

Kitchen Layout Design Guide

Key resources
for your design
process



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Thanks are also extended to all other organisations and individuals who contributed to the Kitchen Layout Design Guide.

Foreword



The kitchen is often considered the heart of the home. Whilst kitchens come at a wide variety of price points and styles, a well-designed and laid out kitchen is often more important than its aesthetic. A good kitchen layout may go unnoticed – a poor design can ruin the experience of a kitchen, however nice it looks.

It is important that everything in the kitchen is at hand when you need it, whether that is ingredients, cutlery, crockery or cookware. Nobody wants to be continually bending down or stretching up to reach to reach than pan or tin of food – let alone pacing up and down the kitchen between the preparation area, cooker and waste bin. A good kitchen layout will remove these issues and enhance the user's enjoyment of their kitchen.

Designing a good kitchen layout needs an understanding of what the user needs and how they will interact with the kitchen, thus a kitchen design is as much a bespoke design for the user as it is for the available space.

The Furniture Industry Research Association is pleased to present this design guide which provides kitchen designers with the information to:

- Design kitchen layouts that suit the users' needs and requirements
- Understand the current standards and legislation affecting kitchen furniture and design
- Understand the importance of ergonomics within the kitchen layout design
- Understand the importance of workflow in kitchen design
- Understand how to design a kitchen for users with special needs

These guidelines are intended to help kitchen designs produce kitchen layouts that will delight their customers and drive up consumer satisfaction.

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1.



Introduction

1. Introducing the Kitchen Layout Design Guide

Good design is essential for any environment. Ensuring this can be challenging when faced with an environment such as the household kitchen. The household kitchen is used for a variety of tasks, not limited to cooking. Direct contact with multiple people presents itself as another challenge. Ergonomics is about ensuring interaction with the product or environment is as efficient as possible. Prioritising ergonomics in the design process will lead to a more functional space. It can be the case that a kitchen design is aesthetically excellent but is not functional or effective. Without the relevant information at hand, it is easy to overlook important issues, therefore resulting in poor design. Ergonomic consideration increases safety, comfort and performance. For this reason, the Furniture Industry Research Association has created the Kitchen Layout Design Guide; this guide does not dictate how to design, but aims to give advice on design choices and improve efficiency within the kitchen. The guide focuses on emphasising the importance of ergonomics in kitchen design.

Competing in a market driven by aesthetics and cost alone is difficult; however the addition of bringing functionality to the forefront of the design will add extra value to the customer which, once explained to them, could be a deciding factor for their kitchen design.

Kitchens are a large financial investment and often will be used for many years, customers could be using their kitchens through significant changes in their lives, e.g. having children, coping with illness or accessibility issues, ageing. Kitchens are also generally used by multiple users with varying requirements and needs. In order to design a kitchen that is fit for purpose at the time of purchase and also future proofed as far as possible, it is important that the right information is gathered about the user(s) at the beginning of the design process.

During the early stages of research for this document, a survey was carried out which looked at various aspects of kitchen layout design and usage. In general, the full results as presented in the appendix does not draw conclusions from the factual data, instead, implications of the survey results are explored throughout this kitchen layout design guide.

In order to survey the UK population a professional market research company were hired. This sample was nationally representative in terms of age, gender and regional profile. This highlighted the four main issues of current kitchen designs:

Accessibility

With regards to accessibility, kitchens are commonly designed in a way that doesn't allow for easy accessibility in all areas. The user survey indicated that participants found that their current kitchen storage was often too high, too low or too deep for them to access. This is addressed in the Accessibility section of the guide.

Functionality

This design guide refers to functionality in the kitchen by discussing efficient locations of appliances and equipment to ensure a good workflow. 32% of respondents from the user survey said that their kitchen would be improved by changing where appliances are located in their kitchen. This is addressed in the Functionality section of the guide.

Storage

The storage section of this guide attempts to give guidance on how to tackle the response by participants from the survey. 50% of respondents stated that they would change their type of storage. This is address in the Storage section of the guide.

Hygiene

Household kitchens can often be associated with issues relating to hygiene. The user survey and relevant research papers have confirmed this. The design guide will provide an awareness for the possible hazards this may cause and how to avoid this in the kitchen.

In addition to carrying out the kitchen user survey, a review of available literature was carried out in order to find out what guidance was already in the public domain. It was found that there are very few research papers that are available on the topic of kitchen design and the majority of these papers were very old (1970's). Whilst much of the information in this research is still valid and useful, there has been considerable development in technology and design, the use of appliances and people's lifestyles, and the shapes and sizes of the UK population since the research was carried out, meaning that aspects of it are out of date and require updating.

Discussions with manufacturers and retailers played a key role in determining the content of this guide. This was valuable in giving an understanding of the current knowledge kitchen designers possess. These discussions provided a guideline of what training kitchen planners go through. The training appears to be largely based around the end user and aesthetics. However, there is little emphasis on the importance of ergonomics in the kitchen, understanding the need for this guide. The guide is designed to give a better understanding to kitchen manufacturers and planners on how and why ergonomics should be at the forefront of design in the kitchen environment.

Online research provided an insight into what products and advice is offered by kitchen companies and this has been incorporated into this guide.

Scope

This kitchen layout design guide is designed to be used by designers and manufacturers of whole kitchens and of parts of kitchens.

The aesthetic of a kitchen are a very personal decision and there are almost endless variations that customers can choose from, however it is easy for any manufacturer to recreate a similar look for varying budgets. This guide has not been developed to comment on the design/aesthetics of the kitchen, rather it is to provide guidance to help improve usability for the end user of the kitchen to suit their individual needs.

Relevant standards may be referred to in this kitchen layout design guide where appropriate. This guide will discuss the importance of specifying the correct height of worktops and cupboards for an individual user. Some specific dimensions will be explored and detailed further. The kitchen layout design guide aims to provide valuable guidance on ergonomic principles.

This design guide is for kitchen designers and manufacturers to help them to design for accessibility, sensible workflow and to cater for users specific needs. It is the kitchen designer/retailers job to inform the client about these issues.

1.1 Definitions

Ergonomics: The study of people and their interaction between products and their environment.

Anthropometrics: the study concerned with the measurements of the proportions, size, and weight of the human body.

Kitchen designer: An individual who designs a kitchen for a member of the public.

Kitchen Manufacturer: a manufacturer of any item that can be assembled into a kitchen e.g. cupboard doors, worktops, hinges, sinks etc.

Functionality: The quality of being suited to serve a purpose well; practicality.

Accessibility: It refers to the ability for everyone, regardless of disability or special needs, to access, use and benefit from everything within their environment.

1.2 Relevant Standards

When designing a new kitchen or considering a new layout it is important to ensure that the space will be safe to use and it complies with the relevant standards. These standards ensure safety for the occupants and guarantee it is fit for purpose.

Standards are not a legal requirement however, they are an indication of best practice. Therefore, by meeting these standards, products should meet minimum requirements to be safe and fit for purpose.

1.2.1 ISO 3055:1985 Kitchen equipment – Coordinating sizes

This International Standard defines sizes for components of kitchen equipment in dwellings. This International Standard applies, according to the principles of modular coordination in building, to all components of kitchen equipment, for example cabinets, worktops, sink units and appliances.

It also specifies, in Annex A, the sizes of zones for hot and cold water and waste and gas pipes in kitchen cabinets and certain appliances.

General guidance on the planning of domestic kitchens is given, for information only, in Annex B.

This standard is currently being revised, the dimensions given in the standard are being updated to be in line with the dimensions stated in EN 1116:2018. However, the guidance within Annex B which is provided for information only will not be changing.

It is stated in this standard that kitchen planning should reflect the work processes and sequences to guarantee a comfortable, safe and agreeable environment. The natural behaviour of children, the elderly and people who are physically handicapped should also be considered in design to ensure their safety too.

The standard also states that the provision for subsequent improvements should be in place as activities and equipment needs could change; thus it is important to maintain a high degree of flexibility, attach interchangeable fittings and the ability to adjust.

1.2.2 EN 1116: 2004 -Kitchen furniture. Co-ordinating sizes for kitchen furniture and kitchen appliances

This European Standard specifies co-ordinating sizes for kitchen units, worktops, recess panelling, furniture fronts and decorative panels as well as for kitchen

appliances (white goods and ovens) and further installation elements, e.g. sinks (abbreviated as “appliances”).

It specifies dimensions for the height, the width, the depth and the space to integrate appliances in kitchen units.

This European Standard does not apply to kitchens used commercially (e.g. in hotels, restaurants).

No guidance is provided in this standard to help with the complete planning of a kitchen from an ergonomic or accessibility point of view.

1.2.3 BS 8300-2: 2018- Design of an accessible and inclusive built environment

This British Standard explains how buildings, their approaches and immediate surroundings can be designed, built and managed to achieve an inclusive environment.

This part of BS 8300 gives recommendations for the design of buildings to accommodate users with the widest range of characteristics and capabilities.

Section 19.1 focuses on the importance of ensuring preparation areas, cooking areas and appliances are within reach for users with restricted movement. It also talks about the considering the arrangement of kitchen areas and fittings.

1.2.4 BS 4467: 1991- Dimensions in designing for elderly people

This British standard provides guidance relevant to the design of equipment and building for elderly people. It provides a range of anthropometric dimensions accompanied by a number of applications for this data. The standard does not cover seriously disabled and non-ambulant elderly individuals. The guidance is based upon the dimensional requirements of elderly women but the guidance will also prove suitable for the majority of elderly men.

1.3 Going Beyond the Standards

Generally, standards set out the minimum requirements a manufacturer should aim to achieve whether they be for safety, quality or usability, however, neither of the relevant standards mentioned above provide sufficient guidance on the complete planning of kitchens to ensure good ergonomics and therefore address functionality and accessibility issues. There is often much more that can be done to improve on these minimum requirements to provide a customer with a better overall product. Therefore, producing this design guide will be of value to the designers and the customers.

1.3.1 FIRA Gold

The FIRA Gold Certification is the recognised quality mark for products or installation services within the furniture and kitchen industries.

To be awarded FIRA Gold, a product or installation service must be assessed against specified performance levels through independent tests or evaluation by furniture industry experts, FIRA.

It is documented proof that products and installation processes are of the highest standard with consistency in production and installation quality verified through regular audit testing and inspections.

As well as looking at safety, strength and durability the FIRA Gold assessment process also assess ergonomics, this involves the following assessments:

- Dimensional
- Handles – ensuring they are easy to grip, that there is enough space to fit fingers behind the handle, that cupboard doors are easy to open, that there are no sharp edges that the handles are attached securely to the doors or draws, that handles are appropriately positioned.
- Shelving – ensuring that the shelves are fitted with no large gaps around the sides, that they are securely fastened to the cupboard and cannot be tipped or pulled out accidentally.
- Drawers – ensuring they are easy to use with smooth runners, that they are securely attached to the unit with no risk of them falling out when opened, that the base of the draw is solid and secure
- Cupboard doors – ensuring that cupboard doors are able to open a minimum of 135°, that there are no sharp edges
- Work surfaces – ensuring that they are hard wearing and easy to clean, that the main edges along the front of the worktop should be well rounded and smooth, that the worktop material should be unlikely to scratch or be easily damaged.

2.



Ergonomics

2 Ergonomics

Ergonomics is the study of people and their interaction between products and their environment. Products, equipment and environments can be modified to make the intended task as harmonious as possible to avoid injury, stress, and frustration and increase productivity. In many cases, humans can adapt to unsuitable conditions, but such adaptation often leads to inefficiency, errors or physical and mental cost. Designing equipment and environments to improve posture and ease the stress on the body can reduce instances of injury and also save time.

The application of ergonomics in the design of kitchens is important. Good ergonomics is an important factor in the overall health, safety and well-being of individuals. Good, ergonomically designed kitchens occur when they have been designed with both the intended user(s) and use in mind.

Domestic kitchen design should reflect the principles employed in commercial kitchens such as equipment design and workplace layout (Ward, 1974).

