Screens and projectors present information visually. Audio speakers and Braille displays, on the other hand, make information available to the ears and to the touch.

Assistive technologies for information technology context include:
- Screen magnifier software (supports reading, also may be synchronised with screen reader)
- Screen reader (text output in speech or Braille)
- Text-to-speech or voice recognition software
- Alternative keyboards

Audio stations
- Technology compatible with hearing aids such as, e.g., devices using telecoil and cochlear implants, audio cable connections)
- Use of strong visual contrasts for control elements
- Offer text versions of audio information

Audio transcription equipment
Transcription (Lat. trans-scribere: rewrite) refers to the transfer of an audio or video recording into a written form.

Audio description
An audio description (video description, descriptive narrative) refers to an audio track added to visual media to provide extra information about actions, actors, texts and other types of visual content on the screen).

Audio guides
- Ease of use (e.g., one-button operation)
- Touchscreen and touch-sensitive buttons/keys used only in connection with visual, acoustic, and/or tactile (vibration) feedback on command delivery and acceptance. An acoustic signal should sound for each action made by the person entering commands, even if the command is accepted.
- Strong visual and tactile contrasts

Visual guides
- PDA – personal digital assistant
- Small portable screen with sign language and spoken language represented in text form

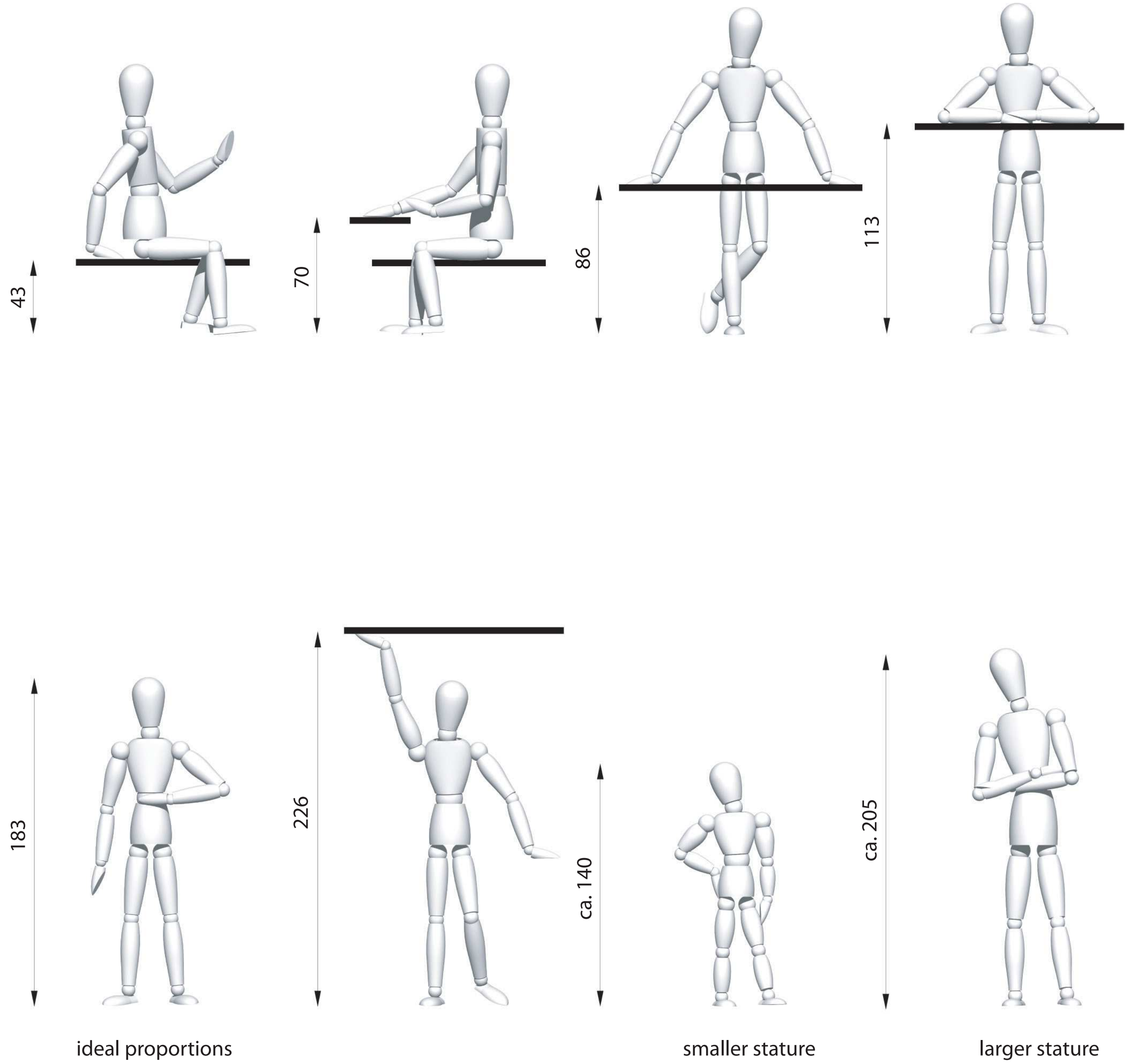
RFID systems (radio-frequency identification)
make it possible to identify and locate objects, or navigate buildings and the outdoors with the help of RFID chips installed in selected locations. They are well-suited therefore to function as a guide for people who are blind or visually impaired. Specially designed canes outfitted with an RFID reading system locate the RFID chips embedded in the area (e.g., the floor or ground) and communicate that data to a wireless device. A beep tone is then communicated via Bluetooth, letting the user know whether he or she is on the right path. Detailed information about the area, such as traffic signals or nearby services can also be communicated in the same way.

