

Chapter 6

Water supply – access and use

Angela Martin

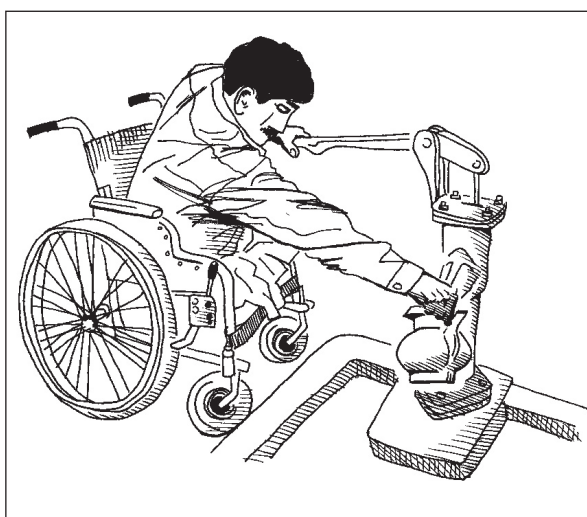


Figure 6.1. Handpump sited close to edge of apron.

A range of water sources are dealt with in this section, including taps, handpumps, wells, rainwater storage facilities, and natural water sources.

6.1 Benefits of access to water

Improved access to water and activities related to water bring far-reaching benefits, including:

- Increased self-reliance and dignity for disabled people: being able to carry out an activity unaided, whereas before they relied on the family for support.
- Improved health and well-being of disabled people.
- Savings in time and effort for the whole family, which frees up more time for other household activities.
- Increased productivity and income generation opportunities: increased quantities of water means the surplus is available for domestic production of vegetables, fruit or for animal raising.

Benefits of accessible facilities are felt not only by the disabled person, but by the whole family, and often neighbours too.

Note:

Technical details of water supply facilities can be found in a range of other publications (See Appendix A1.2, page 256, for a list of resources).

- Improved health and well-being of the whole family.
- Other family members and neighbours, who previously spent a lot of time fetching water, now have time to spend on other activities. Children have time to play, or go to school.

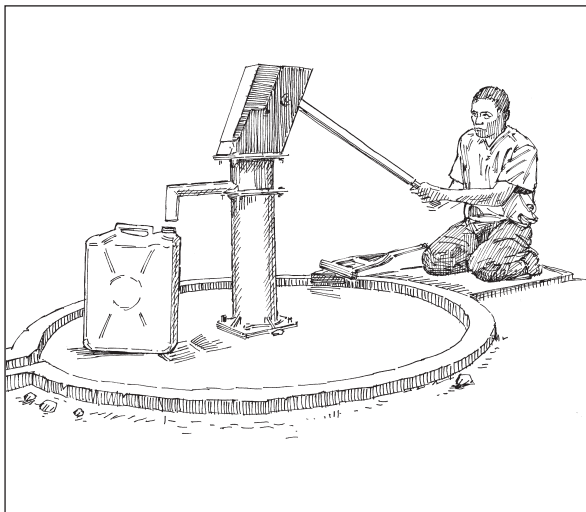


Figure 6.2. Crutch user operating handpump from a platform on the outside edge of the apron.

6.2 Principles of inclusive design

In making a water facility easy to access and use, the principles of inclusive design should be aimed for, i.e. ease of use, freedom of choice and access to mainstream activities, diversity and difference, safety and predictability.

6.3 Drawing water

Accessibility

At the water source, the user needs to be able to get into a position to reach the water drawing mechanism, to be able to operate it, and to reach the water produced.

Handpump aprons

Where a handpump has a concrete apron, this is liable to be slippery when wet, and treacherous for a user with poor balance. For many users, it may be better to avoid the risks of a slippery surface by designing the handpump to be used from outside the apron. This can be done by:

- Installing the pump near the edge of the apron, so that it can be operated from outside the apron (Figure 6.1),
- Lengthening the pump handle so that it is long enough to operate from the edge of the apron (Figure 6.2). Help may still be needed to collect the water.
- Constructing the apron so that it is level with the surrounding ground, or so that any kerb or threshold has a rounded edge, to enable wheelchairs to wheel onto them if necessary.

Some pumps have a concrete platform outside the edge of the apron for the pump operator to stand on. This should be level with the surrounding ground, so it is accessible to wheelchair or crutch users (Figure 6.2). The concrete should have a roughened finish so that it is not slippery when wet, and kerbs should have smooth edges.

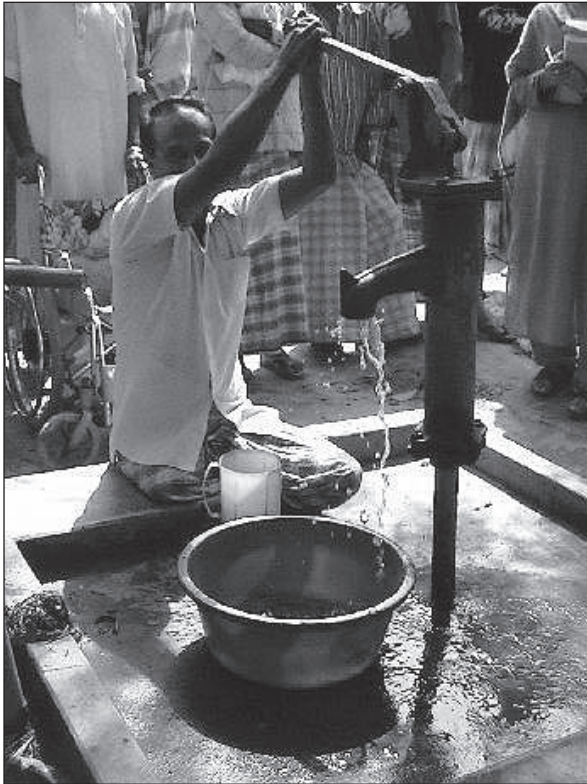


Figure 6.3. Low concrete sitting platform built into pump apron.

(Case-study 9.2, page 161)



Figure 6.4. Handpump with apron showing direction of water drainage away from pump. Note lengthened handle for extra leverage.

(Case-study 9.3, page 164)

An alternative is to build a concrete platform so that it is inset into the pump apron. This brings the user nearer to the pump handle, which can be used either sitting or standing (Figure 6.3). This also helps other family members, children, and women washing clothes or bathing children, to operate it more easily. A basic design of platform can be adapted in terms of height, width, and distance from the pump, to suit individual households or users.

As rain washes away the earth, the ground around the apron will get lower, so regular maintenance is needed to replace the earth to keep it at the required level.

Accessing the concrete apron

If a wheelchair or crutch user needs to go onto the apron to reach the handle or lifting device, a ramp, preferably of concrete, can make this possible (Figures 6.5 and 6.6).

There should be a level area at least 1 metre wide on the platform or surrounding ground to stand, sit or position a wheelchair next to the handle. Where possible, especially if the pump is used by several disabled people, this level area should be on three sides of the handle, allowing *all* users the option of accessing it from the side most suitable for them. This would allow them to use either hand, depending on whether they are left or right-handed.

A slippery floor can cause difficulties for a range of users. Slipperiness can be minimised by:

- Constructing the drainage slope so that water drains away from the ramp and user platform, to minimise water on the platform (Figures 6.4 and 6.6).
- Using a slightly rough finish to the apron where the user sits or stands.

Handpump equipment

Factors that make the equipment or facility easier to operate include:



Figure 6.5. The same handpump operated by a wheelchair user on a level apron.
(Case-study 9.3, page 164)

- Installing the pump at a height from which the handle can be reached, either from sitting in a chair or from sitting nearer ground level.
- Lengthening the pump handle to provide more leverage, so less strength is needed to operate it (Figures 6.4 and 6.5). It also allows the handle to be reached from outside the apron, or from lower down by a person sitting. The drawback is that a greater range of movement is needed to pump the same amount of water, which is a disadvantage for a person with limited arm movement.
- Installing the spout and pump handle at 90 degrees to each other. This allows the user to pump water and hold the container to collect water at the same time (although this is only possible from one side of the pump – see Figure 6.5). This is an advantage for someone with limited mobility, as it reduces the amount of walking between the handle and the container. Even if the container is placed on the ground to be filled, it is still less distance to move from the pump handle to the container. Also, it is possible to hold the container steady while it is being filled.

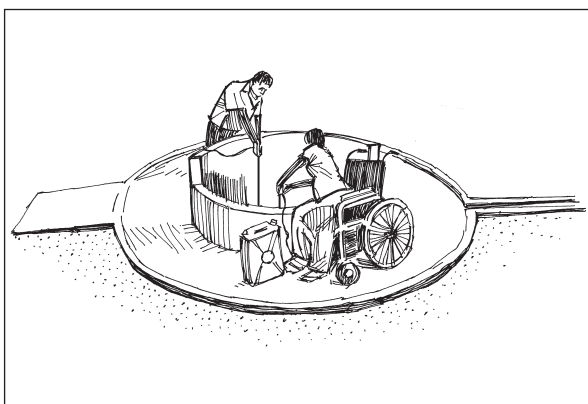


Figure 6.6. Well apron with access ramp. NB the ramp is on the opposite side to the direction of drainage to ensure it stays as dry as possible.

