entertainment.	OBJ.	1-2-4; 1-2-6 2-1-2; 2-1-5 2-2-3; 3-1-2 3-1-4; 3-2-1; 4-1-1; 4-1-2 4-2-3	N/I	N/I
FT-F	DS301.10	Sitting areas with armrests in parks , gardens and pathways should be at a height of 45- 50 cm.cm from the ground.	OBJ.	1-1-1; 1-1-2 2-1-5; 2-2-1	N/I	N/I

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations:
SBJ: Subjective OBJ: Objective.

Table C.2 The Immediate Surroundings Parking Lot Assessment Module (DS302) of SH and RH

The Immediate Surroundings Module (DS300)					Assessment Case	
The Immediate Surroundings Parking Lot Assessment Module (DS302)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SCO-OPL	DS302.1	The parking lot should be as close as possible to the entrance of the building/house and in a convenient location for alder adults.	OBJ.	1-1-1; 1-2-5 2-1-5	N/I	Y
	DS302.2	The parking lot must be at a distance of maximum 30 m from the housing.	OBJ.	1-1-1; 1-2-5	N/I	Y
	DS302.3	The housing must have a parking lot measuring at least 400 cm and the length 600 cm.	OBJ.	1-1-1; 1-2-5 2-1-5	N/I	N
	DS302.4	The number of accessible parking lot (400 cm x 600 cm) for buildings should be as follows: 1 for 20 flats; 2 for 21-50 flats; 3 for 51-100 flats and 1 for every 100 or more flats.	OBJ.	1-1-1; 1-2-5, 2-1-5	N/I	N
	DS302.5	Accessible parking should be marked in a way that is visible, legible, understandable and simple to all.	OBJ.	1-2-5; 2-2-5	N/I	N
SS-LT	DS302.6	Parking lot should be adequately illuminated at night.	OBJ.	1-1-1 2-2-3	N/I	N/I
SS-AL	DS302.7	All spaces should have infrastructure for assisted living technologies such as health, environment, communication and entertainment.	OBJ.	1-2-4; 1-2-6 2-1-2; 2-1-5 2-2-3; 3-1-2 3-1-4; 3-2-1; 4-1-1; 4-1-2 4-2-3	N/I	N/I

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations:
SBJ: Subjective OBJ: Objective.

Table C.3 The Immediate Surroundings Park / Garden Assessment Module (DS303) of SH and RH

The Immediate Surroundings Module (DS300)					Assessment Case	
Immediate Surroundings Park / Garden Assessment Module (DS303)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SCO-OPG	DS303.1	There should be small gardens full of plants around the housing or building land.	OBJ.	2-2-5; 2-2-6	Y	Y
	DS303.2	A distinction should be made between different green space designs and similarly designed residences or apartments.	OBJ.	2-2-5; 2-1-3	Y	N
	DS303.3	The garden should be designed in such a way as to prevent the use of plants as hiding places by humans.	OBJ.	2-1-2	Y	Y
SS-LT	DS303.4	Parks and gardens should be adequately illuminated at night.	OBJ.	1-1-1 2-2-3	N/I	N/I
SS-AL	DS303.5	All spaces should have infrastructure for assisted living technologies such as health, environment, communication and entertainment.	OBJ.	1-2-4; 1-2-6 2-1-2; 2-1-5 2-2-3; 3-1-2 3-1-4; 3-2-1; 4-1-1; 4-1-2 4-2-3	N/I	N/I
FT-F	DS303.6	Sitting areas with armrests in parks , gardens and pathways should be at a height of 45- 50 cm.cm from the ground.	OBJ.	1-1-1; 1-1-2 2-1-5; 2-2-1	N/I	N/I

QOL Domains:

1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots

Design Element:

SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers

Abbreviations:

SBJ: Subjective OBJ: Objective.

Appendix D

The Community Scale Assessment Module (DS400)

Community Scale Module (DS400) consists of four sub-modules including the Community Scale Pathways Assessment Module (DS401), Community Scale Parking Lot Assessment Module (DS402), Community Scale Park / Garden Assessment Module (DS403), and Community Scale Facilities Assessment Module (DS404). The modules in which RH is evaluated are below. Any housing is evaluated in the same way as these modules.