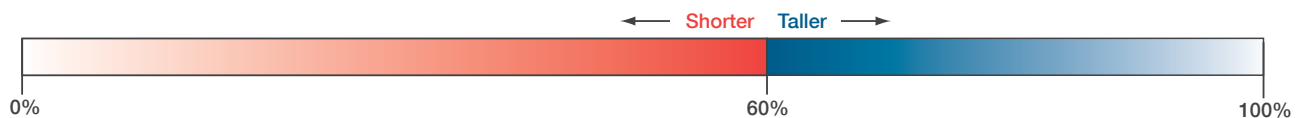
The ergonomic design of kitchens has to take into account the following factors:

- The size and height of worktops to match the size of the prime user
- The amount of storage to match the cooking style of the intended user(s)
- Wellbeing, safety and comfort of users
- Productivity and efficiency of users in carrying out their tasks
- Meeting the needs of the intended users
- Ensuring unimpeded interaction between the user and equipment
- Time spent in the kitchen
- Activities carried out in the kitchen
- Matching the forces required to operate any equipment and the capabilities of the intended user population
- Safety of the furniture which should not be the source of risk of injury during intended use
- Inadvertent operation of any functions of the kitchen
- Acceptable misuse of the furniture and the consequences
- Ensuring the kitchen can accommodate intended appliances in a safe manner

2.1 Anthropometrics

Kitchen design should be centred on the user and how they intend to use the space. This is often overlooked by aesthetics and style. For kitchens, it is critical that the tasks and usability are at the forefront of the design. Using dimensional standards for the design is important, however these dimensions may be given higher importance if the designer understands why these specific dimensions have been chosen. This is why it is necessary to understand anthropometrics.

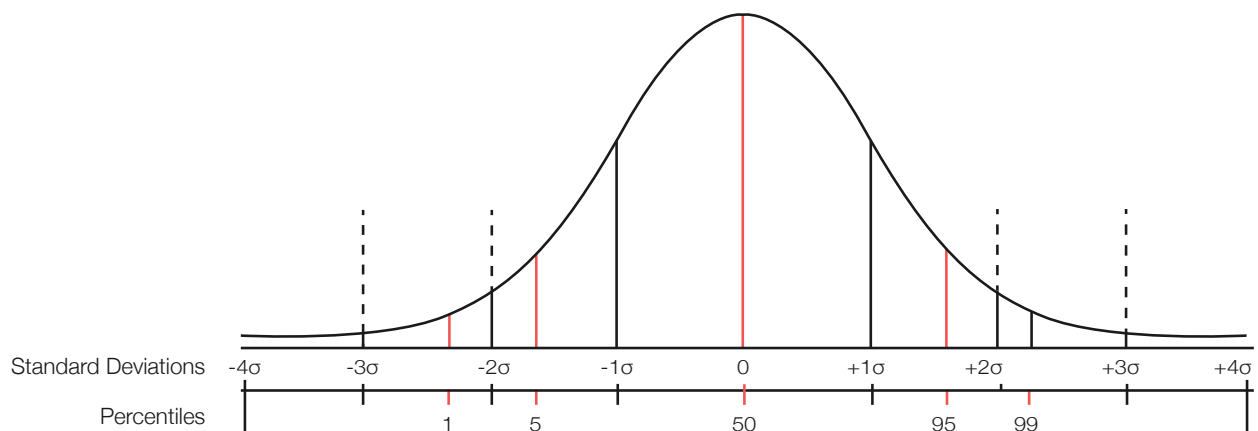
A commonly used term when referring to anthropometric data is percentiles. This means the percentage of the user population that is more or less than the particular dimension stated. Due to the fact that every person/user is different, it is hard to rationalise a designer stating that they are just going to design their kitchen for the average user. Kitchens are often a shared space and therefore people with varying age, height and stature will be using it. For example, if a kitchen worktop was designed for the 95th percentile male then there would be a huge proportion of people that would struggle to use the work surface. For this reason, kitchen designers must consider a variety of anthropometric data in order to result in an efficient space for users to interact with.



Or if data said that the reach of a 5th percentile female was 623mm, it would mean that 5% of the population had a shorter reach than this, and 95% had a longer reach.



The distribution of percentiles is not even. On a graph, a distribution would look something like this:



Notice that the scale of percentiles is not linear; there are more people closer to the 50th percentile.

2.2 Ergonomic Tools

2.2.1 Task analysis?

Task analysis is a systematic breakdown of job elements to identify the operational sequence of the activity and the way in which the individual uses the information and equipment provided.

2.2.2 How can it be used to optimise a kitchen layout?

Task analysis is the initial step to take that gives the designer a good understanding of how the space needs to function in order to aid the user to fulfil tasks with minimal effort and maximum efficiency. It identifies the needs of the user and the frequency of tasks they complete. Task analysis can also help to define the nature of specific tasks and can help to show how certain things need to be adapted in order to make the environment more suitable.

If specific tasks are identified, then they can be investigated further to give clarity on the most efficient method of completion. Task analysis can provide a detailed description of both manual and mental activities, both factors being important to bear in mind when designing a new kitchen layout. It can deliver information on task durations, frequency, complexity, environmental conditions and any other prominent factors that may be required for one or more people to perform a given task.

2.2.3 How to go about a task analysis in the kitchen

If you follow a simple three step guide then task analysis can be simple.

Step 1: identify the main tasks that are completed in the kitchen environment. You need to break down the accumulation of broad activities that take place in the kitchen into separate tasks and focus on each as an individual job. The task should describe what the person does on the job. Generally this will start with an action verb. An example of a task could be; wash up the dishes or prepare the vegetables.

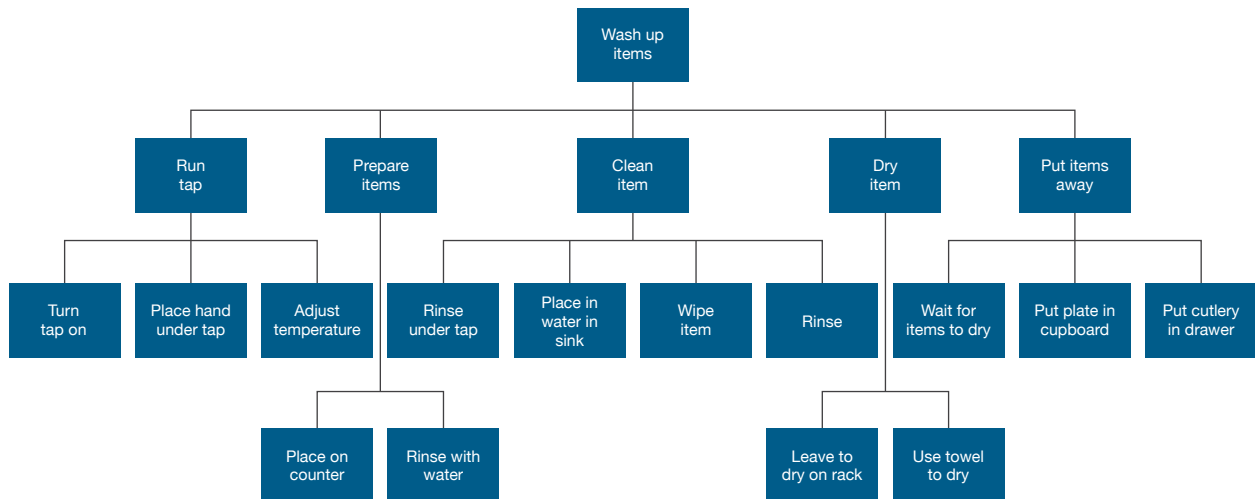
Step 2: Break down the identified tasks into sub-tasks.

Sub-tasks are smaller sections of the main job that combine together to complete the overall task. This information is obtained by observation of the task as a whole. For example, when tackling the task of preparing vegetables a sub-task would be to obtain the utensils needed to complete the task.

Step 3: Identify the steps that need to take place to complete the subtask.

This is a breakdown of the sub-tasks. They are actions that should be carried out in order. It is the actually separate actions that take place to complete the job.

For example, 'go to drawer', 'take knife out of drawer', 'chop carrot'.



Example HTA of a simple task performed in the kitchen – Washing up.

2.2.4 What are the benefits of performing task analysis for a kitchen planner?

By applying task analysis it ensures that a product is easy to use and meets the user's needs. Kitchens are often a shared space so it is common that two people may have different techniques of completing the same task. Task analysis can help to make sure that each person is taken into account.

Task analysis can reveal a better picture of what the kitchen needs to do. From this the planner can then consider what the design implications are because of this. For example, if a user goes back to the same cupboard multiple times to get different items the design could be altered to be closer to the activity point or the cupboard could be made better for visibility to show that both items were in there at the first point of collection.

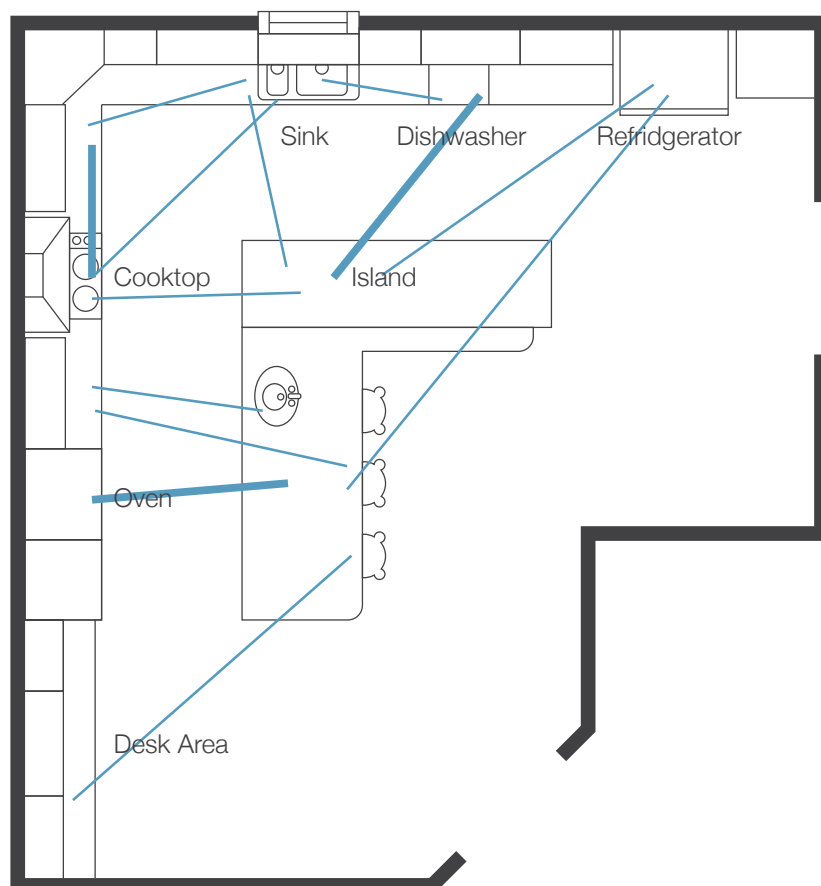
It can also help to identify frequent, common and less frequent tasks. Therefore helping the design process by ensuring that all of the frequent task equipment is in the most accessible position in the kitchen.

2.2.5 Link analysis?

Link analysis is an analysis technique that is used to evaluate relationships or connections between objects or tasks. These relationships can be between various types of objects or people.

2.2.6 How could link analysis be used in kitchen design?

This analysis technique could be really beneficial when designing the layout of a new kitchen. It can provide a link and pattern between different objects associated with a certain task. If these links can be identified then the layout of the kitchen can be changed accordingly to make the task performance as efficient as possible. For example, if there was a strong connection between the user interacting with the hob and a certain cupboard with certain appliances in there, then the cupboard could be moved closer to the hob to reduce the movement and effort during the task.



Example of a simple Link Analysis demonstrating frequent movements within the kitchen



3.

Accessibility

3 Accessibility

Accessibility within a kitchen is very important to ensure all users are able to easily source everything they need to carry out their kitchen tasks, this section will focus on how anthropometrics of users should inform the decisions made about the type of storage chosen and the heights at which storage units and worktops are placed.

3.1 Accessibility- Survey Data

When carrying out the Kitchen User Survey, participants were asked if they had any accessibility issues in their kitchen, whether this be storage that is too high, too low or too deep to access easily. The following responses were given:

- **41.5%** said that they had storage that was **too high** for them to access easily.
- **14.4%** said that they had storage that was **too low** for them to access easily.
- **19.5%** said that they had storage that was **too deep** for them to access easily.

Participants that stated they had difficulty accessing some of their storage cupboards were asked how they personally get around the issue, 14.9% of respondents said that they 'put things in high units that are not often used' or 'don't use high unit at all'. This doesn't need to be the case as there are products on the market that provide a solution to make storage space more efficient and these can be adapted to make use of all of the available space.

When asked how they get around their deep cupboards one respondent just answered that they 'just have to struggle'. From an ergonomics perspective, there is a clear opportunity for improvement here. The use of pull outs and drawers would help these users from struggling to access deep cupboards as they would not have to bend down and reach into them, instead they would be able to easily see what is in a draw and have easy access to it.

These statistics clearly show that more can be done in the design of kitchen storage to make it more accessible and therefore better utilised. The high percentage of the population that have stated they have these accessibility issues is a clear opportunity to manufacturers and kitchen designers to add value to the product.