Open wells

Lifting devices benefit everyone, especially those with weak arms or grip, such as children and the elderly. Various types of lifting device are widely used, including the following devices used by disabled people:

Simple pulley arrangement on a wooden frame over a shallow well (Figure 6.8 and Case-study 9.12 on page 191). This has the following advantages:

- The user pulls down on the rope to lift water, which is easier than pulling upwards;
- A pulley can be operated from either a standing or sitting position;

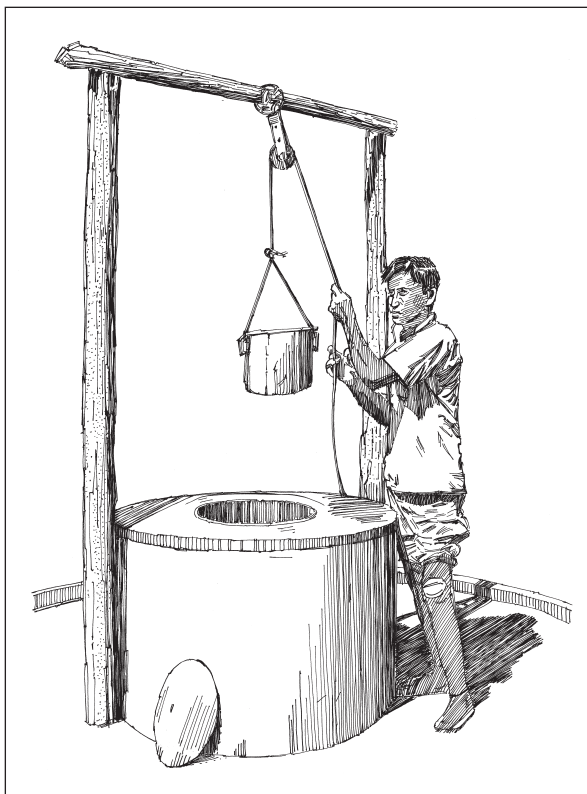


Figure 6.7. Rope and pulley over a shallow well.
(Case-study 9.12, page 191)

Sarah House, WEDC



Figure 6.8. Detail of pulley lifting mechanism.
(Case-study 9.12, page 191)

- There is no need to lean over the edge of the well to lift water, so a person sitting beside the well, such as an elderly person or wheelchair/trolley user, can operate it.

The user does however need to lean across to reach the water container once it is raised. People with limited reach could use a long-handled hook to do this. Once the container is raised, it is also useful to be able to tie off the rope, round a pole or cleat for example, so that both arms are free to handle the container.

A cantilever lifting mechanism with a pulley over the well can be made easier to use by the addition of a **ratchet and pawl** winding and locking mechanism for the rope (Figure 6.9). The ratchet and pawl can be made out of wood, which is cheaper than metal, but easily damaged. Metal is more expensive but more durable. Its advantages are that:

- Less strength is needed to raise water, and it prevents the rope burning hands or stumps of arms.
- This is useful for a disabled person with only one arm, or a user with limited strength, as it gives additional control. For this reason it could also be of wider benefit to all users of deep wells.

Treadle pump designed to be operated using the feet (Figure 6.10). The user pushes down alternately on the ends of two lengths of wood, which are pivoted around a metal bar. The wooden beams are connected to a simple twin cylinder suction pump that draws water through a pipe from a nearby shallow well or borehole. Its advantage is that:

- It can be operated using either hands or feet and is easy to use by people with a range of impairments.

However, it is only useful for water tables less than 7m below the surface.

Maintenance

All the above types of lifting devices can be repaired and maintained by the disabled

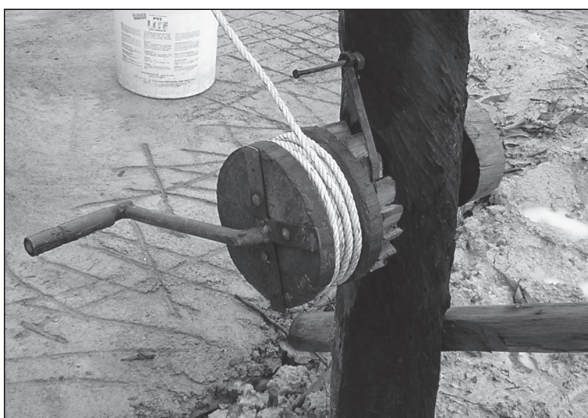


Figure 6.9. Detail of ratchet and pawl winding mechanism.

(Case-study 9.11, page 187)

owners themselves. The spare parts of the pulley mechanism (Figure 6.8) and the treadle pump (Figure 6.10) could be purchased locally and replaced by the user. The ratchet and pawl winding mechanism (Figure 6.9) was designed and constructed by the disabled user.

The benefit of equipment that can be maintained by the user is that it can lead to greater self-reliance and sustainability (Box 6.1).

Handpump

Installing a handpump directly over a well makes water lifting easier and also generally improves the quality of water provided (see pages 66 to 68 for more on handpumps).

Open well without lifting mechanism

If the well is open with no lifting mechanism, there should be somewhere safe for the user to stand or sit (see pages 56, 66 and 67 for suggestions on flat platform areas).

A raised well wall, while reducing the risk of water contamination, is helpful for a person who is standing to draw water, to lean against for balance. The height of the wall should be between an adult's hip and waist, or approximately 80cm high. The wall should be strong enough to support the weight of a person leaning on it while lifting water.

For a wheelchair user, or any person sitting, the wall should not be above the height of their waist or chair arm (approximately 50cm high). This will allow them to reach over the side of the wall to lift water.

Wells used by a range of disabled and non-disabled people should have a wall at various heights to suit different users (Figure 6.11). The minimum height of an open well wall should be 50cm, to reduce the risk of small children falling in.

A flat cover over the well, of concrete or wood, with an access hatch, provides an additional surface to lean on, and to rest the container before and after filling (Figures 6.12 and



Figure 6.10. Treadle pump in operation.

(Case-study 9.13, page 193)

Box 6.1. Mr Lann becomes the local treadle pump repairman

Mr Lann watched carefully as the treadle pump was being installed, as he knew that when the agency had gone he would have to repair the pump himself – which he does, replacing valves and pipes as needed. Mr Lann's skills in repairing the pumps have also led to him being asked to repair his neighbours pumps and he is paid for this service in cash or in rice. Mr Lann and his family hold spares at their home and purchase them from local suppliers. Mr Lann has thus become a community resource person and his family have gained increased respect.
(Case-study 9.13, page 193)

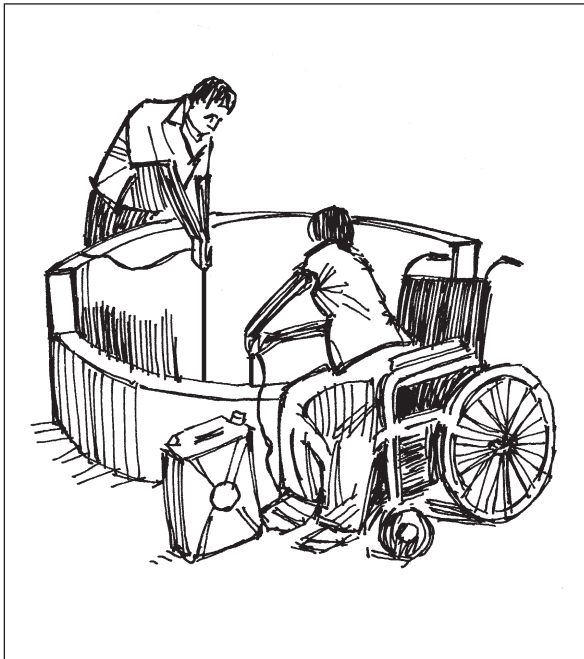


Figure 6.11. Well wall of different heights.



Figure 6.12. A concrete slab cover over the well provides a surface to rest a container.

6.13). This avoids the need for the user to bend down, reduces the risk of accidents and reduces contamination of the water in the well. The hatch must be at the edge of the cover so that it is within reach of all users.

Taps and tapstands

The advantage of a tap is that it requires little strength to operate, compared with water lifting devices. It can be installed at any convenient height, to suit a variety of users, and to allow the filling of any size of container. The rate of flow can be controlled easily, so there should be less wastage.

Height of tap

A communal tapstand needs to have taps at different levels to suit different users.

80 – 100cm is suitable for someone sitting on a seat or wheelchair and for many crutch users (Figures 6.14 and 6.16). A higher tap may be more suitable for people who have difficulty bending (Figures 6.13, 6.17 and 6.18).

A low tap is useful for a person crawling, and can result in less water being lost between spout and opening. If the height of the tap from the floor or shelf is too low, however, larger sizes of container cannot be used (Figure 6.15).

If the tap is over a basin or shelf, it needs to be positioned so that it can be reached from a sitting or standing position. In addition, there should be enough space for the wheelchair user to get their knees under the basin and



Figure 6.13. Tapstand in Tibet with higher tap and shelf that does not require the user to bend.
(Case-study 9.32, page 252)



Figure 6.14. A wheelchair user collects water from a tap ~90cm high.
(Case-study 9.3, page 164)

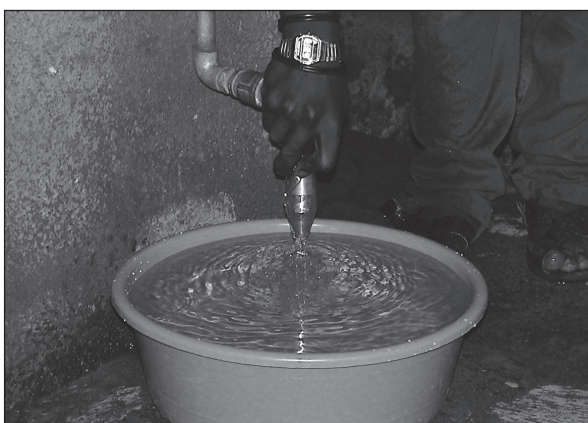


Figure 6.15. A low tap (25cm high) is useful for a person crawling or using a trolley.
(Case-study 9.20, page 217)

close enough to reach the tap (Figures 6.17 and 6.18).

Place to rest the container

A shelf or platform should be provided to rest a container while filling (Figures 6.13, 6.17, 6.18 and 6.19). This is beneficial for all users, especially those with weak arms, weak backs, women and girls carrying babies and elderly people.