Urban Context Scale Module (DS500) consists of four sub-modules including the *Parking Lot Assessment Module (DS502), Urban Context Scale Park / Garden Assessment Module (DS503), and Urban Context Scale Facilities Assessment Module (DS504)*.

Table D.1 The Community Scale Pathways Assessment Module (DS401) of SH and RH

The Community Scale Assessment Module (DS400)					Assessment Case	
The Community Scale Pathways Assessment Module (DS401)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SC-HP	DS401.1	The clean height of the pathways should be at least 220 cm.	OBJ.	1-1-1	Y	Y
	DS401.2	The slope of the pathways should be at most 5%. Ramps should be built on roads where the slope is more than 5%.	OBJ.	1-1-1	Y	Y
	DS401.3	Pathways should have a clear, logical and easy to understand road hierarchy from the main road to the smaller streets.	OBJ.	1-1-1 2-1-5	Y	Y
	DS401.4	The clean width of the pathways should be at least 200 cm.	OBJ.	1-1-1	Y	Y
	DS401.5	There should be a resting landing adjacent to the pathway with a clear area of 150 x 150 cm every 30 meters.	OBJ.	2-1-4	Y	N
MC-F	DS401.6	Pathways should not be covered with loose and slippery materials such as gravel.	OBJ.	1-1-1; 2-1-2 2-1-5	Y	Y
	DS401.7	Contrasting materials and colors should be used to ensure safety and accessibility on the pathways along the travel route.	OBJ.	1-1-1; 2-1-2 2-1-5; 2-2-4	Y	Y
SS-LT	DS401.8	Adequate lighting should be provided on all pathways.	OBJ.	1-1-1 2-2-3	N/I	N/I
SS-AL	DS401.9	All spaces should have infrastructure for assisted living technologies such as health, environment, communication and entertainment.	OBJ.	1-2-4; 1-2-6 2-1-2; 2-1-5 2-2-3; 3-1-2 3-1-4; 3-2-1; 4-1-1; 4-1-2 4-2-3	N/I	N/I
FT-F	DS401.10	Sitting areas with armrests in parks , gardens and pathways should be at a height of 45- 50 cm.cm from the ground.	OBJ.	1-1-1; 1-1-2 2-1-5; 2-2-1	N/I	N

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations:
SBJ: Subjective OBJ: Objective.

Table D.2 The Community Scale Community Scale Parking Lot Assessment Module (DS402) of SH and RH

The Community Scale Assessment Module (DS400)					Assessment Case	
The Community Scale Parking Lot Assessment Module (DS402)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SCO-OPL	DS402.1	5% of public parking spaces in the community be accessible parking.	OBJ.	1-1-1; 1-2-5 2-1-5	N/I	N
	DS402.2	An accessible parking lot should be at least 400 cm and the length 600 cm.	OBJ.	1-1-1; 1-2-5 2-1-5	N/I	N
	DS402.3	Accessible parking should be marked in a way that is visible, legible, understandable and simple to all.	OBJ.	1-2-5; 2-2-5	N/I	N
	DS402.4	5% of public parking spaces in the community be accessible parking.	OBJ.	1-1-1 2-2-3	N/I	N/I
SS-LT	DS402.5	Parking lot should be adequately illuminated at night.	OBJ.	1-2-4; 1-2-6 2-1-2; 2-1-5 2-2-3; 3-1-2 3-1-4; 3-2-1; 4-1-1; 4-1-2 4-2-3	N/I	N/I
SS-AL	DS402.6	All spaces should have infrastructure for assisted living technologies such as health, environment, communication and entertainment.	OBJ.	1-1-1; 1-2-5 2-1-5	N/I	N

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations:
SBJ: Subjective OBJ: Objective.