3.2 Key Anthropometric Data to Consider when Designing a Kitchen

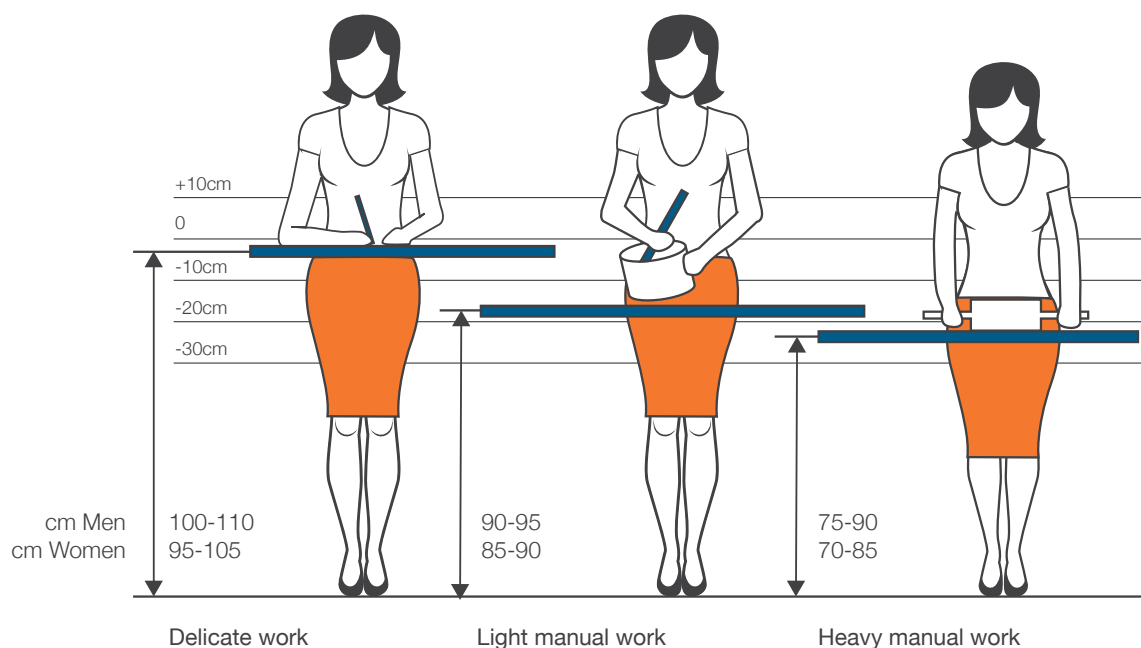
3.2.1 Worktop height

Research into kitchen design stated that worktop heights need to vary according to the height of the user and the task they are performing. For example, preparation of

food, washing up and kneading all require varying working heights to achieve optimal efficiency and comfort for the task.

Whilst in principle the optimal height of the three main work surfaces (upper edge of sink, cooker and work table(food preparation) is different, as described above, there is more to be said for a uniform height, reducing both the amount of handling of pots and pans and the risk of hitting them against the raised edges. Ergonomics of the home (published in 1973) suggests a uniform height of 900mm, this is in line with most guidance today for the height of a worktop and is largely due to the height of appliances that are designed to go underneath the worktop, for example, dishwashers, washing machines, fridges and ovens.

A worktop height of 900mm may be suitable for a variety of users, however, it may not suit users who are on the extremes of the user population, for example very tall users and very short users. In these cases a higher or lower worktop height may be preferred but when making this decision all users of the kitchen should be considered.



It is recognised that worktop height is also dependant on the height of appliances that have been specified to sit underneath it, this will generally set a minimum height that the worktop can be placed at. If a user has a requirement for a worktop that is lower than is necessary to fit standard appliances under, the layout of the kitchen may need to be reorganised to reposition these appliances and allow for a lower worktop height to be prioritised.

3.2.1.1 Working heights, standing

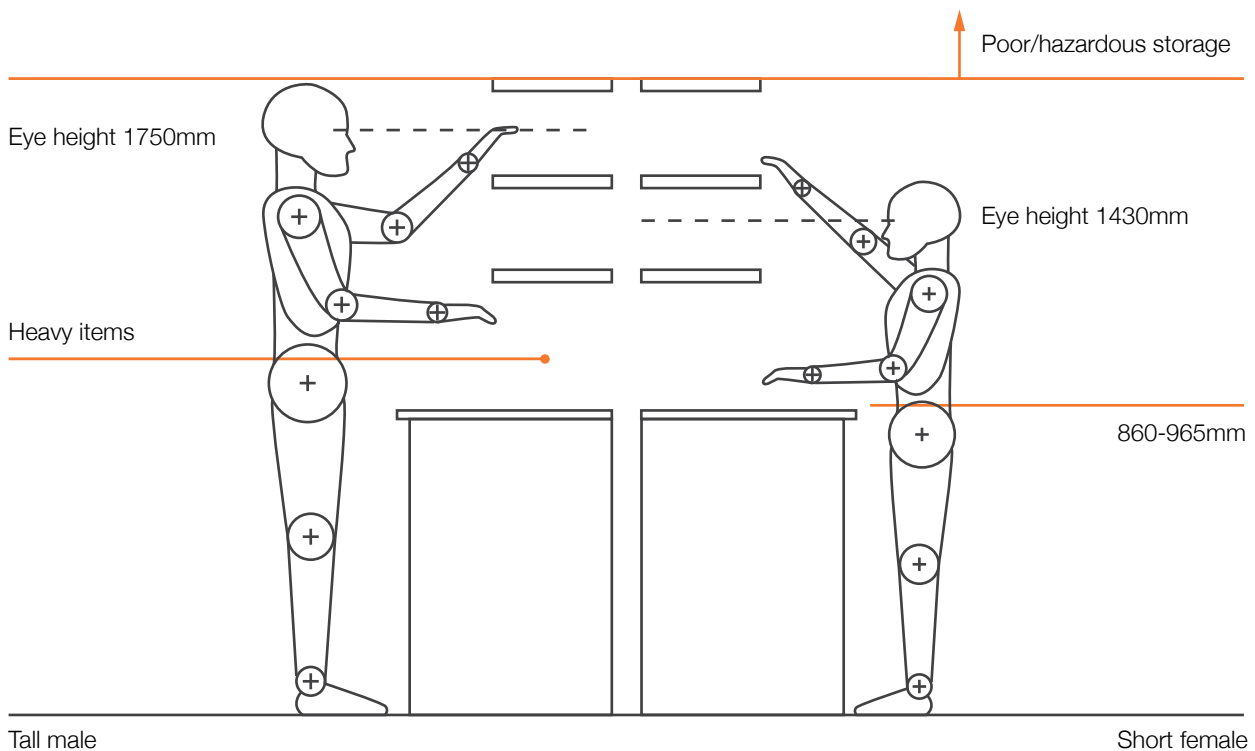
ISO 3055:1985 states that certain activities require different working heights. When standing, food preparation should take place between 850mm and 1000mm. For activities such as washing up the working height is required to be higher, ranging from 900mm to 1050mm.

A worktop level of 850 mm and 900 mm is specified in 5.1. To make allowance for differing statures and activities, a range, at intervals of 50 mm, up to 1 050 mm is desirable. Adjustments in height can be made by different plinth heights and other means.

3.2.2 Height of wall cabinets

Since stature plays a decisive part in determining height of reach, shelves in both top and bottom cupboards should always have the maximum possible adjustment so that they can be adjusted to the individual needs.

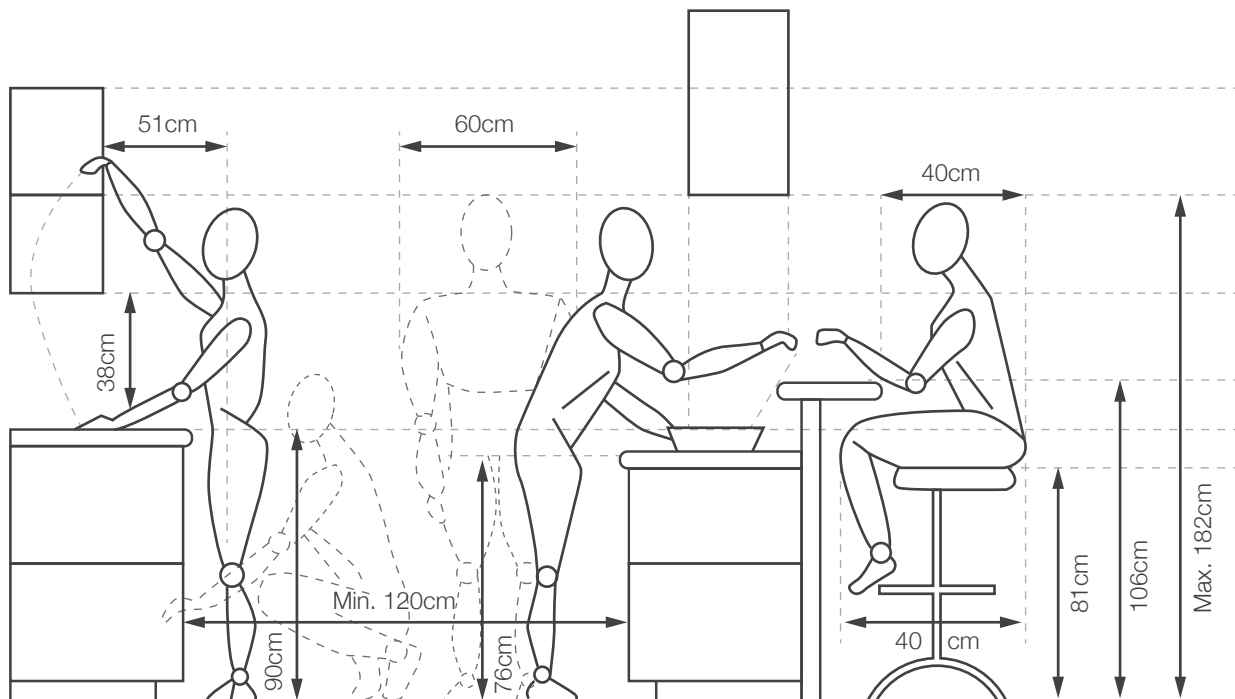
When considering what height to put wall cabinets there are a few parameters that need to be factored into the design. Discussed below are a number of ergonomic factors to consider about the height of wall cabinets that will be designed into the user's kitchen.



3.2.2.1 User's reach, vertically and horizontally

When designing a product that involves the user needing to reach a smaller percentile should be used. This is to ensure that as many users as possible can make use of the product. If the reach capacity is designed for the average person then 50% of the population will struggle to reach it. This includes reaching vertically up to a cabinet and reaching horizontally across a work surface. Therefore, by using a smaller percentile is allows for a larger percentage of people to be able to reach the space.

Annex B in ISO 3055:1985 states that it should be possible to store frequently used items within convenient reach. The term 'vertical reach' refers to the maximum height from the floor to which a person can reach an item. A convenient range of vertical reach for frequently used items is 400mm for a floor unit and 1800mm from the floor for a wall unit. These limits will allow the user to reach appropriately for both grip height and touch height.



3.2.2.2 Strength of the user

Lifting ability is something that needs to be considered when designing a kitchen. It is important to consider the weight of the items being lifted onto and off of a shelf in relation to the height of the shelf. Users may not know exactly what they want to place on each shelf at the time when the kitchen is being designed, however a zonal approach can be taken whereby advice is provided on how much space is available within cupboards from certain types of items. This way customers can decide whether they have enough storage within accessible reach for their most commonly used items. Heavy items should be placed at a low-medium height in order to prevent the

user from straining too much when retrieving it. It is also a good idea to have a lot of flexibility in the heights at which shelves can be placed, users can then rearrange the shelf height to suit their needs at any point in time.

3.2.2.3 Line of sight to back of counter

Your line of sight is an imaginary line that stretches between your eye and the object that you are looking at. In a kitchen environment users like to be able to see that whole counter. The line of sight to the inner edge of the worktop should not be obstructed by fixed units or appliances. For this to be possible, the users' height and the height of the worktop needs to be taken into consideration. This is also applicable in relation to kitchen cupboards. The users need to see to the back of the cupboard to get full use of the space available. If this isn't possible then items often get lost and forgotten about. Annex B in ISO 3055:1985 states that this condition is met if the bottom of the wall unit is 1300 mm from the floor.