The shelf should bear the weight of a full container of water.

Types of tap

Taps are an efficient way of accessing piped or stored water. Standard twist action taps are generally easy to use and control the flow of water easily. Large size taps (22mm diameter) are better than small ones (12mm diameter) because they are more robust and easier to operate.

A 'hospital tap' with a long lever is recommended (Figure 6.20), as it is easy to operate with almost any body part although it may be difficult to find in many areas. Instead, a tap turner can be made with nails or notches that fit over the twist tap (Figure 6.21). A lever which can be padlocked enables the owner to control who has access to their water (Figure 6.22).

Twist action taps may be difficult to use for some people because of the twisting wrist movement required. A press action tap may be more suitable for users with stiff wrists. However, the spring mechanism makes it more difficult to control the flow, and continuous pressure is needed to keep the tap open, which is difficult for those who lack strength, so press action taps are not generally recommended.

A flexible hose attached to a tap allows water to be directed into a container without lifting it off the floor. This can be done with one hand only (Figure 6.23). It can be cut to a length that allows a disabled person to direct



Figure 6.16. A man using crutches collects water from a 40cm high tap.
(Case-study 9.24, page 224)

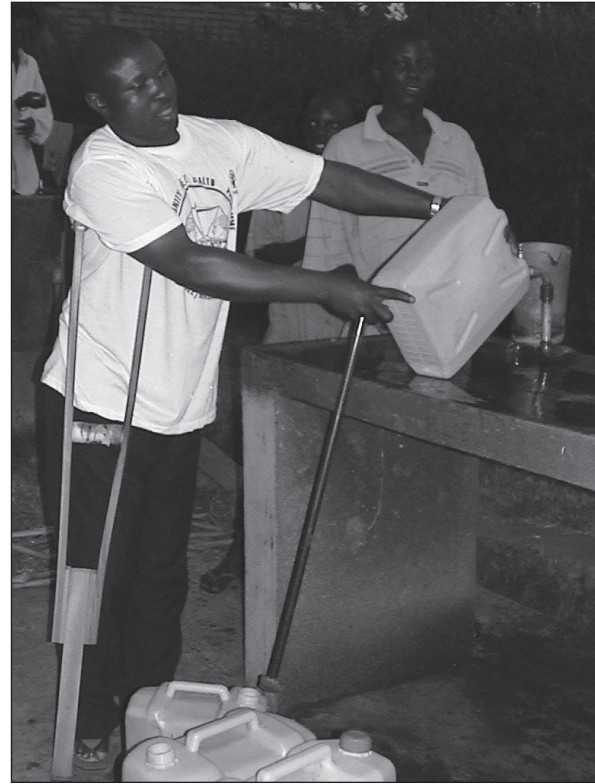


Figure 6.17. Taps ~25cm above a concrete shelf (H: ~1m) do not require the user to bend.
(Case-study 9.20, page 217)



Figure 6.18. A user parks his wheelchair with his knees under the concrete shelf of a tapstand.
(Case-study 9.20, page 217)



Figure 6.19. Tapstand in Ethiopia.
Note the indentation in the shelf to sit round-bottomed containers in while they are filled.

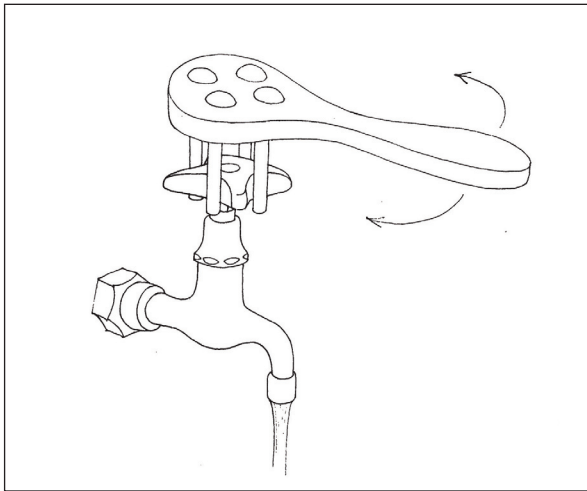


Figure 6.21. Tap turner made by driving nails through a piece of wood.



Figure 6.20. Lever operated tap.



Figure 6.22. Lever operated tap with padlock.
Unsuitable for a person with limited grip or stiff fingers.
(Case-study 9.21, page 219)



Figure 6.23. A flexible hose attached to a tap allows water to be poured into a container with one hand. (Case-study 9.6, page 177)



Figure 6.24. Carrying a jerry-can on the head.



Figure 6.25. Crutch user carrying a jerry-can with three fingers.

the flow of water more easily, for washing and other uses. The hose should be stored off the ground when not in use, to stop it resting on the ground and getting dirty, and contaminating the water and container.

The tap needs to be positioned high enough from the ground or shelf to allow a range of sizes of container to be filled. If it is very low, or over a hand-basin, it may be difficult to fill large water containers.

6.4 Transporting water

The need to transport water can be reduced by (a) bringing the water point nearer to the user (see Section 5.4 under Proximity on page 45), and (b) taking water-related tasks to the water source, such as bathing and washing clothes.

It is the norm in many countries to see children and women fetching water in pairs or groups. Often, one person pumps water while the other holds the container. In this context, the contribution of a disabled person to the group activity is often valued, even if they can only do one aspect of the task, such as carrying, but not drawing water.

Few devices or containers are specifically designed for use by disabled people, but the advantages and disadvantages of equipment and containers in general use are discussed here.

Ways of carrying water

Direct carrying

Water can be carried by disabled people in a number of ways: on the head (Figure 6.24), on the back (Figure 6.13), on crutches – either in the hand (Figure 6.25), or in an adapted container (Figure 6.26).

Wooden yoke

A wooden or bamboo pole rests on one or both shoulders with a container on each end. This method allows more weight to be carried

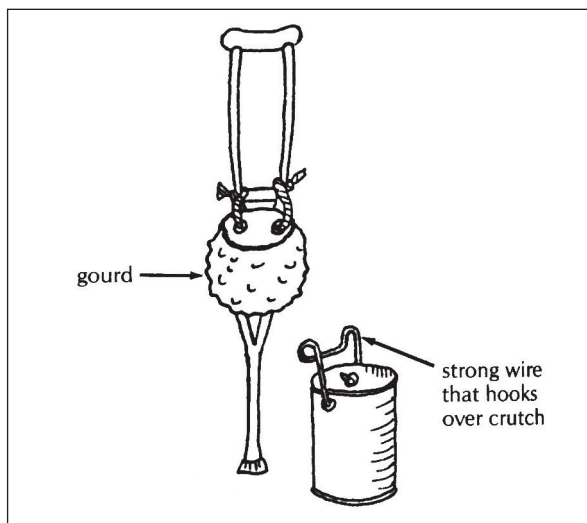


Figure 6.26. Adaptations for carrying things with crutches.



Figure 6.27. Plastic bucket carried on the footrest of a wheelchair. A rubber strap would help keep it in place. (Case-study 9.4, page 169)

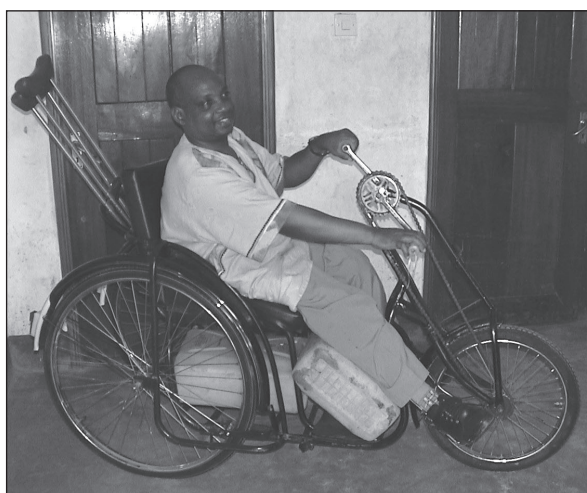


Figure 6.28. Two jerry-cans carried under the seat of this wheelchair. (Case-study 9.24, page 224)

than in a hand-held container, and is widely used by the general population in East and South-east Asia (see Case-study 9.11 on page 187). The yoke is suitable for users who may have damaged arms or hands, or limited grip, but who can walk.

Weight can be shared by carrying a pole on the shoulders of two people, with a container of water suspended from the pole between them. In this way a person with limited strength can contribute to carrying water.

Indirect carrying – using equipment

Wheelchair

Water containers can be carried on a wheelchair in various ways:

- On the footrest: Jerry-cans (see page 77) are most suitable for this, because their square shape can be wedged between the user's legs. Round containers such as buckets or jars are more difficult to carry on a footrest (Figure 6.27). They may need to be kept in place with a strap, hooked onto the frame on each side of the chair and round the container. Straps can be made from recycled inner tube (Figure 6.39).
- Under the seat: this is possible with some designs of wheelchair (Figure 6.28).
- On the knee or beside the user – suitable for small containers up to 5 litres.
- Hooked onto the handles on the back of the chair. A bag with a long strap, or a sling made from a local cloth, sarong or wrapper can be used. Care must be taken not to carry too much weight, otherwise the wheelchair could tip up.

Wheelchair trailer

A trailer can be attached behind a wheelchair, and carry more weight than could be carried directly on a wheelchair or on the head. It can also be used to carry goods to market, or even young children! A wooden two-wheeled trailer hooks onto the back of a wheelchair, which can easily be detached when not in use (Figures 6.29 and 6.30). This could also be



Figure 6.29. Two-wheeled wooden wheelchair trailer.