Navigation systems
In the near future, we anticipate that more effective mobility guides will be available that enhance free movement and safety for people who are blind and severely visually impaired. These will use pedestrian navigation systems that function via a mobile phone in the outdoors as well as inside public buildings. In combination with informational elements within the building (floor guidance systems,
signage, audible traffic signals), such navigation systems will enable independent and confident routing in public traffic areas as well as in public buildings. At present, however, none of the preliminary technologies meet the requirements for reliability and accuracy of location (e.g., bus stops).

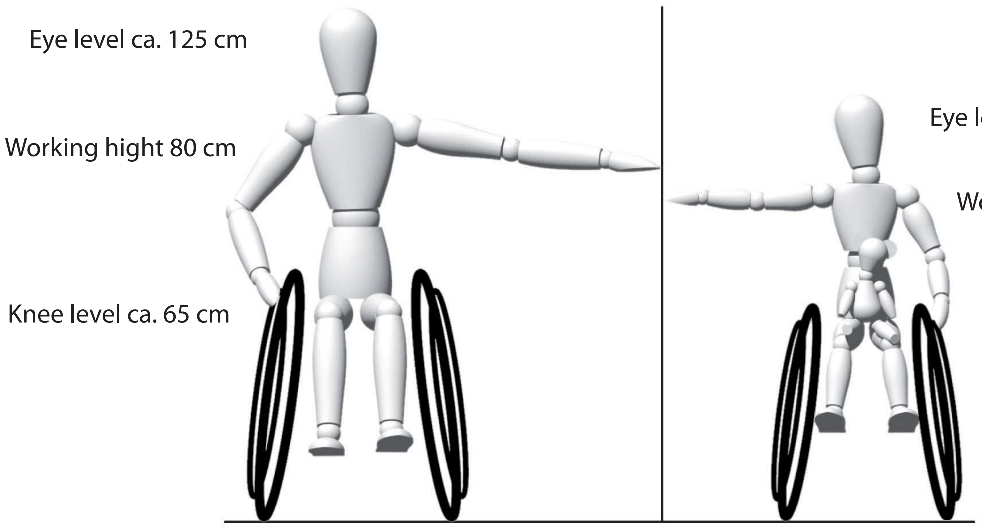
1.2 Movement areas

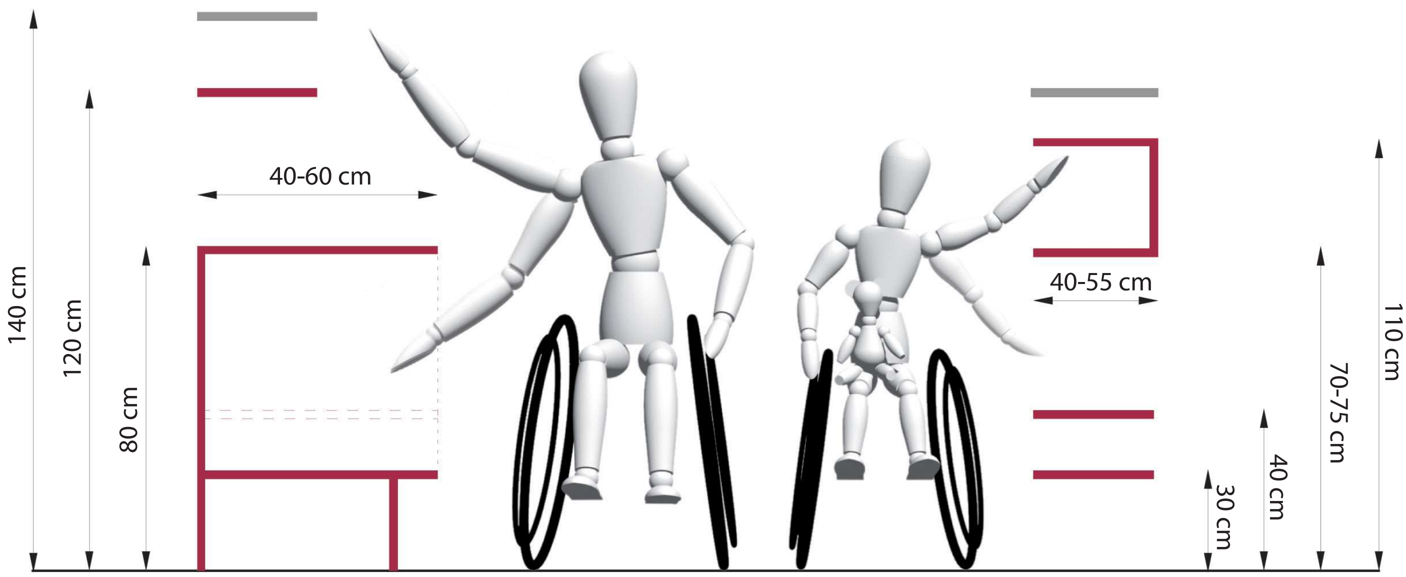
The dimensions of movement areas, rooms and furnishings are determined by body posture and physical measurements. The design should integrate the needs of as many users as possible. Different body sizes can limit transparency and orientation (e.g., different eye levels). Movement areas are not calculated solely on the basis of body measurements. They are also affected by the size of auxiliary equipment like walking aids or wheelchairs. People using wheelchairs require the largest movement areas.
As a basic principle, movement area and passing area should not be reduced or restricted. They may, however, overlap for functional and economic reasons.

The following recommendations should serve as a guide:



Ergonomic dimensions in centimetres


Eye level ca. 125 cm
Working hight 80 cm
Knee level ca. 65 cm
Eye level ca. 105 cm
Working hight 70-75 cm
Knee level ca. 60 cm


140 cm
120 cm
80 cm
40-60 cm
40-55 cm
110 cm
70-75 cm
40 cm
30 cm

Width
- General traffic areas (corridors): minimum width 1.50 m
- Secondary traffic areas: minimum width 1.20 m
- Passageways/door: minimum clear passage 0.90 m