3.2.2.4 Location of appliances in tall units

Appliance height is a deciding factor that influences a lot of the other heights in the kitchen. Annex B in ISO 3055:1985 has given guidance on the location of appliances in tall units. It states that for ovens and dishwashers, a safe and convenient working height is more important than sight lines. Ovens should be located so that the bottom of the oven door is level with the work surfaces in the kitchen or the same as any pull out surfaces that may be of use. Ideally dishwashers should be located next to the sink. This normally means that dishwashers are placed on floor level underneath the work surfaces. However, this isn't always the case. It is suggested that for convenient loading, dishwashers should be located so that the top of the dishwasher is no more than 1000mm from the floor. Refrigerators and freezers should be located within a zone from 40mm to 1800mm from the floor.

4.

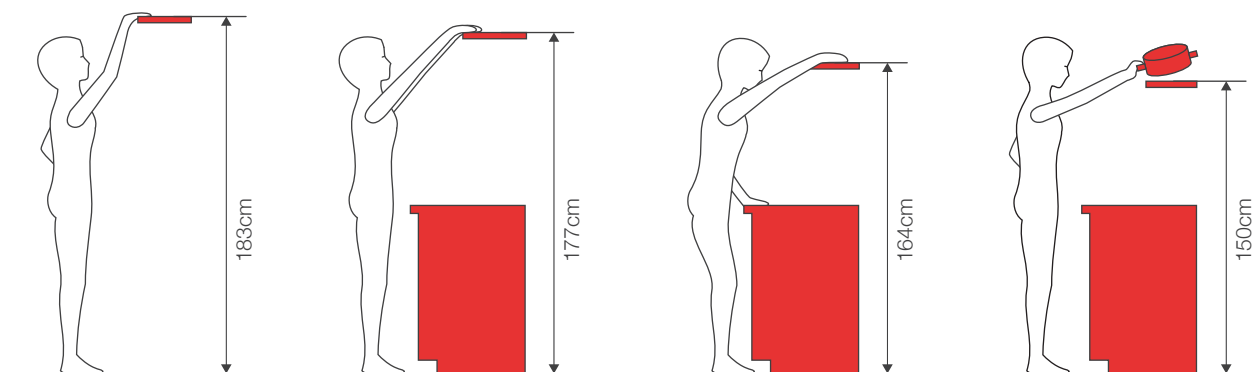


Storage

4. Storage

The importance of anthropometry and ergonomics in the field of furniture design has been confirmed by many authors. Although this doesn't directly relate to kitchens, there are still a number of findings that should be used to make kitchen storage more efficient with regards to space and functionality. Having properly sized and appropriately placed storage can dramatically reduce the effort of kitchen chores and can decrease the amount of space used for this purpose. In designing kitchen furniture and storage the height, accessibility and layout should be taken into consideration. Working in awkward, contorted positions can negatively increase fatigue and stress on the body, as well as reducing strength and dexterity, which over time may make it more difficult to complete the task at hand. This is why it is so important to plan the storage ahead of time so that the users can interact with the space in the most efficient way possible.

Kitchen planners should implement storage solutions to maximise volume of storage and increase efficiency. If storage is still not accessible then there is a need to design it more safely and conveniently to help people better access their storage. Some manufacturers are already providing a number of innovative solutions. Planners should encourage their buyer to choose these kinds of products as they will facilitate efficiency throughout the lifetime of the kitchen. They will also aid accessibility when the user could be faced with physical restrictions in the future due to the aging process.



4.1 Storage - Survey Data

It was discovered through the user survey that storage was one of the biggest downfalls participants experienced in the kitchen. When carrying out the Kitchen User Survey, participants were asked if they thought they had enough storage in their kitchen. The following responses were given:

- **65.2%** of respondents thought that they had enough storage space.
- **31.4%** of respondents did not think that they had enough storage space.

Of the 127 respondents that felt they did not have enough kitchen storage, 52% [66 respondents] felt that units were too high. Of the 264 that felt they did have enough kitchen storage, 34.8% [92 respondents] of them felt that units were too high. The percentage difference here is statistically significant seemingly suggesting that if units are more out of reach, space will not be utilised as effectively and the respondent is more likely to feel that there is less storage.

In section 4.3.16 of the kitchen survey report, we found that 35.7% of respondents had to keep food and or kitchen related items stored outside of the kitchen. This could be out of choice or buying in bulk or it could be due to a lack of usable storage space.

- **39.6%** of those that bought/designed/re-designed their kitchen have cupboards with 'pull-outs' in.
- Whereas **23.2%** of those that did not buy/design/re-design their own kitchen have cupboards with 'pull-outs' in.

This is a statistically significant difference and suggests that you are more likely to have cupboards with pull-outs in if you bought/designed/re-designed your own kitchen, although 39.6% is still a minority.

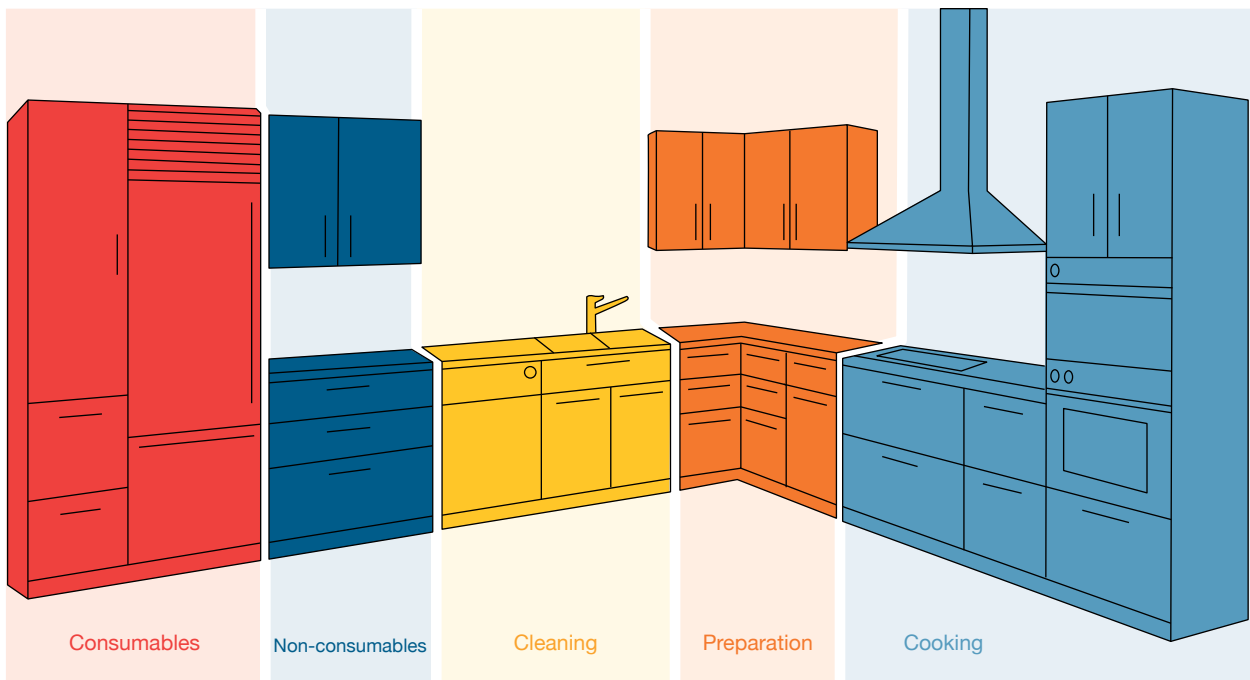
4.2 Storage – Amount, Type and Position

Certain items require different types of storage in order to get the best use of the space and make the access to these items most effective. The amount of storage needed is dependent on the individual and their requirements with regards to cooking and shopping habits, the number of people using the space and the lifestyle of the users. Once the amount of storage has been established the planner then needs to consider the type of storage that is most appropriate for the type of equipment.

Types of storage can be divided into different groups depending on its use. Each type of storage is responsible for different appliances and goods. Consideration for the location of these groups is imperative to ensure a good work flow in the kitchen. The groups can be loosely arranged into 5 areas. Explanation of these are as follows:

Storage responsible for; **consumables, non-consumables, cleaning, preparation and cooking.**

- The kitchen benefits from all consumables being kept in the same area. Storage such as food cupboards and the fridge need to be in close proximity to one another. Arguably, this area will be used most frequently so it needs to be easily accessible.
- Tableware such as cutlery, dinnerware and glasses occupy another area of the kitchen. In order to promote a good workflow it is important to keep these items stored close to each other. If layout allows, it is also beneficial to have these stored close to the sink or the dishwasher.
- The sink and dishwasher should be kept in the same place. This makes the cleaning process easier and it also means that they can use the same access point for water. It is also important to allow sufficient space for cleaning utensils and cleaning agents.
- Utensils used for preparing food need to be stored allowing for easy accessibility and located close to the worktop and food area. It is likely that the user will come back and forth from this point so accessibility is crucial to improve efficiency.
- Finally, cooking pots and pans are another separate storage area. This should be situated next to the hob and the oven. Having this located close to the cooking working zone reduced the effort required during the cooking process.



4.3 Solutions for Poor Storage

Too often the type of storage used in kitchens is overlooked. Frequently kitchens are comprised of as many units that can be fitted into the space, with little thought into what would be most suitable for the user. A consideration for the type of storage put into the kitchen could dramatically increase the efficiency of the space. Cupboards are more effective with pull-outs instead of shelves inside as they allow all items to be reached easier which could mean that items are stored more efficiently thus increasing storage space. Discussed below are a few solutions to overcome the common pitfalls people face in the kitchen with regards to poor storage solutions.

Consideration for **how much** storage space is needed should be the first thought. This is dependent on how many people are going to be using the kitchen, shopping habits and cooking styles. You can then tailor the **type** of storage to fit the user.

Ideas to make better use of storage space:

- The primary goal is to maximise the use of the available space. This includes making use of dead space that wouldn't typically be used. For example, having a drawer under the sink provides an extra area to store items. This area would otherwise be wasted space.
- By fitting wider, deeper and higher drawers it makes a considerable difference to the amount of equipment that can be stored. By using wider pull-outs 15% more storage space can be created. Deeper pull outs can produce up to 30% more storage space. Drawers with higher sides can help to gain up to 55% more storage space.
- Clear visibility makes the access to items within cupboard and drawers much easier. It means that items don't get lost or forgotten about. Therefore meaning you can store things at the back of cupboard without fear of it not being used.
- Corner cupboards are often used in kitchen. However, they are often designed in such a way that it makes it hard to access the items in them. This can be overcome by installing corner drawers that pull out to full extension or adding a carousel to the cupboard so that items can be accessed once it has been rotated.
- The number of drawers also need to be considered. If one large drawer is used over two smaller drawers then this saves a large amount of space.



5.

Functionality



5. Functionality

This section will discuss how to optimise the functionality within a kitchen and will focus on how layout and integration of appropriate storage solutions play a role in this. It will also discuss the importance of understanding the customer's unique requirements in terms of their lifestyle and their preferences and how this will impact the design of the kitchen.

5.1 Functionality- Survey Data

When carrying out the Kitchen User Survey, participants were asked what changes they would make to their current kitchen. The following responses were given:

46.7% of respondents suggested changes that they would make to their current kitchens, these responses were grouped into categories, and multiple responses were possible.

Of note:

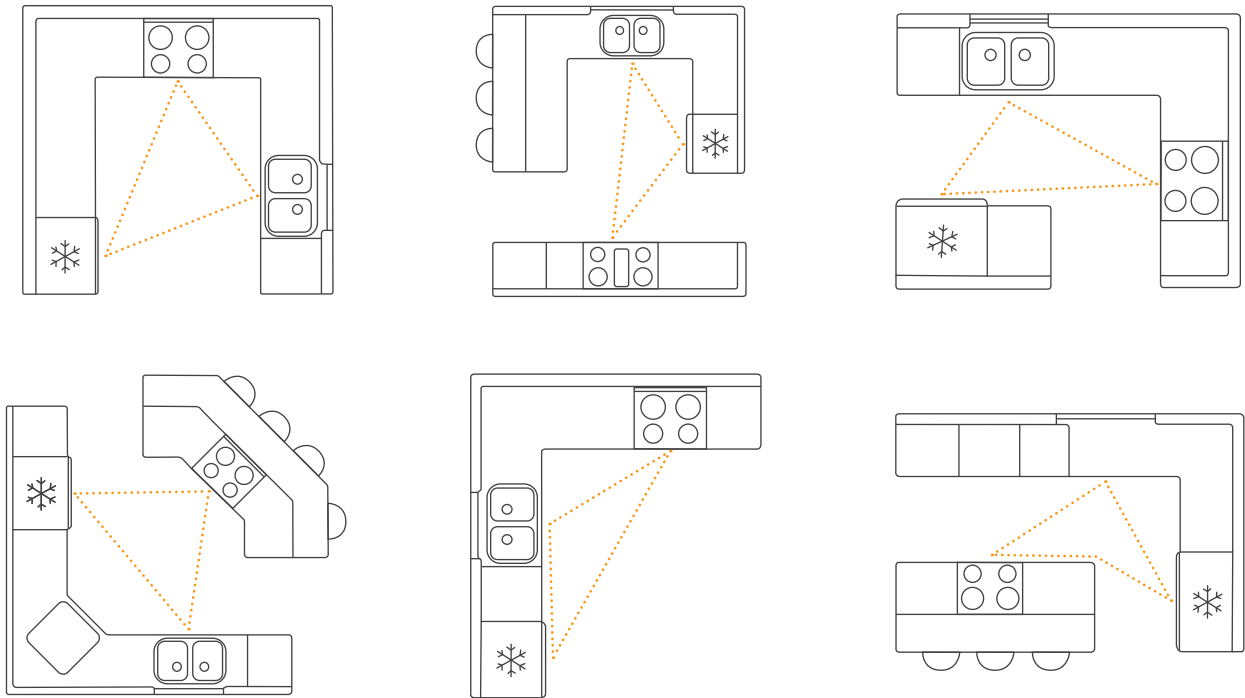
- 16.9% of respondents referred to adding or changing major kitchen units.
- 12.3% wanted better or bigger worktop space.
- 9.7% said that they wanted better designed units.
- 9.2% of responses were about layout.