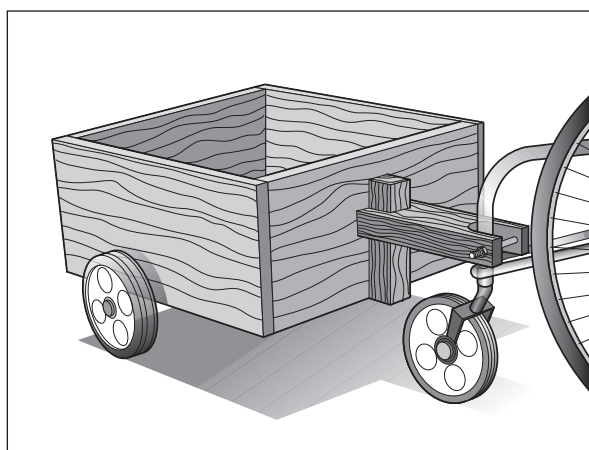


Figure 6.30. Detail of how the trailer attaches to the wheelchair frame.

used as a hand-drawn trailer, with a different pulling arrangement, such as a rope.

A trailer may not be suitable for rough, narrow paths.

Types of water container

Jerry-cans

A **jerry-can** is a plastic or metal container with a handle and screw lid. They are widely used in Africa to transport and store water in various ways. They have a number of features that make them convenient for disabled people:

- They are cheap, durable and widely available in Africa.
- They are available in different sizes, from 1 to 25 litres. The smallest – 1 litre – is small and light enough for a disabled child to carry when filled (Figure 6.32).
- Wheelchair users can select the size of jerry-can that suits them. It needs to fit the space available, such as the footrest of the chair, and be light enough to be lifted on and off without unbalancing the wheelchair.
- The handle makes it possible to carry using two or three fingers, which means it can be carried while walking with crutches (Figure 6.25). Threading the rope through a short piece of pipe, bamboo or used bicycle inner tube can make the handle wider and more comfortable to carry.
- Using rope or string, the handle can be made any length for the convenience of the user when either filling or carrying water. This can be useful for someone with a lack of reach or who has trouble bending.
- The square shape makes it easy to carry on its side, and the screw-on lid prevents spilling, even when the container is carried on its side, or moved erratically.

Source: Werner, 1987 (3)

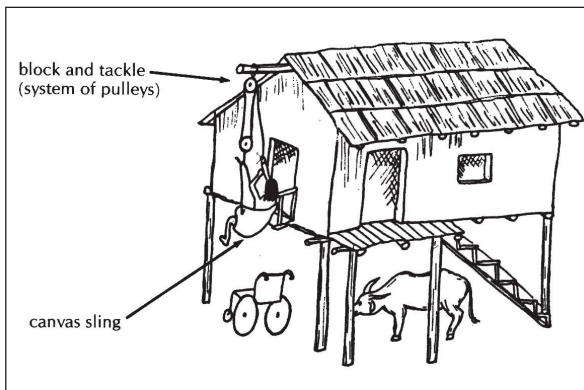


Figure 6.31. Rope and pulley system could be used to lift water, or even people.

- The square shape allows jerry-cans to be packed closely together, which makes good use of available space under a wheelchair (Figure 6.28) or on the footrest. They can also be carried on the head.
- The plastic is strong but flexible enough to be adapted by cutting and piercing (Figure 6.33).

Drawbacks of jerry-cans

- Less widely available outside Africa.
- The lid is easily lost, so bananas, leaves or other unhygienic objects are often used to close the opening to prevent spilling, which can cause contamination.
- They are difficult to clean inside, so contamination and unsightly algal growth (green slime) can be a problem.
- A lot of spillage occurs when filling because of the narrow opening.

Buckets and bowls

Buckets and bowls have an advantage for disabled people in being easy to fill because of their wide opening. They can be placed on the floor, and even if there is a long distance between the water spout and the bucket, little water is wasted in collection.

Box 6.2. Houses built on stilts

In many parts of the world, entry to the house is up a steep wooden ladder. Carrying a bucket of water upstairs to the house is possible for a person with only one leg, or weak legs, who cannot walk up the steps. This can be done by sitting on one step at a time and pulling the container up to balance on each subsequent step. This task can be made easier if the ladder, rather than having round rungs, has steps, which provide a flat surface to rest the bucket on. (4)





Figure 6.32. A full 1 litre jerry-can is light enough for a child to hold in one hand.
(Case-study 9.30, page 245)

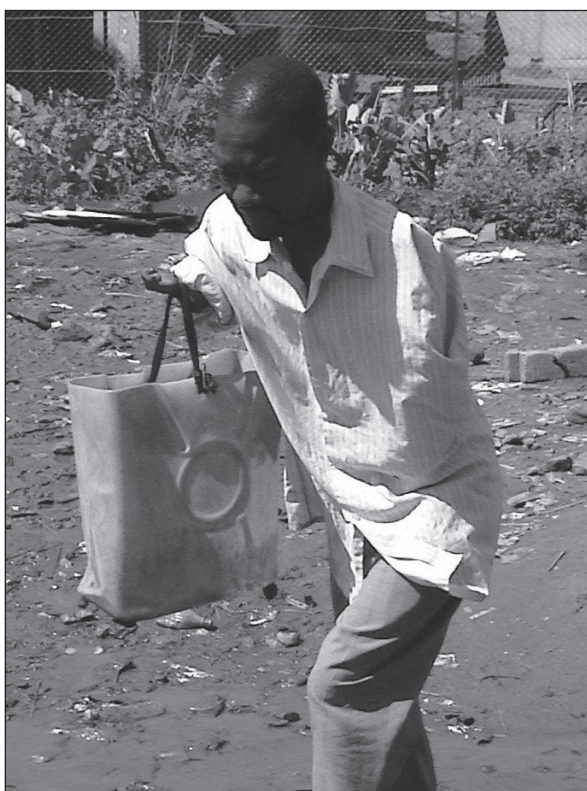


Figure 6.33. A man with one very short arm carries an adapted jerry-can one third full.
(Case-study 9.22, page 221)

Buckets are suitable for large quantities of water. Both bowls and buckets are easy to empty and clean. A tight fitting lid can reduce spillage during transport, and contamination during transport and storage.

Used food cans and other containers can be adapted for collection and storage of water.

For lifting water from a well, the size of container can be adjusted to suit the strength of the user. In this way, the weight of water and any risk of rope burn are reduced, which is of particular benefit to people with limited strength or poor grip, such as elderly people and children. Water can then be emptied into a larger container for transporting if required.

Drawbacks: Bowls are very difficult to carry without spilling water. Buckets are easier to carry than bowls, but are still inconvenient to carry because of their width, and the wide opening, which makes it easy to spill water.

Tight fitting lids are hard to make and not always widely available.

Traditional water jars

Traditional aluminium and clay water jars are widely available in a range of sizes. Their wide opening makes them easy to fill and to clean. However, they have no handle, which makes them difficult for disabled people to carry, as they must be carried by holding the rim of the jar. They have no lid, which means there is the risk of spilling water, and of contamination.

A handle could be made with string or rope tied round the neck of the jar.

Soda bottles

Soda bottles (1 litre), with a screw-top to prevent spilling and contamination, can be carried easily by a wheelchair user, as they do not need to be carried upright, and can be carried on the knee, or tucked between the chair arm and the user's side.

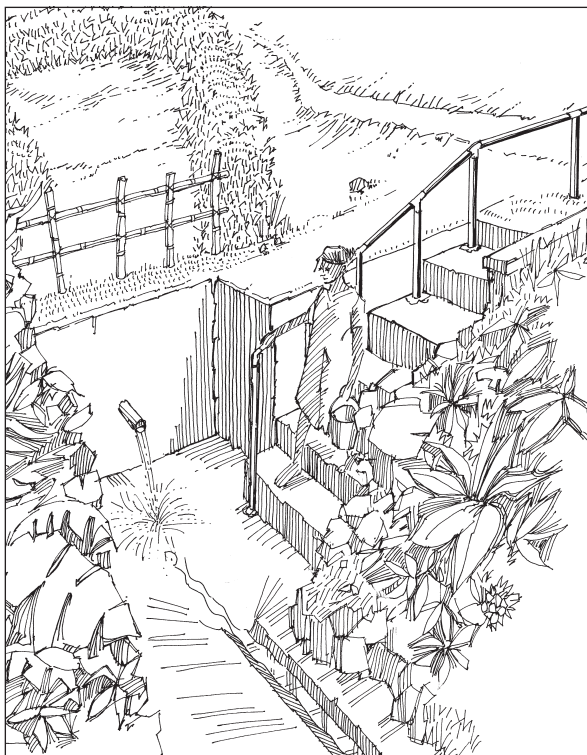


Figure 6.34. Protected spring with a rail for guidance and safety.



Figure 6.35. Ferrocement water storage jar. Water is scooped from the top using a mug.
(Case-study 9.17, page 209)

Drawbacks: The narrow neck makes them slow to fill at a tap, and almost impossible to fill at a handpump without using some type of funnel. They have no handle, which makes them difficult to carry for a crutch user or someone with poor grip. Some bottles can be fitted with a carrying handle made of string or rope.

Issues for blind and visually impaired people

Getting to and from a water source can be particularly hazardous for people with visual impairment, especially if they are carrying a container of water and have only one hand to feel their way and to steady themselves.

A safety rail or rope is recommended for paths that lead to or past an open water source (Figure 6.34). This is useful for everyone, especially young children, and others with unstable balance, such as pregnant women, elderly people and people with epilepsy. This must be installed at a height of 100cm (adult waist height), otherwise it can become a trip hazard for many users. A lower rail of 75cm high can be added for children.

See also page 57 in Section 5.4 on issues of mobility for blind people.

6.5 Storing water and accessing stored water

Water can be stored in the home in a variety of containers, varying in size from 1 to 500 litres and beyond.

Accessing the water

In general, containers with a wide open top, such as buckets and wide-mouthed jars, are easier for disabled people to use, as they can scoop water from the top with a small container (Figures 6.35 and 6.36). This is possible for most people with a reasonable range of arm movement, and no heavy lifting or pouring is needed. A wide opening also makes the container easy to clean. A lid reduces the risk of contamination.