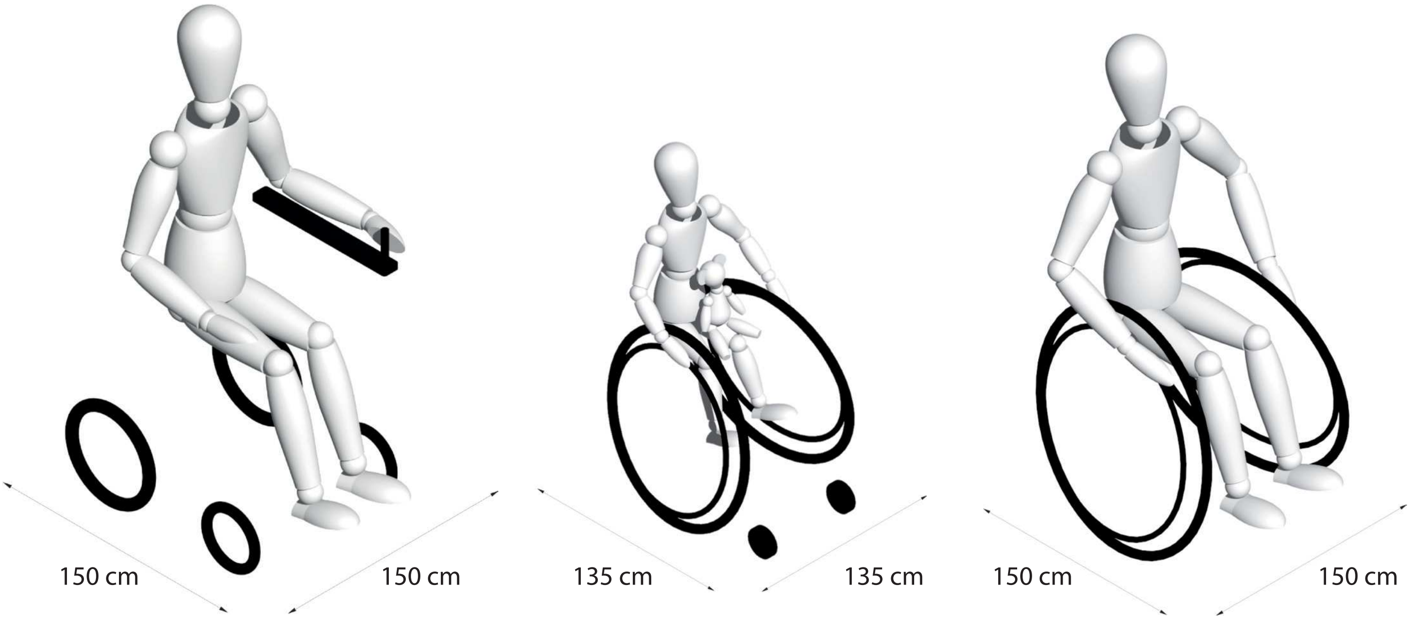
Movement areas
- Turning areas (e.g., wheelchairs): 1.50 x 1.50 m
- In front of side-hung doors: 1.50 x 1.50 m
- Passing space for wheelchairs or people with walking aids: minimum width 1.80 x 1.80 m

Operating height (seated position)
- From 0.85 m to maximum 1.05 m

Working height (seated position)
- Maximum 0,80 m

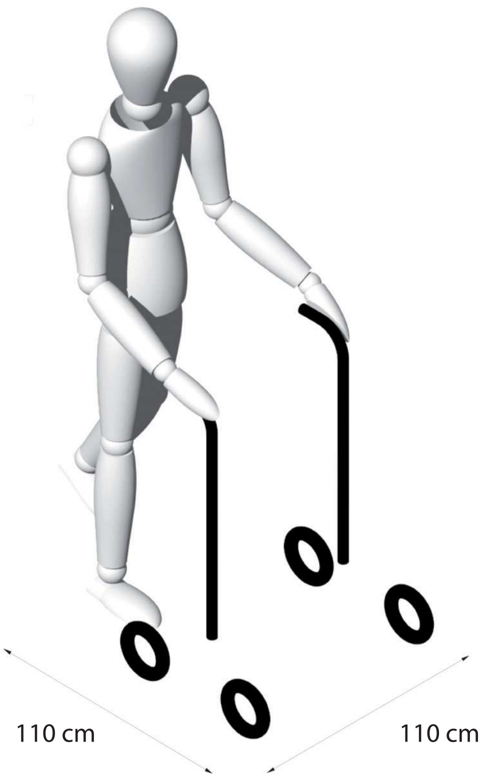
Highest reach (seated position)
- Minimum 0.30–0.40 m
- From 1.20 m to maximum 1.40 m

Knee clearance
- Height approx. 0.70 m
- Width minimum. 0.90 m
- Depth minimum. 0.55 m



Movement areas of different wheelchairs

Rollators
Rollators today have become indispensible tools for individuals with temporary or permanent mobility impairments and for those with less robust physical constitution. Especially in light of demographic shifts in the population, we expect to see a steadily increasing number of people using rollators in public spaces. For this reason, the needs of this group of users should be studied more carefully during the planning process, alongside those of wheelchair users. In general, people using rollators have the same needs for indoor and outdoor areas as those of for wheelchair use, such as sufficient movement area (minimum 1.10 x 1.10 m) and level, non-skid ground surfaces (Section II, 4.8; Section III, 3.1). The maximum allowable height difference in the outdoors of 3 cm already presents some difficulties for those using rollators. It is recommended that height differences not exceed 2 cm. Height differences in the ground surface should be chamfered, since even a 2 cm height difference can present a challenge.