These statistics indicate that more could be done at the initial design phase to ensure the kitchen fits the customer's needs.

5.2 Types of Kitchens

Kitchens don't always function in the same way. This is due to its layout, the number of users in the space and also the type of kitchen the user has. Extra tasks and activities can occur in the kitchen dependant on space and design. For example, an enclosed kitchen is likely to be used for the sole purpose of cooking. However, an open working kitchen would be more likely used as a communal space where users perform other tasks and socialise in this area as well as cooking. Below are a few definitions of the different types of kitchens:

- Enclosed working kitchens (self-contained space for all ordinary kitchen work)
- Dining kitchen – an extended enclosed working kitchen with a space for dining
- Open working kitchen – a kitchen that does not include a dining area but which has an open link with adjoining rooms.



5.3 Work Flow in the Kitchen

A workflow consists of an organised and repeatable pattern of activity. This is enabled by systematic organisation of resources making the process of activities more efficient. It can be represented as a sequence of operations for the work of a person or group. In a kitchen environment the workflow is related to the layout and positioning of equipment that is required to complete kitchen tasks.

Good workflow means increased convenience. Workflow is based on the appliances, products and utensils owned and where the most convenient placement would be.

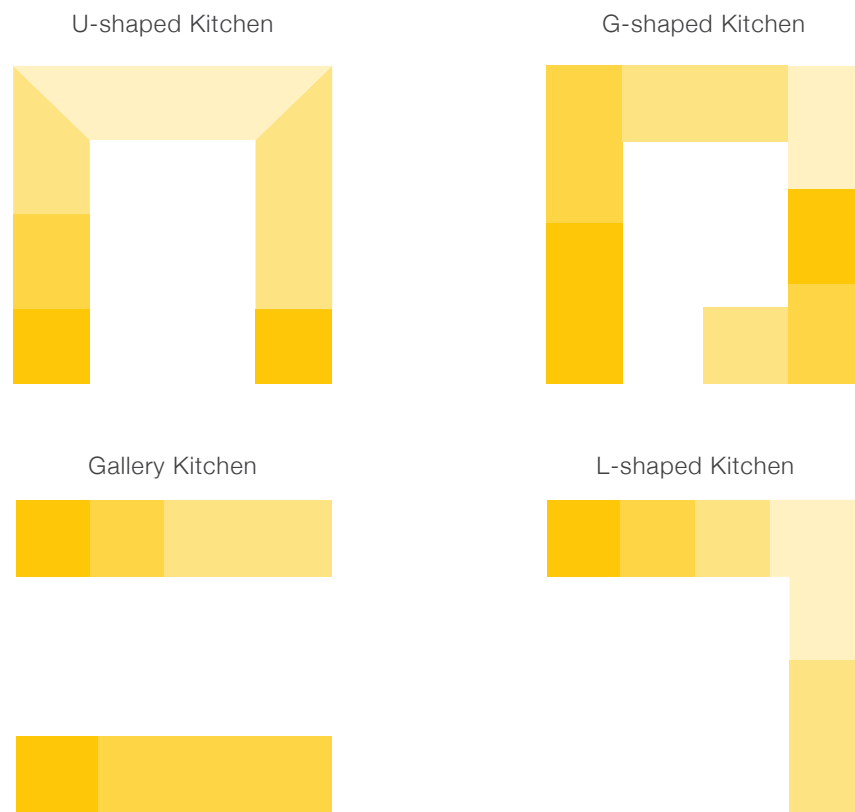
‘Cooking’s a piece of cake if everything’s within easy reach. Full extensions with practical inner dividing systems organise interiors and give you clear visibility.’
(BLUM, 2018).

For example, meal preparation and clean-up are normally recurring activities or ‘workflows’. Thought needs to be put in about what utensils you need and where you’ll need them right from the start when planning your kitchen. This will shorten distances and increase functionality.

A good workflow is obtained by keeping distances short between key areas that are often linked together in tasks performed. However, it must be ensured that work areas have enough space to perform tasks there, but close enough to effectively carry out tasks. The direction of the workflow depends on whether the prime user is left-handed

or right-handed. The workflow should operate in a clock wise motion if the prime user is right-handed and anti-clockwise if they are left-handed. The most commonly used appliances and equipment needs to take priority in the location of these items within the workflow system. They must be placed in areas of easy accessibility. All of these factors will help to make the workflow as smooth as possible.

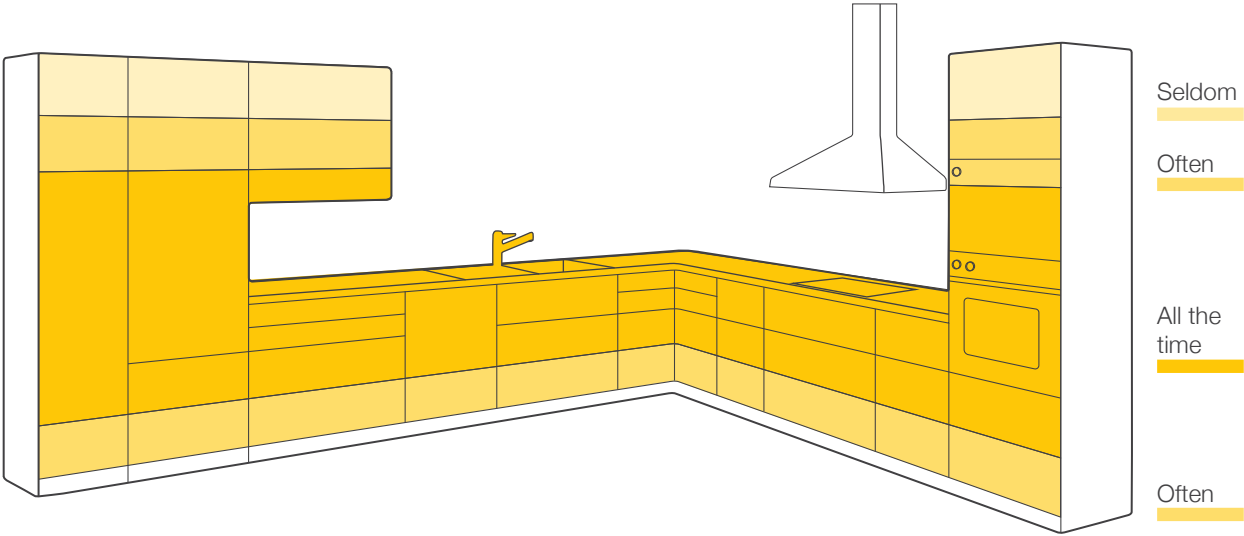
Most studies show that the most frequent movements are those between the sink, working surface and cooker. Movements to the fridge and food storage cupboards are equally common.



This diagram, shows how these zones should be laid out for right handed people according to the shape of their kitchen. If the primary user was left handed then the zones would be reversed.

Items that are used daily should be stored closer to the countertop and seldom used items at the top or very bottom of cabinets.

The kitchen should be designed with accessibility in mind, if all possible steps have been taken for that individual then infrequently used items can be put in the inaccessible places. An aid should be designed in to help them to reach, e.g. kickboards/plinths that fold out to be a step.



6.



Hygiene

6. Hygiene

The domestic kitchen is a common place for bacteria to be found. Most cases of food poisoning are picked up in the home rather than outside it. This is can be partly due to inadequately designed kitchens that are not conducive to safe food preparation and contain areas for food to get trapped.

Our survey showed that the majority of respondents do not consider themselves to have problems with hygiene due to design of their current kitchen. However, private homes are far less likely to report illnesses occurring at home than those in commercial and public premises. It is believed that infections caused from poor hygiene in domestic kitchens are three times more likely to occur than those in commercial kitchens (Scott, 2008).

Through the user survey it was discovered that 14.4% of kitchen users reported having problems with hygiene due to the design of their current kitchen. 15.1% of that proportion of people said that this was due to gaps in worktops which caused food traps as a result of poor fitting or installation of their kitchen.

Of the 186 respondents that bought/designed/re-designed their kitchen and had answered the hygiene question, 15.6% of them had hygiene issues.

Whilst there is no statistically significant difference between these groups, one would probably not expect hygiene issues to occur if one has re-developed their kitchen. Whilst we do not know the background behind this or the age of the current kitchen that was re-designed, hygiene issues like food traps could be to do with the fitting of the kitchen rather than the planning, and so there may be an issue with the workmanship.

When cleaning worktops there may be places for dirt to collect; this is unsanitary. Avoid gaps between worktops and appliances, these have been identified as causes of hygiene issues.

7.



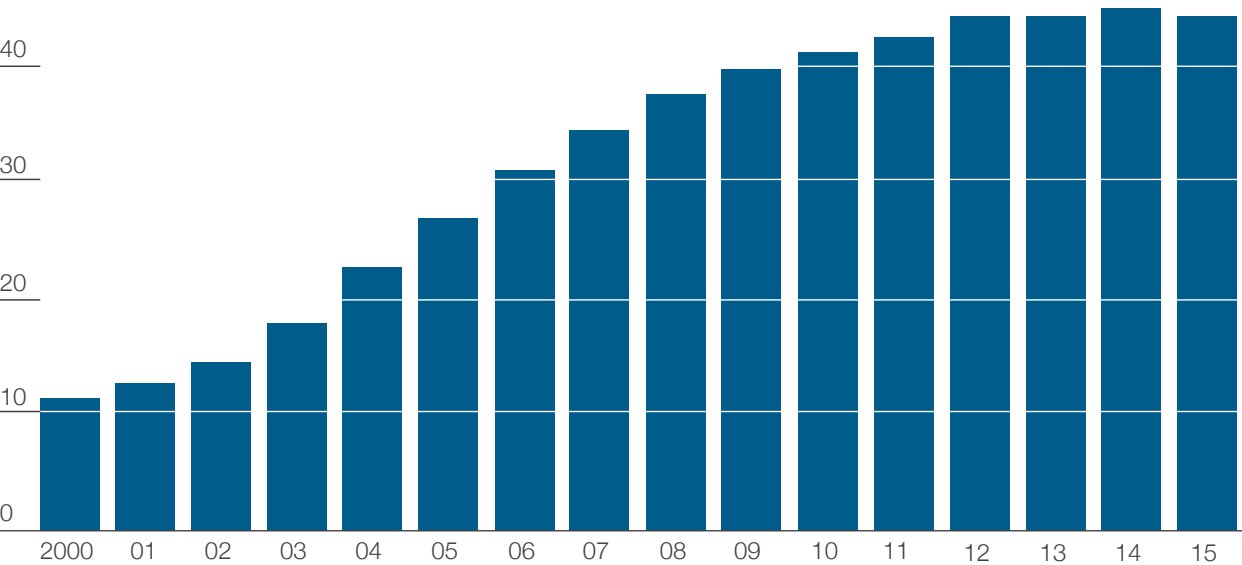
Recycling

7. Designing for Recycling and Food Waste

In the UK domestic households have a recycling policy that promotes individuals to recycle in their own homes. Different regions are regulated in slightly different manners, however, all are encouraged to separate waste into different recyclable materials. Statistics show that there was a 235% increase in household recycling in England between 2000/01 and 2009/10. It was found that 44.3% of household waste was recycled in 2015. However, this figure has started to plateau in most recent years.