Figure 6.36. Water jar placed below the user, to make it easy to reach in.*
(Case-study 9.15, page 201)



Figure 6.37. Water for handwashing.
(Case-study 9.24, page 224)

The drawback is that the water in a wide-mouthed container is easily contaminated, as any cover must be removed for access, and a scoop repeatedly dipped in the water. This is not a problem if the water is used for bathing or washing clothes, but it is not recommended for storing drinking water.

For people with limited arm movement, a tap fitted near the bottom of a container makes it easier to draw water (Figure 6.37 and 6.38). The container needs to be raised off the ground so that the tap is at a convenient height. However, raising the container can also make it more difficult for the disabled user to fill and clean.

A flexible hose attached to a storage container, or to a tap, can be useful for bathing and anal cleansing (Figures 6.70 and 7.55). This can either be attached to a tap, or have a tap on the end of the hose to control the flow. The end of the hose must be hooked off the floor when not in use to avoid getting it dirty.

For handwashing a 'tippy tap' can be used. This consists of a can which releases a small amount of water – just enough for a clean handwash – each time it is tipped. It can be used with one hand.

Drinking water is best stored in a container with a close-fitting lid to reduce contamination. Ideally the water should be delivered through a tap as described above (Figure 6.38). If the water has to be scooped from the top, a two-cup system should be used. This means that the scoop is used only for scooping into other containers, and never for drinking from.

Plastic jugs with handles and a lid are widely available in different sizes, from 2 to 3.5 litres. These are suitable for storing and pouring smaller quantities of water, particularly for drinking. The handle makes it usable by a person with poor grip. The lid prevents contamination.

* Note: the footrest of this wheelchair is designed for sitting on. Many wheelchairs will tip over if the user sits on the footrest (see pages 92-93), Wheelchairs for bathing).



Figure 6.38. Disabled woman pouring a drink of water.

Location

Water is most useful when provided at the point of use, such as next to the bathing/ laundry area, or inside a latrine. The container needs to be positioned so that the disabled user can easily access the water. In some cases this means raising the container (Figure 6.37), and in other cases lowering it in relation to the user, so that it is easier to reach in and scoop water (Figure 6.36).

If the container is raised off the floor, it needs to be held in place so that it is not knocked over. A wooden or metal stand (Figure 6.37) or a rubber strap made of recycled tyre inner tube (Figure 6.39) are two ways of doing this.

The container can be suspended, as in the case of a tippy tap used for handwashing (Figure 6.40).

Filling the storage container

Water which is stored at the point of use enables disabled people to be more self-reliant, as they can access water when they need it (Figures 6.39 and 6.41). Even if the water container has to be filled by family members, the disabled person does not have to request and wait for water each time he or she needs it. Family members can fill the container at their own convenience, on a daily or weekly basis, rather than each time the disabled person needs it, which may be several times a day.

Water stored at the point of use can be fed by a gravity system from a primary source. A flexible hose leads from the main storage container to the smaller secondary container, which must be positioned lower than the main container (Figure 9.66). The hose has a tap on the end, which allows the user to stop and start the water flow at the point of use, and to fill the secondary jar as required.

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Figure 6.39. Water storage jar in bathing area, raised on a wooden stand and held in place with a rubber strap.

(Case-study 9.14, page 197)



Figure 6.40. Tippy tap for handwashing.



Figure 6.41. Water trough next to the toilet.
(Case-study 9.19, page 215)



Figure 6.42. Water jar next to the toilet.
(Case-study 9.15, page 201)

6.6 Bathing

Bathing facilities can take a range of forms, levels of sophistication and cost, from specially designed brick built rooms with internal piped water to bathing in a pond.

Benefits of inclusive facilities

Wherever possible, the aim should be for the disabled person to use the same facilities as the rest of the family. None of the features described here excludes non-disabled people from using the same facilities. Accessible facilities can promote inclusiveness, but also bring positive benefits to other family members, especially frail elderly people, women and children.

At the same time, some individual equipment can provide more flexibility for disabled users. For example, they may wish to move a bathing seat to a different location, depending on the time of year, or use it for a different purpose, such as washing clothes. Such equipment can be moved out of the way when not in use, to prevent it getting dirty or damaged, and to prevent it obstructing other users.

Accessible bathing facilities have a number of features in common.

Getting there and getting in

See pages 45 to 60 for issues related to getting to and into facilities.

Privacy

In many countries and communities, it is traditional for both men and women to bathe in the open, usually in separate areas, or at separate times. A piece of cloth such as a wrapper or sarong is often used for personal privacy. Many people with movement or co-ordination problems may have difficulty manipulating a wrapper in this way. This can be made easier by adding elastic to the top of the wrapper to keep it in place at the waist, below the arms or around the neck.



Figure 6.43. Space for the wheelchair beside the bathing seat for easy transfer.



Figure 6.44. Sitting on a low stool to bathe.

Additional privacy may be needed while bathing, especially for women. A private bathing area can be created at low cost, using screens of locally available materials, such as leaves (Figure 6.45), wood, or plastic sheets (Figure 6.47).

See page 60 in Section 5.4 for further discussion of privacy and security.

Internal space and layout

See Section 5.4 on page 60 for issues related to internal dimensions and extra space to suit the needs of different users.

If the bather needs to transfer from a wheelchair to a bathing seat, space should be provided so that a wheelchair can be positioned beside the seat for easy transfer (Figure 6.43).

Floor

The floor should be level with a slight fall for drainage, and it needs to be even, to allow a wheelchair to stand firm while the user transfers, and so that bathers who are blind, or unsteady on their feet do not risk falling. The floor should not be too smooth, to prevent it from becoming slippery when wet. Good drainage also helps to reduce slipperiness. The drainage outlet should encourage water to flow away from the bathing area.

See pages 51, Surface of paths and step, and page 61, Floors, for detailed discussion of materials for floor surfaces.

Internal water source

A water source at or inside the bathing area is a great advantage, as it saves the disabled person carrying water or having to ask a family member to fetch water.

See Section 6.5, pages 80 - 82, for discussion of water storage options and pages 92 and 94 for ideas for simple showers.

Examples of screening materials for bathing areas

HITS, Uganda



Figure 6.45. Demonstration bathing area (the floor surface is not recommended).
(Case-study 9.31 on page 247)

Wall	Leaves on a wood frame
Cost	Low
Longevity	6 – 12 months



Figure 6.46. Communal bathing area in residential school.
(Case-study 9.25 on page 229)

Wall	Cement-plastered brick
Cost	High
Longevity	5 years +

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Figure 6.47. Household bathing area.
(Case-study 9.14 on page 197)

Wall	Palm leaves on bamboo frame
Cost	Low
Longevity	6 – 12 months



Figure 6.48. Low concrete sitting platform.
(Case-study 9.2, page 161)

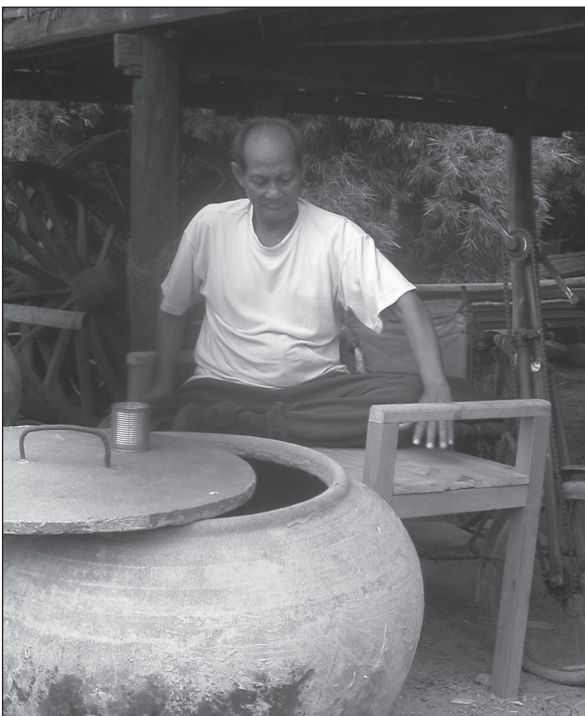


Figure 6.49. Wooden bathing bench next to water source.
(Case-study 9.17, page 209)

Bathing at the water source

In many communities, it is usual to bathe at the water source rather than to carry water to a separate bathing area. There are a number of design and equipment options to enable disabled people to bathe at a water source comfortably.

A water point may be designed and constructed to enable bathing and other water-related activities to take place there. A sitting area next to the water is comfortable not only for disabled people but also for women and elderly people. For example, a flat concrete platform built on the edge of a handpump apron allows a disabled bather to sit at the pump to bathe (Figure 6.48). It also allows the women in the family to sit comfortably to do their laundry and bathe their children, it reduces back-ache and injury from too much bending, and reduces accidents from slipping on the wet apron.

A seat or bench placed next to a water source can allow a disabled person to bathe with less help (Figures 6.49, 6.62 and 6.69).

Bathing in natural water sources

Where a pond or river is used for bathing, the bank around the edge is often muddy and slippery, which can cause problems for many people, especially people who are unsteady on their feet. For a person who can walk, but may need support, a rail of rope or bamboo or similar local materials may be useful to reach the water safely. The rail should also extend into the water, to provide support to hold onto whilst bathing (Figure 6.50).

An alternative is to place a bathing seat beside the pond, so that the person can sit on it to bathe.

Bathing seats

A seat is needed for the bather to avoid sitting or lying on a wet or dirty floor, in his own wastewater. It may be a fixed feature of the facility, such as the concrete platform in Figure 6.48. Or it may be a piece of furniture, such as a stool or bench, chosen or designed for the individual disabled user as in Figure 6.49.