Table D.3 The Community Scale Community Scale Park / Garden Assessment Module (DS403) of SH and RH

The Community Scale Assessment Module (DS400)					Assessment Case	
The Community Scale Park / Garden Assessment Module (DS403)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SCO-OPG	DS402.1	The parks and gardens within the community should be enriched with garden furniture, various fountains, the use of different colors and scents, different types and sizes of plants and trees.	OBJ.	2-2-5; 2-2-6	Y	N
	DS403.2	There should be enough space for outdoor games/sports and recreation activities in parks and gardens.	OBJ.	1-1-1; 2-1-5 2-1-6; 3-2-3 3-2-4; 3-2-5 3-1-3	Y	Y
	DS403.3	Seating areas in parks and gardens should be arranged in such a way that they can be used as sunny areas and shaded areas all year round.	OBJ.	2-1-4; 2-2-3	N/I	N
SS-LT	DS403.4	Parks and gardens should be adequately illuminated at night.	OBJ.	1-1-1 2-2-3	N/I	N/I
SS-AL	DS403.5	All spaces should have infrastructure for assisted living technologies such as health, environment, communication and entertainment.	OBJ.	1-2-4; 1-2-6 2-1-2; 2-1-5 2-2-3; 3-1-2 3-1-4; 3-2-1; 4-1-1; 4-1-2 4-2-3	N/I	N/I
FT-F	DS403.6	Sitting areas with armrests in parks , gardens and pathways should be at a height of 45- 50 cm.cm from the ground.	OBJ.	1-1-1; 1-1-2 2-1-5; 2-2-1	N/I	N

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations:
SBJ: Subjective OBJ: Objective.

Table D.4 The Community Scale Community Facilities Assessment Module (DS404) of SH and RH

The Community Scale Assessment Module (DS400)					Assessment Case	
The Community Facilities Assessment Module (DS404)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SCO-F	DS404.1	There is a family doctor/ policlinic within a radius of 400 meters from the old person's housing.	OBJ.	1-1-1; 1-2-4 2-1-5; 3-2-3 4-1-3	Y	N
	DS404.2	There is a pharmacy within a radius of 400 meters from the old person's housing.	OBJ.	1-1-1; 1-2-4 2-1-5; 3-2-3 4-1-3	Y	N
	DS404.3	There is a general store within a radius of 400 meters from the old person's housing.	OBJ.	1-1-1; 1-2-3 2-1-5; 3-2-3	N	Y
	DS404.4	There is a religious center within a radius of 400 meters from the old person's housing.	OBJ.	1-1-1; 2-1-5 2-1-6; 3-2-3 3-1-3	Y	Y
	DS404.5	There is a social center within a radius of 400 meters from the old person's housing. (café, public education centers, workshops, etc.)	OBJ.	1-1-1; 2-1-5 2-1-6; 3-2-3 3-1-3; 3-2-4 3-2-5	N	N
	DS404.6	There is a staff station within a radius of 400 meters from the old person's housing.	OBJ.	2-1-2; 4-1-1 4-1-2	Y	N
	DS404.7	There is a bank within a radius of 400 meters from the old person's housing.	OBJ.	1-1-1; 2-1-5 3-2-3	N	N
	DS404.8	There is a hairdresser stop within a radius of 400 meters from the old person's housing.	OBJ.	1-1-1; 1-2-3 2-1-5; 3-2-3	N/I	N/I
	DS404.9	There is a public transport stops within a radius of 400 meters from the old person's housing.	OBJ.	1-2-5; 2-1-5	Y	Y

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations:
SBJ: Subjective OBJ: Objective.

Appendix D

The Urban Context Scale Assessment Module (DS500)

Urban Context Scale Module (DS500) consists of four sub-modules including the Parking Lot Assessment Module (DS502), Urban Context Scale Park / Garden Assessment Module (DS503), and Urban Context Scale Facilities Assessment Module (DS504). The modules in which RH is evaluated are below. Any housing is evaluated in the same way as these modules.