“The UK is at a tipping point and without radical change to improve England’s household recycling rates the UK will not meet its EU agreed target of 50% recycling rates by 2020,”
- Palmer-Jones. D 2015

Recycling rates in England have fallen for the first time ever
The percentage of household waste recycled has dropped to pre-2012 levels



Guardian graphic | Source: ONS

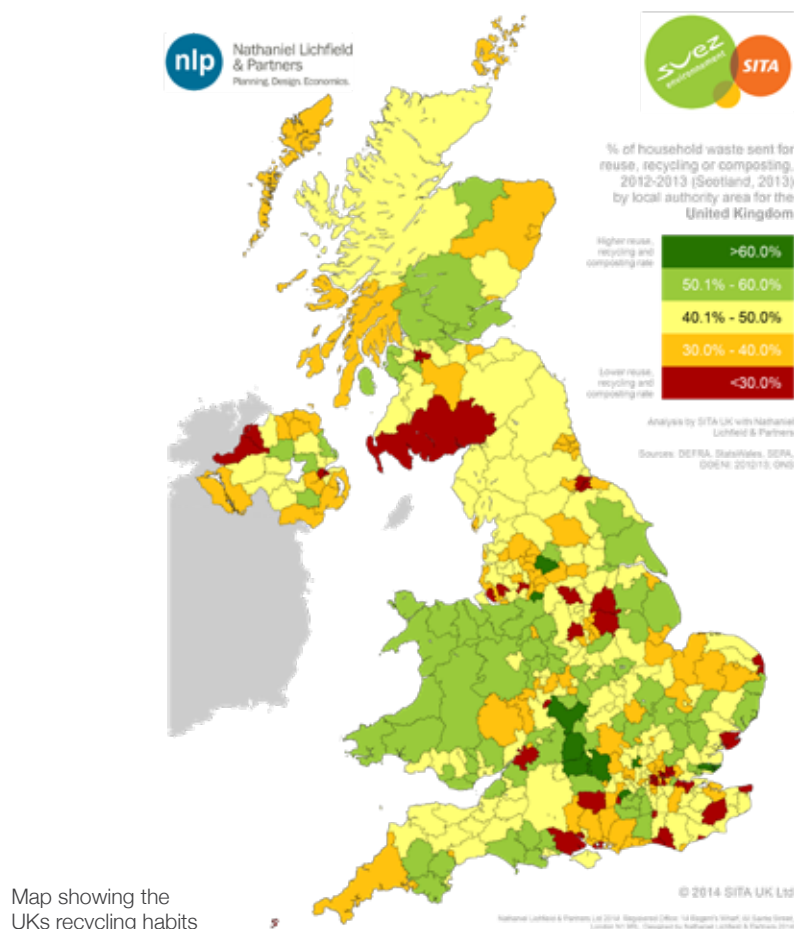
In order to maintain the planets current state recycling habits need to improve and continue to increase yearly. This is why it is so important that more is done to ensure that recycling is an easy process within the kitchen.

Previous studies among households in this area has shown that, lack of space for equipment for food waste sorting in the kitchen is a factor that prevents households from sorting their food waste.

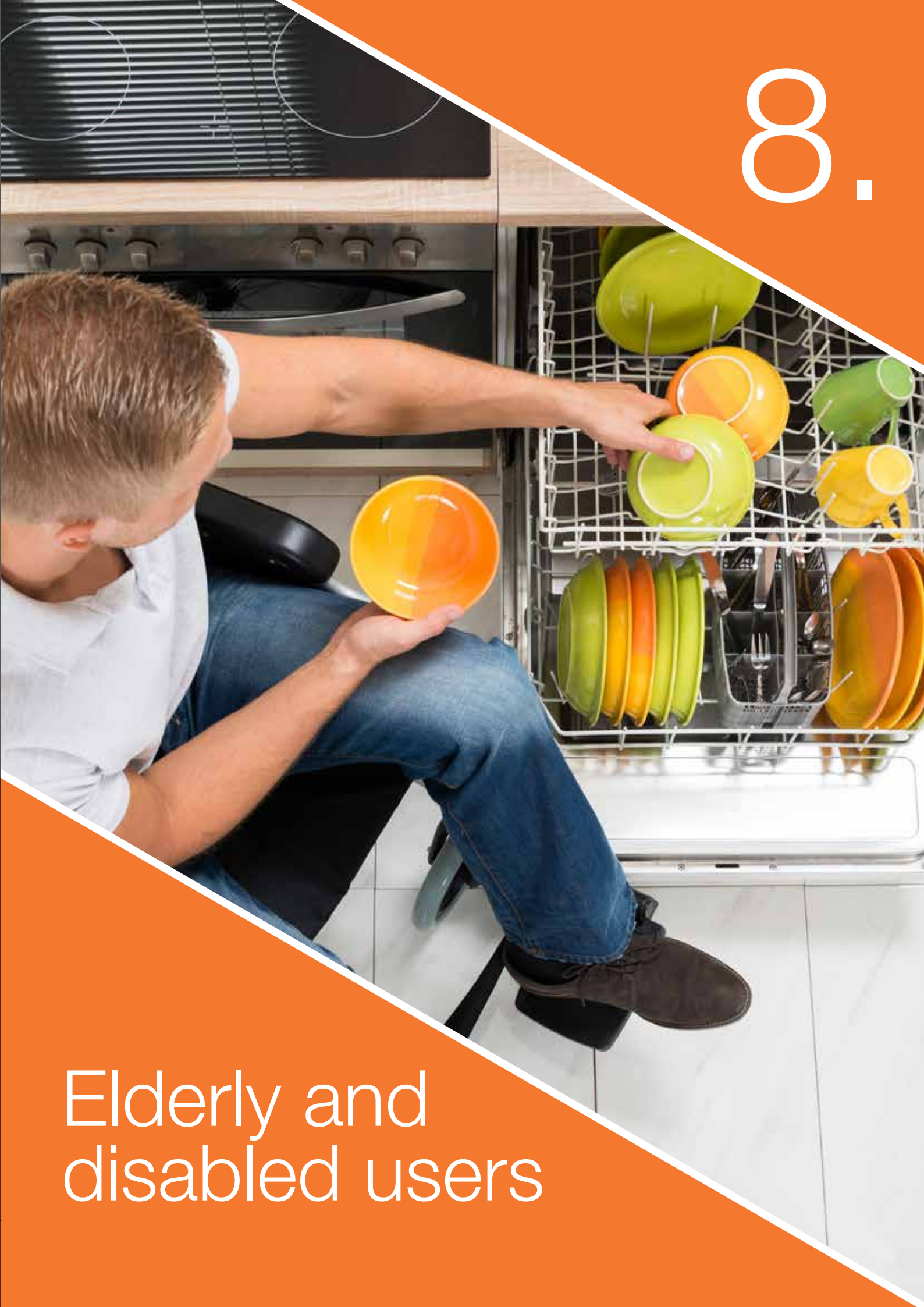
In order to facilitate food waste sorting inside the household, special sorting equipment needs to be developed.

Results from one study supports the hypothesis that convenience is one of the most important factors in increasing household waste separation.

A variety of literature supports the idea that just educating people about recycling doesn't have a long term effect. So, rather than changing people's mind sets it is suggested that a focus should be put on creating well-functioning infrastructure for separation of house hold waste. This includes providing a dedicated area for the separation to take place that doesn't jeopardise the important qualities of cleanliness in the kitchen. It is also argued to be more effective if there is sufficient space for the recycling set-up and this doesn't obstruct other important aspects of the kitchen.



8.



Elderly and
disabled users

8. Designing For Elderly And Disabled Users

In the UK we have an ever ageing population. The number of people aged over 65 is increasing yearly and for this reason it is important that design keeps up with the maturing generation. Physical limitations associated with getting older necessitates designers need to adapt to meet particular requirements and to ensure they are designing inclusively.

Kitchen tasks and workloads can be minimized if the space has been designed and arranged appropriately for the user. When designing a kitchen, too often heights, depths and storage capabilities are over looked, resulting in a below par operating kitchen space.

Kitchen designers should cater for a universal spectrum, allowing accessibility for people of all ages and abilities. This proves to be a complex task due to the limitations in flexibility of appliance sizes and work layouts that are required for the number of tasks performed in the kitchen. (Wellcome Home Project 2007). Designing a kitchen to be universal is a particular challenge due to its non-prescribed final state. This environment needs to provide application for an ongoing series of tasks (Mullick and Levine 2001).

“Today, for the first time in history, Britain’s over-65s now outnumber people under the age of 16, and the real growth market for business from now onwards is the 50-somethings.”

- Morrison, G. (2018).

New build houses present a trend of kitchens reducing in size. This increases accessibility issues so more thought needs to be put into planning for the safe use of the space by elderly and disabled users. However, this being said, there is also an increase in people converting their homes into a more open plan living space. So the kitchen isn’t just somewhere that food is prepared. It is now a place for family interaction and socialising. By making changes to adapt for the elderly and disabled it means that the kitchen can remain a place where this is still possible. It will support better usability and safety for those utilising the space.

This section of the Kitchen layout design guide is intended to give a brief guideline on how to design kitchens for the elderly and the disabled and why it is so important that these changes are made.

8.1 Ergonomic Design Considerations

The body and its various systems show changes with age. Physically, the result of this is that capabilities reduce or diminish over time. These changes mean that systems and processes work less effectively in old age than in youth. The implications of these changes for the design of the domestic environment are considerable. The needs and capabilities of elderly people have to be considered when specifying work surface heights, the situation of cupboards and windows and the forces required to operate door handles and drawers.

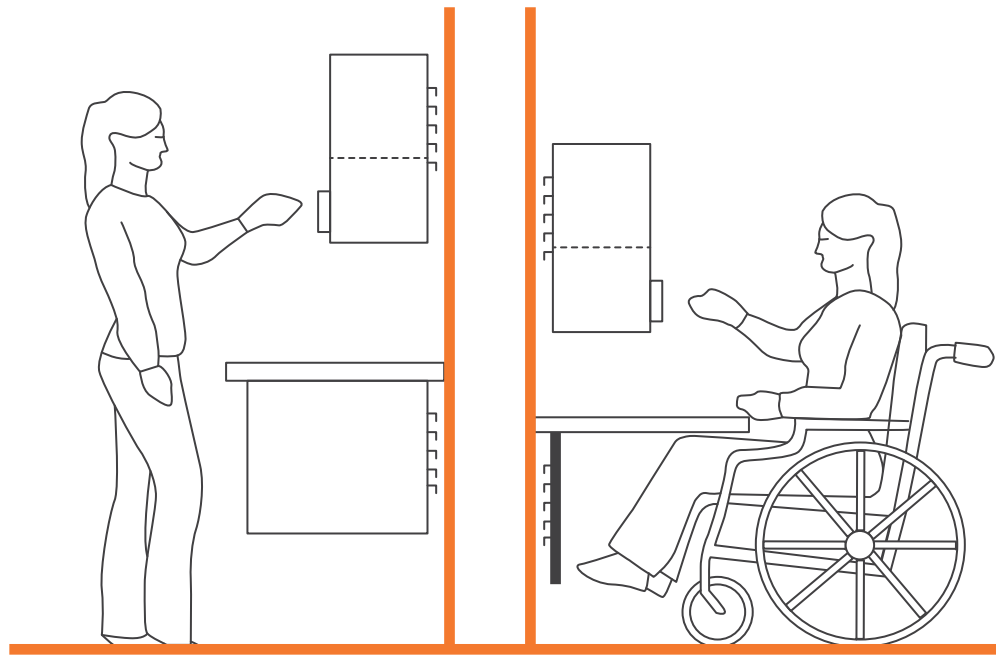
These factors should be well-thought-out and influence the design of the environment. While able-bodied users experience minimal difficulties, children, pregnant women, the elderly, people with physical, visual and/or hearing impairments and seated users face diverse challenges regarding kitchen layouts, such as gaining access to cabinets and storage areas, reaching counters, using appliances and operating controls (Mullick and Levine 2001). Making it more than likely that they will have different needs when using a product compared to a younger individual. These are discussed below:

8.1.1 Dexterity

A person aged 65+ generally, can only achieve about 75% of earlier capabilities in strength and endurance. This means that the elderly person's ability to grip onto objects is reduced. Therefore, making it hard to perform tasks that require forceful hand strength. For example, an elderly user may struggle opening drawers that have a high level of resistance when pulling them out. The same is said for pull out cupboards. If this action requires too much strength then they may really struggle or not be able to complete the action at all. Therefore, resulting in a waste of space within the cupboard or drawer. The elderly also tend to struggle lifting heavy things for a long distance e.g. lifting a pot or pan from one surface to another. Current products on the market can help to overcome this. Mechanically assisted drawers allow users with reduced muscle strength and limited manual dexterity to open drawers easily with a simple touch. The drawers can be operated with a hand, knee or foot.