Figure 6.50. Bamboo rail leading into the bathing pond.



Figure 6.51. Low wooden stool, widely used throughout South Asia to carry out floor level tasks.

(Case-study 9.4, page 169)

* People who lie or sit in one position for long periods risk developing pressure sores. These can take a long time to heal, and can cause permanent damage if left untreated (3).

A bathing seat needs the following features: Appropriate height and support, good drainage, and to be hygienic.

Height

The height of the seat needs to be suitable for transferring easily, whether from standing, crawling or from a wheelchair. This should be decided in consultation with the user as far as possible.

A **low seat** (height: 10 – 25 cm) makes it easy to use a washbowl placed on the floor, and reduces the risk of injury if the bather falls, but makes independent transfer to and from a wheelchair more difficult for some (Figures 6.44, 6.45, 6.51 and 6.52).

A **seat at similar height to a wheelchair seat, or at knee height** or above, is convenient for transfer to and from a wheelchair, and is easy for a bather with poor balance or difficulty bending to sit down and get up again (Figures 6.61 and 6.62).

Support

People with poor sitting balance need a back support to lean against. Side-rails on one or both sides of the seat are good for the person to hold onto for balance while moving on and off the seat, and whilst bathing (Figure 6.49). These can also provide a handle for picking up and moving the seat without having to bend too low (Figure 6.52). However, side-rails can be an obstacle to sideways transfer from a wheelchair. See page 108, Support and safety, and Figures 7.20 and 7.21 for flexible options for side-rails.

Good support needs to be balanced against comfort. Seating materials that provide a high level of support may be the least comfortable. Concrete is firm, but could feel cold and harsh. Concrete edges need to be smoothed and rounded, to avoid injury if the user falls, and to avoid rubbing the skin or making pressure sores worse*. A wooden or bamboo seat can be firm and supportive, but again the edges must be smooth to avoid splinters. Softer, flexible materials, such as

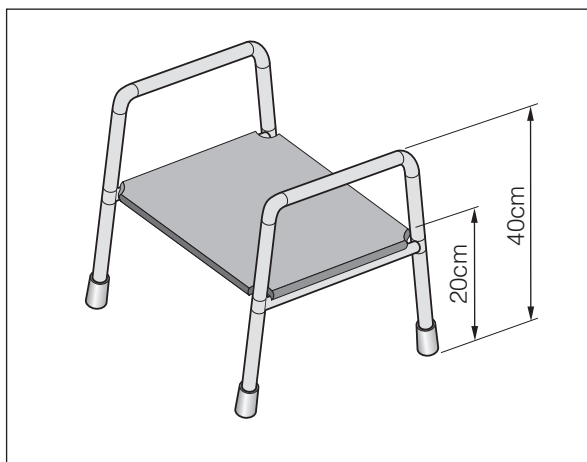


Figure 6.52. Low stool with side-rails.
(Case-study 9.4, page 169)

Source: Van der Hulst et al (2)

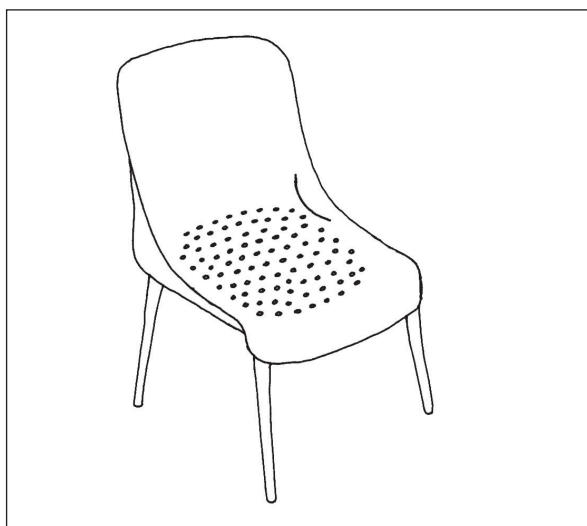


Figure 6.53. Moulded plastic bathing chair
with holes in seat.

Source: Van der Hulst et al (3)

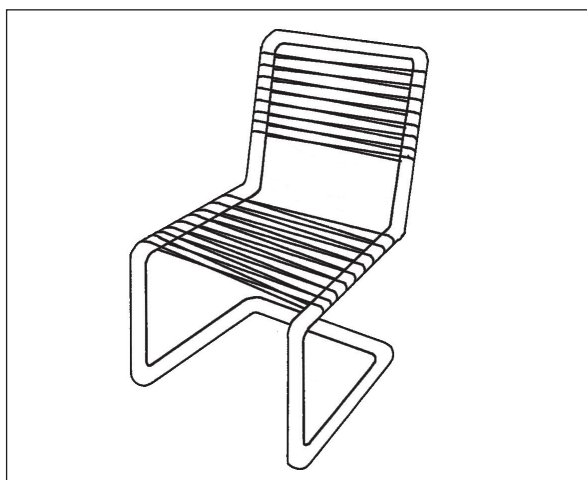


Figure 6.54. Steel tube frame bathing chair with
seat and back of woven plastic strips.

rubber or plastic, are more comfortable to sit on but may provide less support, so that a person with poor balance may need extra support from a raised back and/ or side-rails. A good compromise can be a supportive wood or metal frame, but with a softer surface for sitting or lying, such as woven rubber or plastic strips (Figures 6.53, 6.54 and 6.61).

Drainage and hygiene

Water needs to drain easily away from the surface of the seat, so that the bather is not sitting in his or her own bathwater, which can be uncomfortable and unhygienic. Good drainage will also enable the surface of the seat to dry more quickly, so it does not deteriorate rapidly. Drainage can be encouraged in the following ways:

- A narrow seat that lets water run off easily (Figures 6.45, 6.51, 6.52 and 6.68);
- Holes or gaps in the seat to let water flow through, such as wood or bamboo slats, or woven rubber or plastic strips (Figures 6.53, 6.54 and 6.61).

Materials such as rubber and plastic are easy to clean and therefore hygienic. If wood, bamboo, metal or concrete are used, they should be painted or varnished to make them moisture resistant, easy to clean and therefore more hygienic (Figure 6.55).

Bathing while sitting down can make it difficult for the bather to wash their buttocks. Solutions to this include using a bathing seat with a large hole in the middle (Figures 6.55 and 6.56), or with a cut-away section at the front (Figures 6.57 and 6.58), or raising the buttocks off the seat, with a cushioned ring such as a tyre inner tube (Figures 6.59 and 6.67).

Materials

A range of materials can be used to construct bathing seats, such as concrete, metal, plastic, rubber, wood, bamboo and even paper*. In general, the higher the cost of materials, the greater their durability. Table 6.1 summarises the strengths and weaknesses of different materials.

Table 6.1 Summary of strengths of different materials

Material	Durability	Cost	Hygiene	Comfort	Support
Concrete	High	High	Good if painted Poor if unpainted	Low	Good
Metal	High	High	Good if painted	Low	Good
Plastic	Good	High	Good at first, but cracks and peels in sun and heat.	Good	Good
Rubber	Good	Medium	Good	Good	Low
Wood	Good	Medium	Good if painted/ varnished	Fair	Good
Bamboo	Low	Low/none	Good if painted/ varnished	Fair	Good
Paper	Low (especially if it gets wet)	Low	Good if painted/ varnished	Good	Good

For information on making furniture from paper, see Appropriate Paper-based Technology (APT) Appendix A2.6, page 273.



Figure 6.55. Painted wood bathing/toilet seat is moisture resistant and easy to clean.

Bathing benches

If resources and space are available, a bathing bench can provide enough space for the user to put a water container, soap, and clothes beside them when they sit to bathe (Figures 6.61 and 6.62). In this way the bather does not have to bend or reach too far for these items.

The drawback is that a bench takes up more space than a chair or stool. If the bench has more than one function, however, the use of space can be justified. For example, a bathing bench can also be used for eating or sleeping or by other family members.

Advantages

- Saving space – one piece of equipment generally takes up less space than several.
- Reduced cost – only one piece of equipment to pay for.
- Less need for the user to transfer from one seat to another.

Source: WHO, 1996 (7)

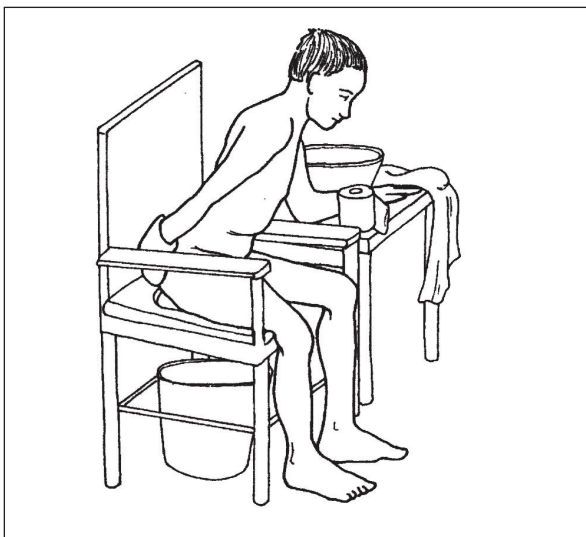


Figure 6.56. Using a bathing chair. Bather washing anal and genital area from behind. To do this, the bather must be able to lift his weight off the seat.