Table D.5 The Urban Context Scale Facilities Assessment Module (DS504) of SH and RH

The Urban Context Assessment Module (D5400)					Assessment Case	
The Urban Context Facilities Assessment Module (DS504)						
Design Element	Design consideration			QOL Domains	SH	RH
	Code	Explain	Type			
SCO-F	DS404.1	Access from the community to indispensable facilities such as the city hospital, food shops should be unobstructed and reliable.	OBJ.	1-2-3; 1-2-4 1-2-5; 2-1-2 2-1-5; 4-1-3	Y	Y
	DS404.2	Access from the community to necessary but not indispensable facilities such as social centers, cultural and religious centers, post offices and banks should be unobstructed and reliable.	OBJ..	1-2-5; 2-1-2 2-1-5; 2-1-6 3-1-4; 3-2-4 3-2-5	Y	N
	DS404.3	Access from the community to useful facilities such as shopping malls, restaurants, cafes, bookstores and sports centers should be unobstructed and reliable.	OBJ.	1-2-3; 1-2-5 2-1-2; 2-1-5 2-1-6; 3-1-4 3-2-4; 3-2-5	Y	N
	DS404.4	Access from the community to parks and gardens should be unobstructed and reliable.	OBJ.	2-1-2; 2-1-5 2-2-6	Y	Y
	DS404.5	The urban context should have public transport stops.	OBJ.	2-1-1; 3-1-3	Y	Y

QOL Domains:
1-1-1: ability to be mobile, 1-1-2: ability to self-transfer, 1-1-3:ability to take care of one's own body, 1-1-4:ability to go to the toilet on one's own, 1-1-5: ability to self-feed, 1-1-6: ability to self-dress, 1-2-1: ability to prepare meals, 1-2-2: ability to do housework, 1-2-3: ability to do one's own shopping, 1-2-4: ability to manage one's own health, 1-2-5: ability to manage transportation, 1-2-6: ability to manage technological devices, 2-1-1: sense of privacy, 2-1-2: sense of security and safety, 2-1-3: sense of belonging to one's own home, 2-1-4: sense of peaceful sleep and rest, 2-1-5: sense of self-esteem, 2-1-6: sense of self-actualization, 2-2-1: suitable equipment size and height, 2-2-2: enough storage/worktop space, 2-2-3: suitable environmental comfort, 2-2-4: suitable material, 2-2-5: visual well-being, 2-2-6: access to nature and view, 3-1-1: relations with partner, 3-1-2: relations with family and friends, 3-1-3: relations with neighbors, 3-1-4: relations with the wider community, 3-2-1: continuing familiar activities, 3-2-2: looking after plants/flowers and pets, 3-2-3: staying active, 3-2-4: contributing to volunteer activities, 3-2-5: doing recreational activities with others, 4-1-1: caregiver support, 4-1-2: on-site staff support, 4-1-3: access to healthcare professionals, 4-2-1: alarm systems, 4-2-2: structural supports, 4-2-3: assisted living technologies, 4-2-4: social robots
Design Element:
SE-HE: Housing Entrance, SE-BE: Building Entrance, SC-HH: Hall, SC-HC: Corridor, SC-HP: Pathways, SL-RL: Living Room, SL-RK: Kitchen, SL-RB: Bedroom, SL RBT: Bathroom, SL-OPG: Private Garden, SL-OBT: Balcony/Terrace, MC-F: Finishes, MC-C: Complementary Components, BE-D: Door, BE-W: Window, BE-S: Stair, BE-R: Ramp, BE-WL: Wall, BE-FL: Floor, SS-L: Lifts , SS-E: Electrical Installations, SS-V: Ventilation, SS-H: Heating, SS-LT: Lighting, SS-WS: Water Supply Systems, SS-SA: Safety and Alarm Systems, SS-CS: Communication Systems, SS-AL: Assisted Living Technologies, FT-SU: Shower Unit , FT-TO: Toilet, FT-SK: Sink, FT-CT: Countertops, FT-CB: Cupboards, FT-FR: Furniture, AP-WM: Washing Machines , AP-RF: Refrigerators, AP-CK: Cookers
Abbreviations:
SBJ: Subjective OBJ: Objective.