8.1.2 Reach

People tend to shrink with age in terms of stature and most other body measurements. The muscle groups of the body also become less flexible, leading to a reduced reach distance. In addition to this there is an increased likelihood of the development of a health condition such as arthritis. Cabinets that are too high are already a problem for the general population and the problem is increased further when users get to an older and less able age.



8.1.3 Touch

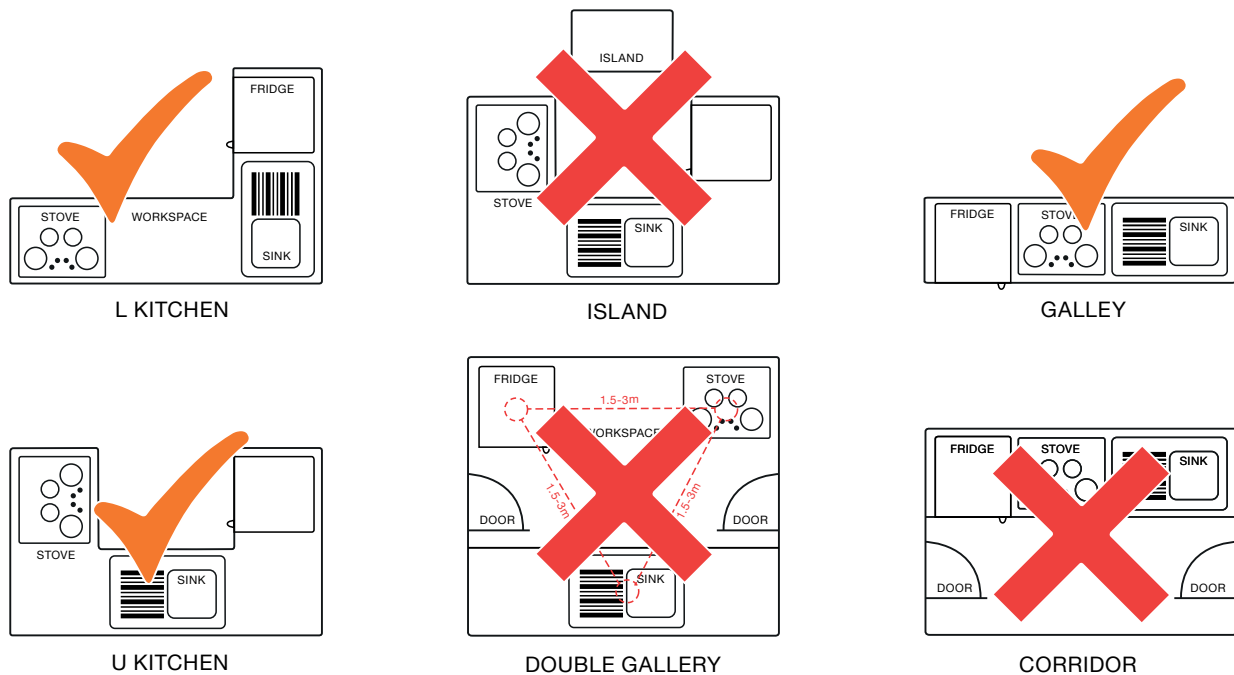
As an individual ages, their sensitivity in their fingers and extremities reduces. Resulting in a lessened ability to sense vibration, pressure, temperature and pain. This is particularly dangerous in a kitchen environment due to its constant changing nature. Users are exposed to extreme temperatures so, having a reduced ability to sense this could result in potential harm caused.

Elderly users can bruise more easily due to a weakening of the skin structure and reduced muscle and fat mass, meaning minor bumps result in more serious consequences. This is why it is important to reduce the number of obstructions and hard edges that could result in the elderly user bumping into them. Consider this factor in your floor plans to accommodate sufficient space between work surfaces, cupboards and doors.

8.2 Optimising Layout for the Elderly

The kitchen isn't a disposable product, they can be in place for 20 years or more, so they need to be functional throughout their lifetime. Pre planning needs to be done to ensure it adheres to the needs of the user as they get older and their physical capabilities change. Discussed below are a number of considerations regarding layout and functionality for elderly/ disabled users. Designers need to consider whether their kitchen design allows continuity of ergonomic advantages throughout its long-term use.

8.2.1 Lateralization



Research indicates that lateralization effects the disabled and elderly when interacting with a product to a great extent. Often there is an obvious preference for one side of their body over the other. E.g. being left handed or right handed. Therefore, most individual's express better motor skills in one side of their body and this is the side that is predominately used for the majority of tasks. This is also the case when performing kitchen chores.

In the case of a person moving in a wheelchair, the subordinate hand drives the wheelchair and the leading hand performs the tasks – opens drawers, takes out and moves objects. Lateralization in designing of functional zones in the kitchen means the adjustment of the sequence of works performance to the preferred direction of movement of a user in the wheelchair.

With this knowledge, floor plans need to optimise the use of the most dominant side of the body. Providing the most efficient method of completing kitchen tasks. If the space cannot accommodate for all tasks being performed this way then, there needs to be thought into prioritising tasks that are the most physically exerting.

8.2.2 Continuity of surfaces

Result from one study highlighted the importance of the continuity of work surfaces. This significantly aids the meal preparation process. Both comfort and safety is increased when the worktop is continuous as it means less effort and movement is required to perform tasks. Having an un-interrupted surface means that there is a

reduced need to lift or carry objects above the floor from one place to another. Kitchens that have divided worktops prove to be more difficult for the less able to interact with. This is because sliding or pushing an object along a flat worktop is far easier than lifting the object from one surface to another.

8.2.3 Accessibility

ISO 3055:1985 gives guidance on working heights in the kitchen whilst sitting. These guidelines are relevant for wheelchair users or those who cannot be standing for long periods of time.

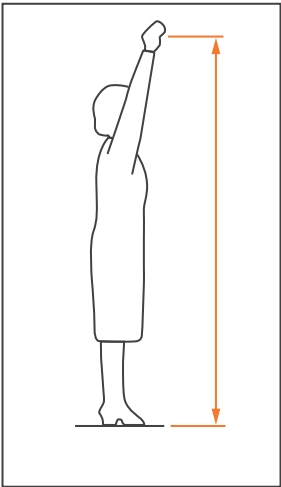
The appropriate working height for food preparation is between 600mm and 800mm. For washing up, the appropriate height is between 750mm and 850mm. It also states that if the height of the work surface is fixed then adjustable seating is required. For wheelchair users, a minimum clear height of 650mm under worktops and sink bowls is required.

Multiple studies have highlighted the fact that high cupboards are a huge source of wasted space. Some results indicated that objects that were easily accessible for females was less than 30%. The elderly have a reduced stretch range so an even smaller percentage of the elderly will be able to reach cabinets at this level. This percentage is reduced even more when the worktop protrudes out further. This significant waste of space indicates that wall cabinets are an inefficient use of space, especially when cabinets are higher. This could be tackled by using pull out systems, less deep cabinets or lowering the cupboards significantly.

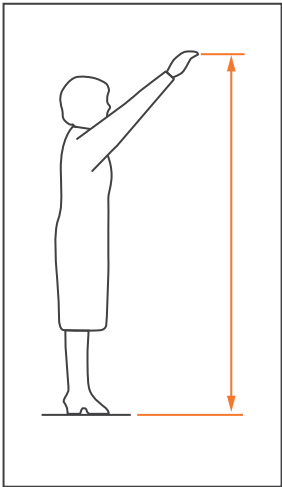
Lower cupboards also present an issue with a large proportion of wasted space. Items get pushed to the back of the cupboards making them harder to reach and often get lost/forgotten about. This is easily avoided by using pull-outs instead of shelves in the low cupboards. However, the elderly struggle to bend down and then get up again, especially whilst carrying something weighted. Therefore designers need to ensure that the storage space designated in these areas are for items that are rarely used.

One way to overcome accessibility issues is by installing adjustable units. Making worktop areas accessible for all users is a great way of creating an adaptable kitchen space that can be used with ease. This is particularly important when elderly or disabled users are living with others in their home. A simple change in height of the worktop can provide great benefits in usability. It also promotes better independence for the user as they don't have to rely on others for simple day-to-day living. Adjustable features in the kitchen allows all users to get full use of the space, regardless of their mobility or reach range.

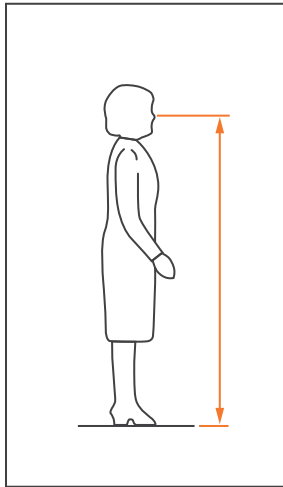
005 Maximum upward grasp



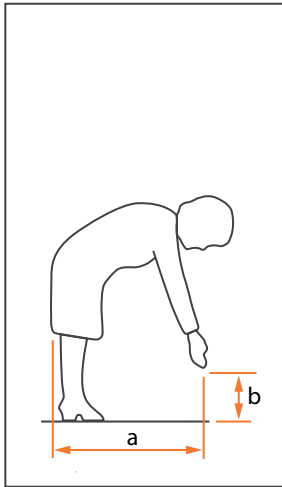
006 Maximum upward grasp at 360mm in front of body



007 Standing eye height



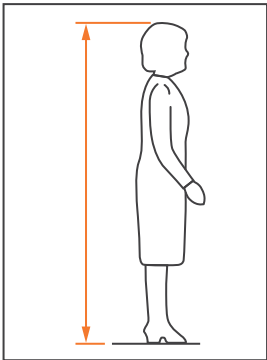
008 Low reach



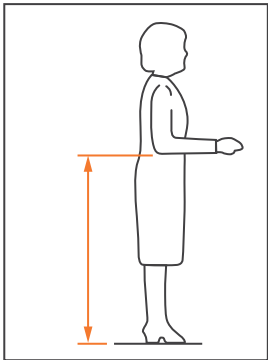
8.2.4 BS 4467- Dimensions in designing for elderly people

This British standard provides anthropometric data accompanied with illustrated diagrams for application of the dimensions. The applications given are examples to indicate ways in which the data could be used. This data isn't dramatically different compared to the 'normal' user however, as discussed above there are limitations for the elderly with regards to reach distances etc. So, these dimensions are more representative of what an elderly person would be able to interact with in an efficient way. The standard can be applied to kitchens and kitchen storage. Below are a few of the key measurements that have been taken from the standard accompanied with possible applications.