Source: WHO, 1996 (7)

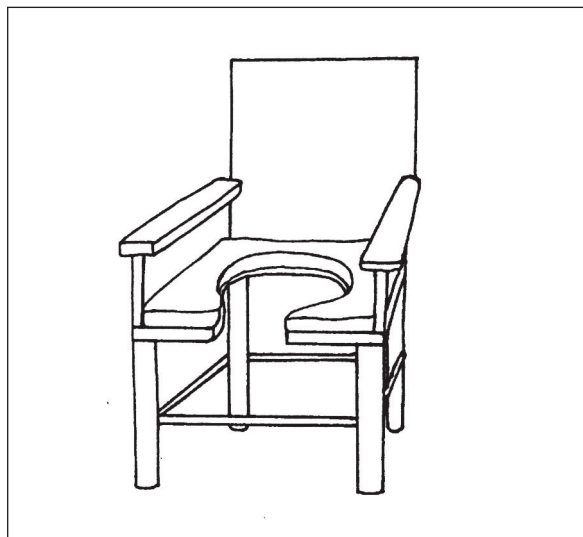


Figure 6.57. Wooden bathing/ toilet chair. The gap in the seat allows access for anal cleansing from the front, but may be uncomfortable for some people to use.

Source: WHO, 1996 (7)

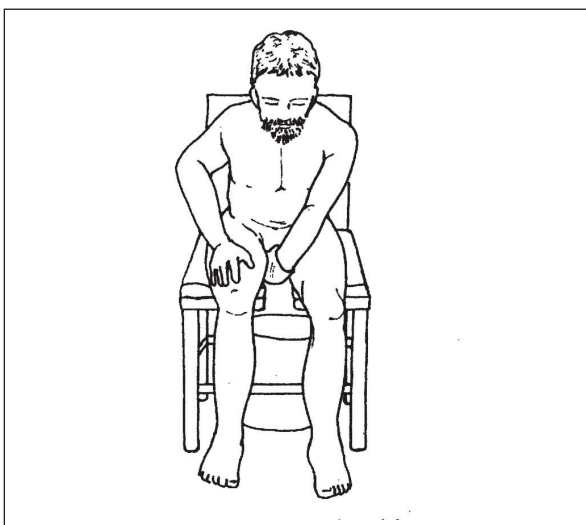


Figure 6.58. Anal cleansing from the front, without the bather lifting his weight off the seat.

Source: Werner, 1987 (3)



Figure 6.59. An inner tube on poles used as a bathing seat.

Source: WHO, 1996 (7)

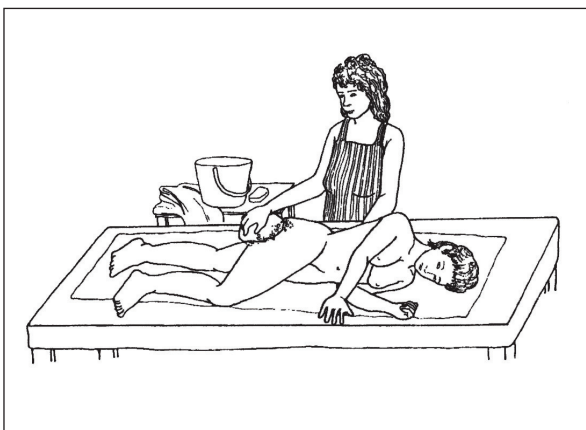


Figure 6.60. Lying on one side to bathe.

Examples of multiple use bathing benches

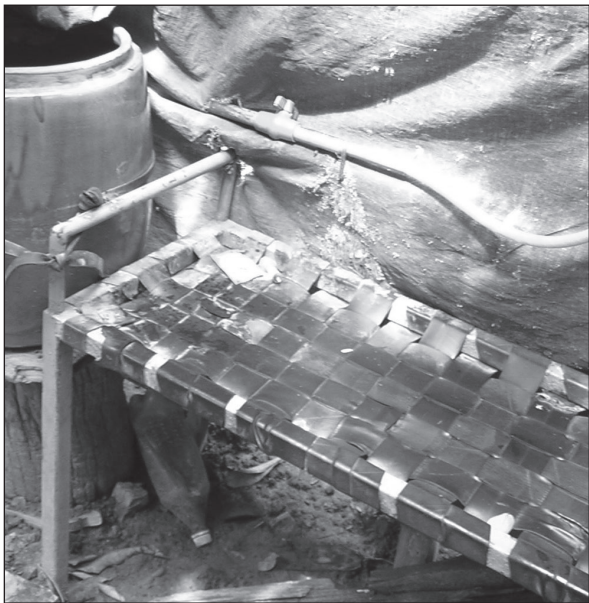


Figure 6.61. Metal framed bathing bench.
(Case-study 9.14, page 197)

Description	Metal framed bathing bench with seat of rubber webbing (woven strips of recycled rubber)
Uses	Bathing, washing clothes
Key features	<p>Rubber webbing is low cost, locally available, durable, easy to clean and comfortable.</p> <p>Good drainage, the bather is not sitting in her own bath water.</p> <p>A rail at each end of the bench for the bather to hold on to for balance.</p>
Drawbacks	<p>Rubber webbing is not very supportive.</p> <p>No back support, so suitable only for users with good balance.</p>



Figure 6.62. Wooden bathing bench.
(Case-study 9.17, page 209)

Description	Wooden bathing bench
Uses	Bathing, washing clothes
Key features	<p>Locally made, reasonable cost. Wood is fairly durable, and easy to clean.</p> <p>A rail at each end for user to hold onto for balance.</p>
Drawbacks	<p>The wide solid surface makes drainage poor, so the wood may deteriorate if it is always wet.</p> <p>No back support – unsuitable for people with poor balance.</p>

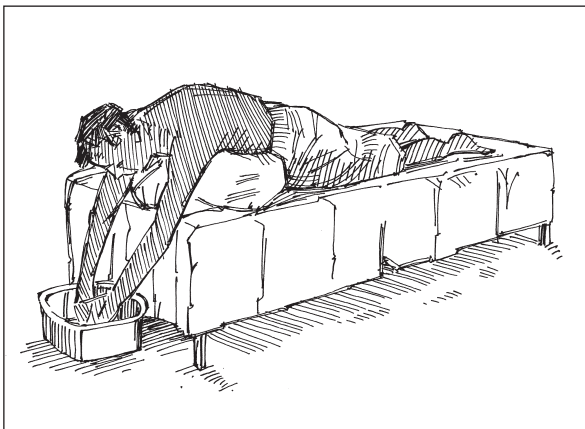


Figure 6.63. Bather lies on his front to bathe.
(Case-study 9.23 on page 223)

Source: Werner, 1987 (3)



Figure 6.64. Simple shower arrangement.



Figure 6.65. Adapted jerry-can with holes pierced around top.
(Case-study 9.27, page 237)

Drawbacks

Poor drainage – water drains less easily off a wide bench with a solid surface, so the bather sits in a pool of water while bathing. This can result in discomfort and pressure sores. After bathing the seat remains wet, which is a problem if the bench is also used for eating or sleeping.

A woven seat can reduce this problem (Figure 6.61) (see also previous section under Drainage and hygiene, page 188). Rigid wooden slats would also improve drainage, and have the advantage of providing something to hold on to for support.

Wheelchairs for bathing

If a wheelchair is used for bathing, it is important that it is designed for this use. If not, always check for stability, especially when putting weight onto the footrest, which may tip the chair over and cause injury.

Bathing lying down

For disabled people who have difficulty supporting themselves in a sitting position, it may be suitable to bathe lying down, with or without help.

Bathing may be done lying on one side (Figure 6.60), with equipment next to the bather, or lying face down, with the wash-basin on the floor (Figure 6.63).

For comfort, and to prevent the bedclothes getting wet, a towel or plastic sheet may be spread under the bather.

Equipment used for bathing

A variety of equipment can be used by disabled people and their family members to enable them to bathe more easily and independently.

Examples of wheelchairs used for bathing



Figures 6.66 and 6.67. Wheelchair convertible to a bathing seat. Wheelchair with cushion and seat board removed and tyre inner tube in place.
(Case-study 9.3, page 164)

Description	The wheelchair has a removable seat board and cushion. These are replaced by a small tyre inner tube, which is supported on two metal struts, but with a wide enough gap for drainage.
Use	The bather enters the bathroom in the wheelchair, replaces the seat with the inner tube, which he or she sits on while bathing.



Figures 6.68 and 6.69. Wheelchair with wooden footrest and child sitting on footrest to bathe.
(Case-study 9.15, page 201)

Description	Wheelchair with wooden footrest located behind the single front wheel. It also serves as a ‘transfer’ seat between the seat and the ground. A metal rail holds the feet in place, and also acts as seat back.
Use	Bather parks the wheelchair next to the water source and lowers himself to sit on the footrest. He bathes sitting on the footrest. When he has finished, he lifts himself back onto the chair seat.

Source: ILCP (6)



Figure 6.70. Bathing with a flexible hose connected to a water container.

Source: Van der Hulst et al (2)

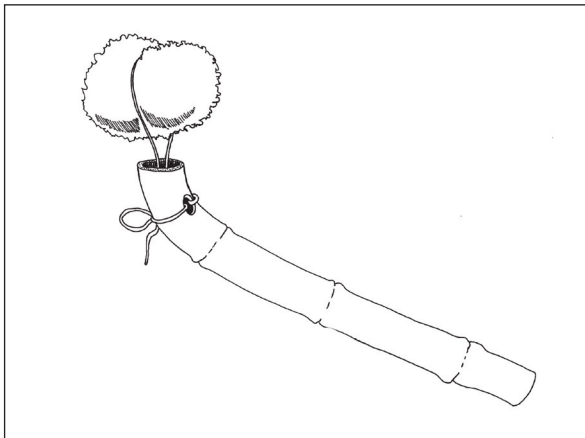


Figure 6.71. Bathing sponge on a bamboo stick.