Movement area for a Rollator

1.3 Light and lighting

All human beings require a minimum amount of light for effective orientation, work and well-being. People who are older or have a visual impairment, for example, require roughly ten times the intensity of light needed by young people. Optimal lighting conditions for the user are created by the interaction of different light sources – avoiding exclusively direct or indirect light. If reduced lighting is desired, for example in specific functional rooms, reflective markings or added accent lighting fixtures can be used to compensate, but should never result in glare. Sparkling or flashing light installations should be kept to a minimum and should not be installed in orientation areas. Artificial lighting for areas where significant activity takes place should adapt to the spectral colours of daylight, so that colours and contrasts are reproduced accurately. Strong shadows and surface glare should be avoided. The surface reflectivity of materials should not be overlooked (Section II, 4.8). This should be an essential component of a lighting concept.
In transitional areas leading from indoors and outdoors and vice versa, natural and artificial lighting can be effectively used as an integrating element, enhancing visual comfort and reducing the time needed for the eyes to adjust to new lighting conditions.

1.3.1 Quality of light

In assessing light quality, experts distinguish between ergonomic factors (ELI) like visual performance, visual comfort, vitality and individuality, as well as factors relating to energy efficiency (LENI). All factors should be considered to the greatest possible extent when developing a lighting scheme. In general, the general aim of lighting is to approximate daylight conditions by creating uniform illumination throughout a space (indirect lighting). The demand on light quality increases when concentration, efficiency or creativity are required, for example, in a workplace. It is important to identify the lighting needs of a given project during the planning stages and then to evaluate them again in the context of the finished solutions. Depending the function of a particular area, there will be different priorities and criteria used to evaluate the light quality.

Visual performance
Lighting that complies with current standards is crucial so that people are able to accurately perceive visual tasks and thus carry out activities effectively. The following criteria should be considered:
- Sufficient lighting
- Uniform lighting
- Colour rendering
- Contrast rendering
- Avoidance of strong shadows
- Avoidance of physiological glare (i.e., reduced visual performance)

Visual comfort
Visual perception in a room is more pleasant when lighting is uniformly bright and balanced. The decisive criteria in this context are:
- Balanced distribution of brightness
- Light density differences
- Modelling (three-dimensional form, texture)
- Uniform lighting in the surrounding area
- Artificial light supplemented with daylight
- Light that does not flicker
- Avoidance of psychological glare (i.e., discomfort)
- Feelings of security

Vitality
Light contributes to a sense of well-being and influences all human activities. Factors such as
- Lighting that approximates daylight
- Avoidance of heat radiation
- Avoidance of electromagnetic fields

contribute to the stimulating and energising influence of light.

Individuality
Different visual needs, visual activities and times of use require that individuals have some control over their lighting situation. Sensors and control systems help users adjust the lighting to their specific needs. Individuals can have control over lighting though:
- Switches and dimming controls
- Selection of lighting mood
- Presence detection
- Choice of lighting schemes
- Flexible options for building modifications

1.3.2 Functions of light

Light as a guide
Light is not only a tool for seeing. It can be used to emphasise important cultural objects and can assist orientation. Light fixtures can have very specific functions, for example, to guide people in one direction or mark a dangerous situation. It should be noted, however, that artificial lighting is rarely able to reproduce the same level of visual contrast as that perceived in daylight. Moreover, artificial light should not detract from the existing light density contrasts in the environment under daylight conditions.
Examples:
- Step markings (not as a replacement for the requisite physical markings of the step edges!)
- Path markings indoors and outdoors, e.g., with recessed floor-level lighting or at plinth height. Floor-level uplighters can easily cause glare and should be kept out of the immediate walking area.
- Specific placement of light elements (e.g., next to control elements, to support guidance)

Light as a warning
For light to warn of a dangerous situation, it must not only have a high-contrast design and colours to indicate warning, but also include extra lighting effects (e.g., blinking or flashing lights to warn of a construction site barrier). It should always be directed downward to avoid glare.

Light to create emotion
Light also has an effect on the emotions. Brightness, colour, light distribution and light dynamics can shape the mood in a room. Depending on the desired outcomes, colour can nurture an atmosphere of dynamic energy or peaceful relaxation. Emotional factors like these can provide support for specific groups of people.
There is no one optimal solution that can simultaneously satisfy all the varied demands placed on lighting in equal measure – creating visual performance, a spatial impression, and wellbeing. Lighting must be customised during the planning phases to accommodate the unique needs and uses of a space. Effective technologies, an intelligent lighting concept and good lighting management will all contribute to the creation of an energy efficient and people-oriented lighting solution.