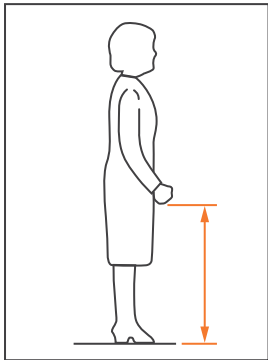
001 Stature



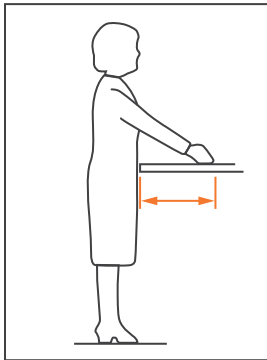
002 Standing elbow height



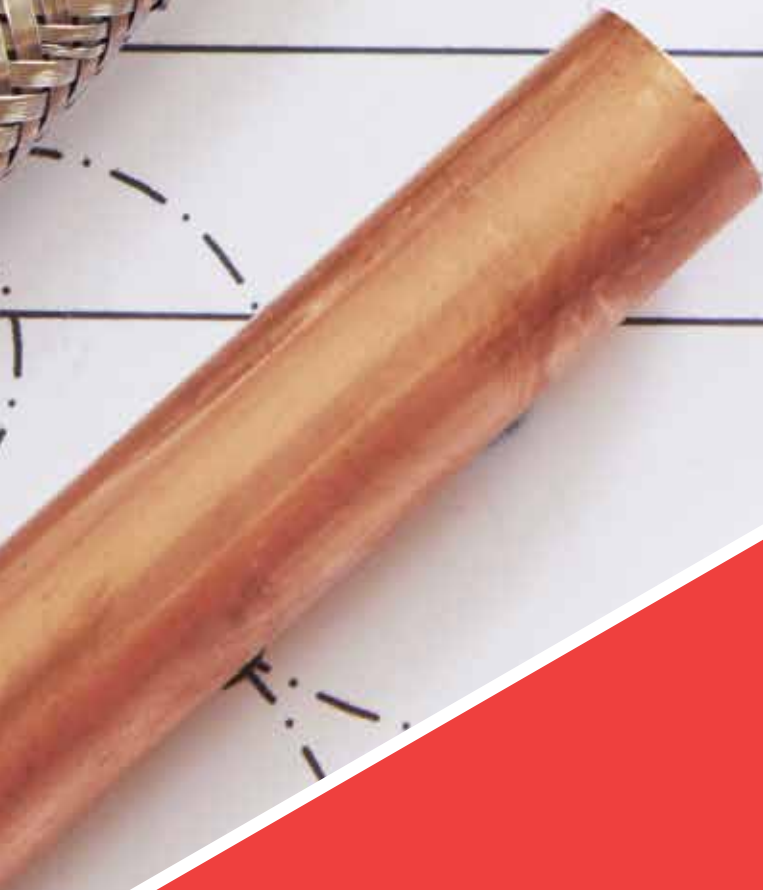
003 Fist height immediately in front of body



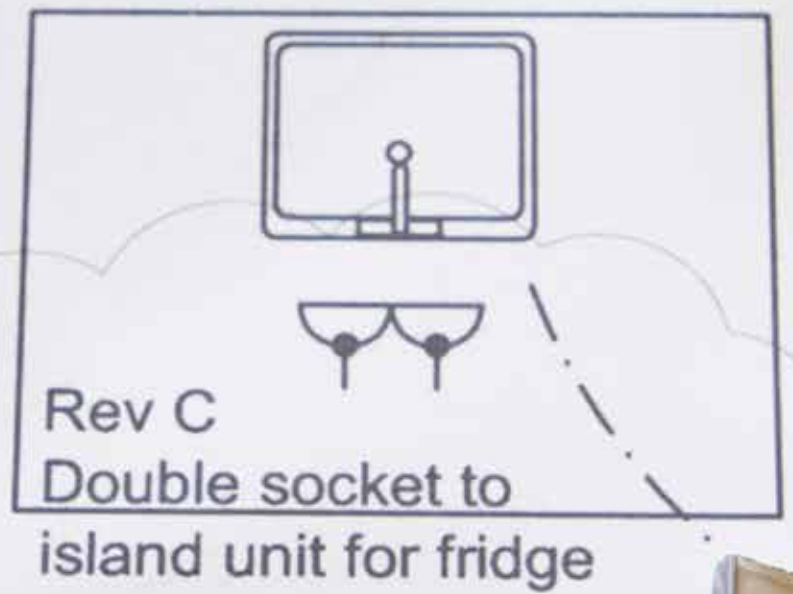
004 Fingertip to front of body at work surface height



9.



Kitchen



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Tools

9. Tools for Kitchen Designers

This section of the design guide aims to offer kitchen designers with a variety of tools to assist in the design process. The tools are provided as a reminder of certain things to be aware of regarding their customer and the planning process.

Our survey showed that 65.4% of people had bought/designed/re-designed their current kitchen. 77% of those who bought/designed/re-designed their current kitchen used a kitchen designer.

This shows that a large proportion of people are redesigning their kitchens using kitchen designers. It is imperative that kitchen designers are equipped with the relevant information that will aid them in producing a design that is fit for their buyer.

Our survey also asked about their views on the knowledge of the designers. The majority of feedback that we received from the participants was positive. However, there were a few negative criticisms:

- Too much focus on selling rather than focusing on customer's needs
- Incorrect measurements

These tools can help to improve these criticisms by providing clear guidelines on the information kitchen planners need to collect from the customer and the process that they should follow. They serve as an effective prompt during the design process.

9.1 Prioritising Customer Wish List

Customers may have a very clear preconceived idea of what they would like their new kitchen to contain, it is important to take these desires into consideration from the beginning of the design process. However, it is also necessary to try and not allow those preconceived ideas get in the way of delivering a functional and ergonomic kitchen.

Some customers may place the inclusion of a wine cooler or American fridge freezer into their kitchen high up on their priority list, and this may result in the budget or space for other items being reduced. Customers should still be presented with the possibilities for ergonomic/accessible solutions to kitchen design and have the benefits of them explained. Customers may not have originally thought about including these and once they see their value, they may change their priorities.

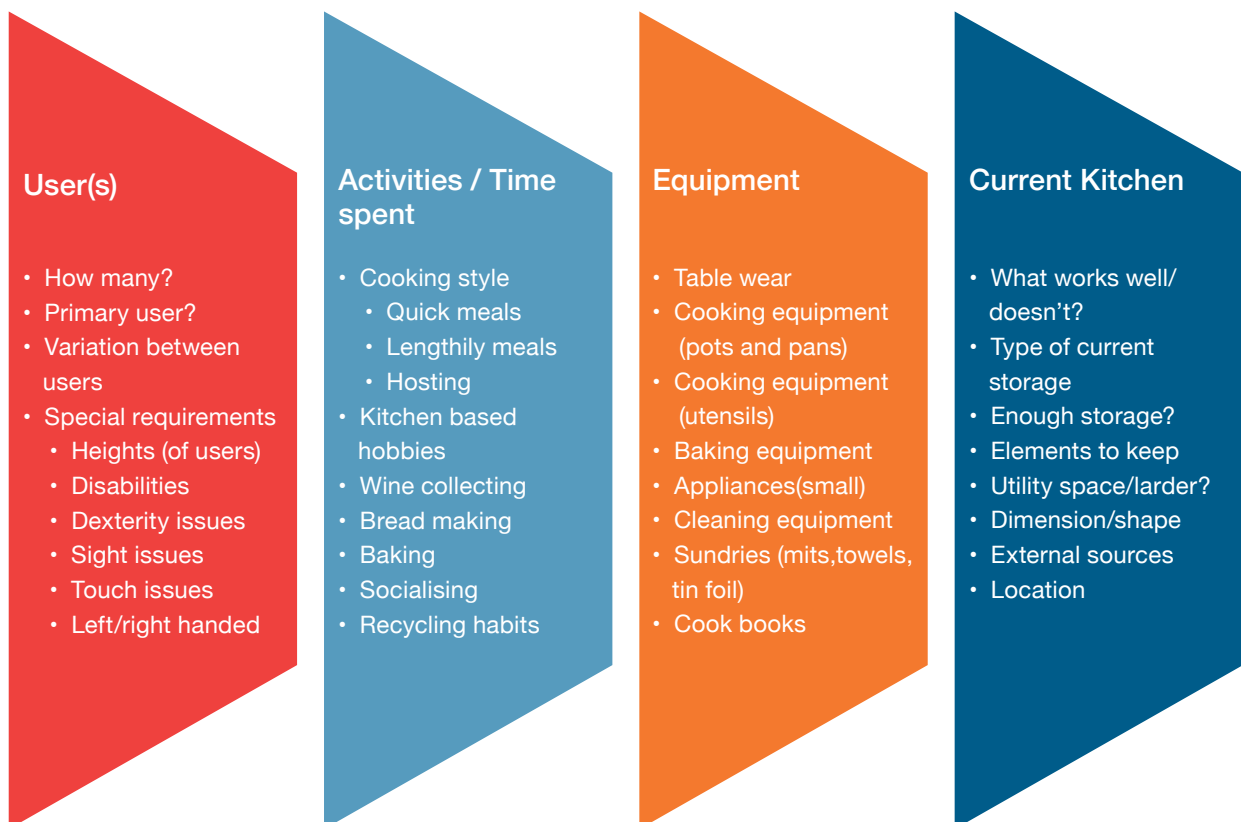
In order to ensure a customer gets what they want and that the final kitchen design is functional and meets their needs, it is important that the design process is iterative. Designers should ask the customer for a list of priorities, present them with alternative ideas and then get the customer to re-evaluate their list of priorities.

It is recognised that expectations need to be managed where there are practical restrictions within a customer's kitchen, e.g. services that cannot be moved or there are fixed features such as the position of a boiler or doors and windows. Designers will need to understand what these restrictions are at the beginning of the design process and work around them as best they can. In addition, the customer's choice of appliances may impact on the height and location of worktops and cupboards and if there are special requirements for these then the appliances would need to be reconsidered and compromises may need to be made.

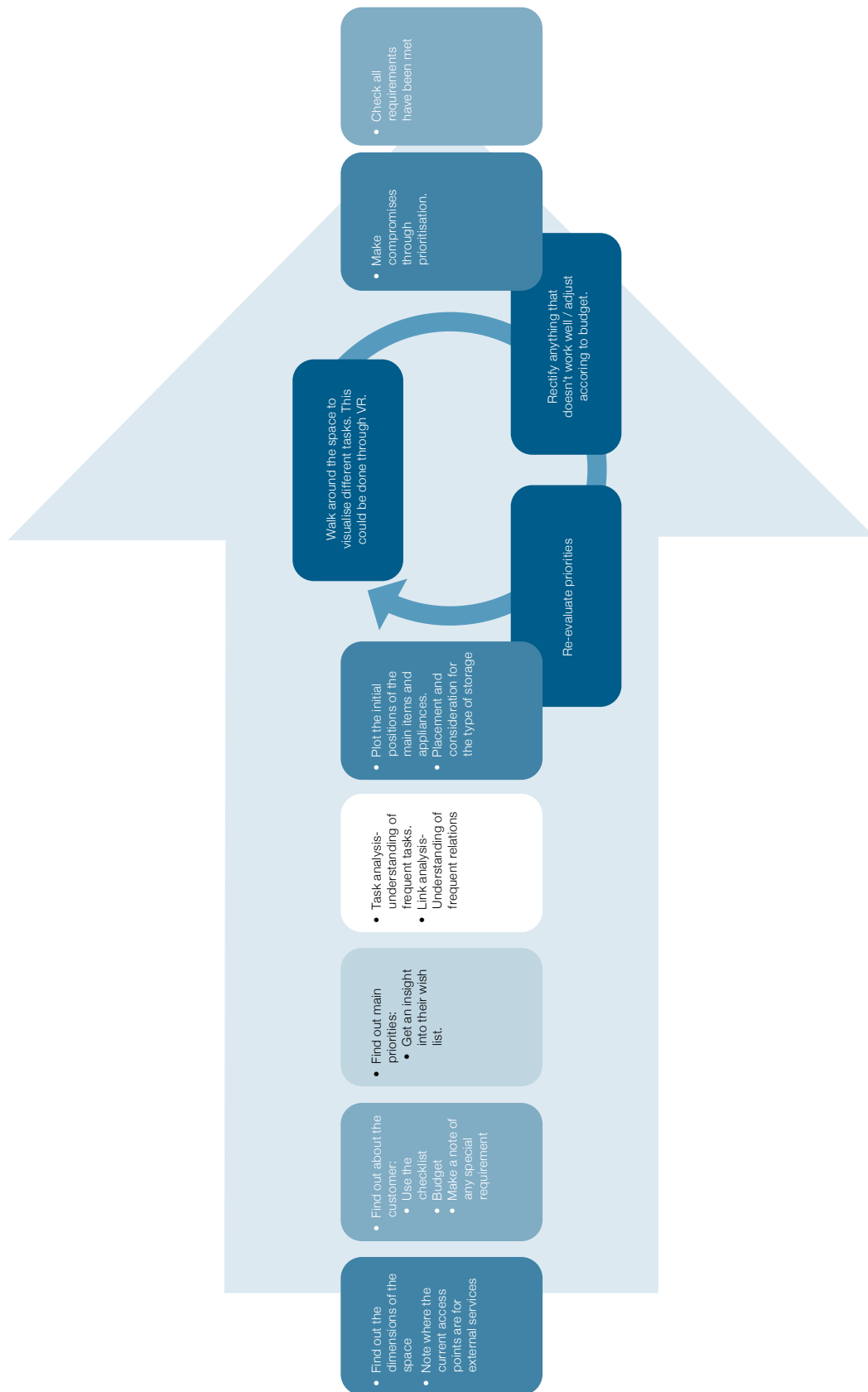
The take away message is that customers may have a lengthy list of requirements for their new kitchen. Sometimes it isn't possible to fit all of these things into the space that they have available. For this reason there needs to be a method of prioritisation put in place that can ensure that the most important elements are built-in. From an ergonomics perspective function comes before form. Therefore, using an iterative design process and prioritising accessibility and efficiency whilst also considering the customer's budget, wish list and aesthetic requirements will likely result in a satisfied customer.

THE FOLLOWING TOOLS CAN BE USED TO HELP THE PRIORITISING PROCESS....

9.2 Information Gathering Checklist



9.3 Iterative Process Flow for Planners



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