Source: Van der Hulst et al (2)

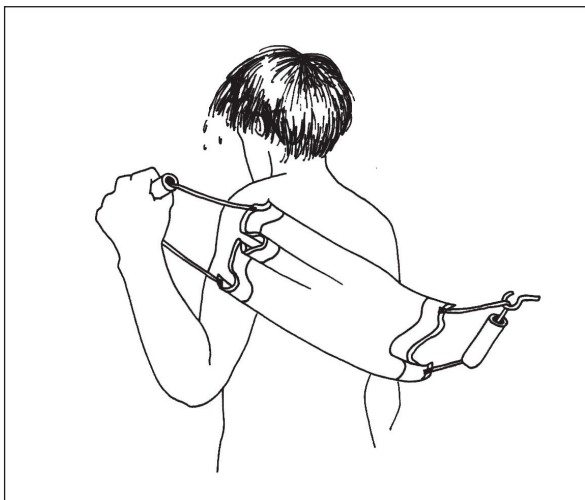


Figure 6.72. Towel with a loop at each end. One end is attached to a hook in the wall, so it can be used with one hand.

Simple showers

Many disabled people find it difficult to move their arms enough to scoop water over themselves, because of poor co-ordination or stiff or weak arms. Simple shower arrangements can make it easier for many people to bathe more independently (Figures 6.64 and 6.65 and 6.70).

Family members may still need to fill the container, but this is probably less time consuming than helping the person bathe.

Cloths and brushes

People with stiffness or limited movement of one or both arms can use a long-handled bath brush or long loofah to wash all parts of the body, so long as they have a good grip (Figure 6.71).

For people with weak grip, loops may be sewn on each end of an ordinary wash-cloth, which the bather can hold one in each hand. The cloth can be made of any length, to suit the bather. If the person only uses one hand, they could hold one loop with a foot, or attach it to a fixed object (Figure 6.72).

A person with the use of only one arm may have difficulty washing that arm. Some kind of sponge or brush can be fixed to a wall for the bather to rub their arm against (Figure 6.73).

Implement holders

An implement holder can be useful for people with limited use of their hands (Figure 6.74). This can be made to any height, to stand on the floor or table, or be fixed to a table or other furniture as needed. A holder that can be used to hold any implement – toothbrush, spoon, comb, etc. – is the most useful (Figure 6.75).

Artificial arm attachment

Some types of artificial arm for amputees are designed with attachments that can be interchanged. A bowl or scoop for pouring water over the body when bathing is one possible option (Figures 6.76, 6.77 and 6.78). A double amputee would need help to attach

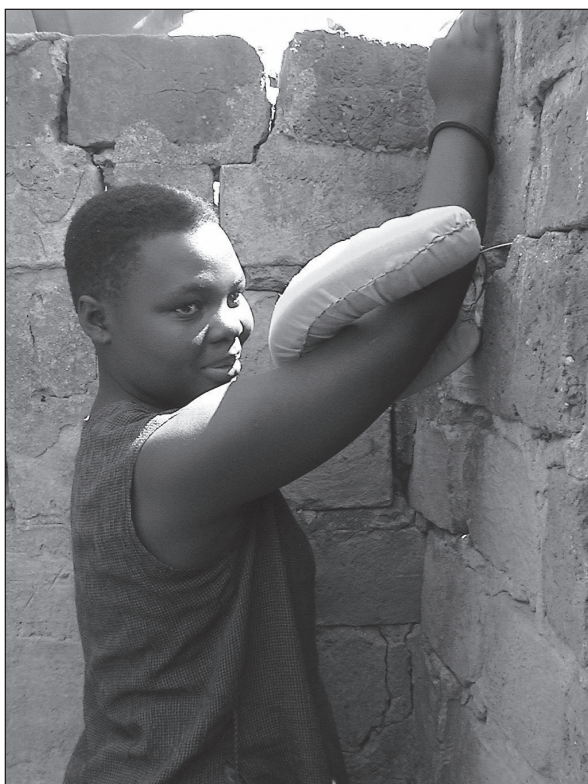


Figure 6.73. Bather using a padded bathing ring to wash her one arm.
(Case-study 9.28, page 241)

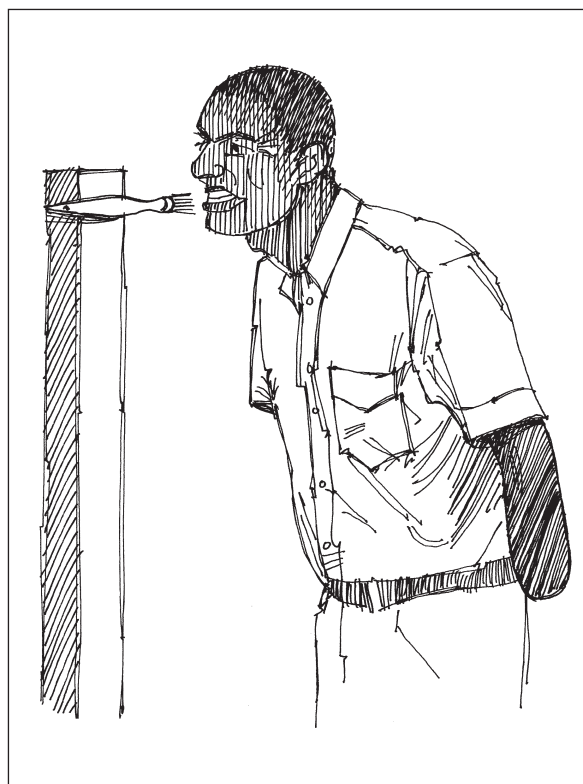


Figure 6.74. Floor-standing wooden toothbrush stand, with toothbrush nailed to post at the required height.



Figure 6.75. Implement holder attached to wheelchair tray, used with spoon, toothbrush or other tool.
(Case-study 9.27, page 237)

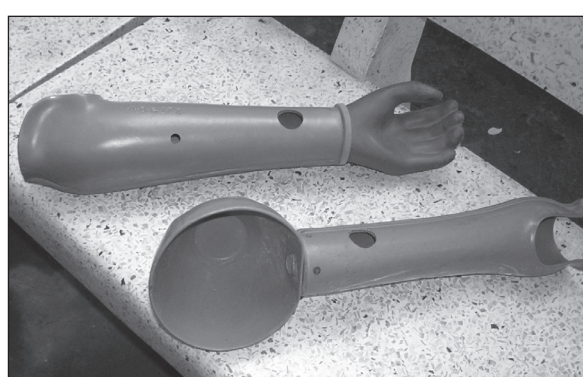


Figure 6.76. Interchangeable bowl and hand attachments on an artificial arm.



Figure 6.77. Screw attachment on a bowl for an artificial arm.



Figure 6.78. Bather uses bowl attachment to scoop water over himself.

it, but could then bathe independently. There are other functions for which it could be used, such as scooping rice, or bathing one's children.

Drawbacks

This is a high cost option. Most wearers prefer to remove their artificial arm or leg for bathing. A single arm amputee is unlikely to need it, as he could use his one hand to hold a scoop to bathe.

Issues for blind people

Blind people need a well ordered bathing area, as storing objects consistently in the same place makes them easier to find. They should preferably be on open shelves, or on hooks, rather than on the floor where they can trip up a blind person. The advantage of this approach is that it costs nothing, but it does depend on a co-operative and tidy family!

Containers of different shapes, which can be identified by touch, can be used for different purposes.

This orderly approach is also helpful for elderly people who are becoming confused, and for people who have difficulty learning and remembering everyday tasks.

Further ideas for people with limited use of their arms and hands

Werner, 1987 (3)

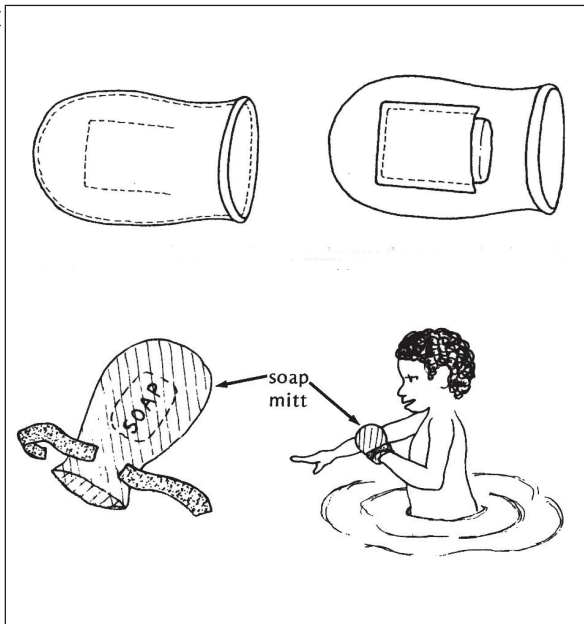


Figure 6.78a. Soap mitt made from two pieces of towel with pocket for soap, fits over bather's hand.

WHO, 1996 (7)



Figure 6.79. Soap on a rope – string threaded through hole drilled in soap, hung round bather's neck while washing.

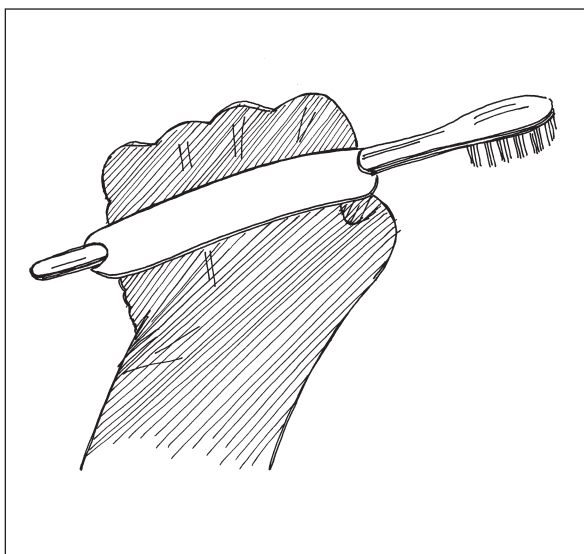


Figure 6.80. A cuff or strap used to hold a toothbrush. Can be made from a strip of recycled rubber inner tube.

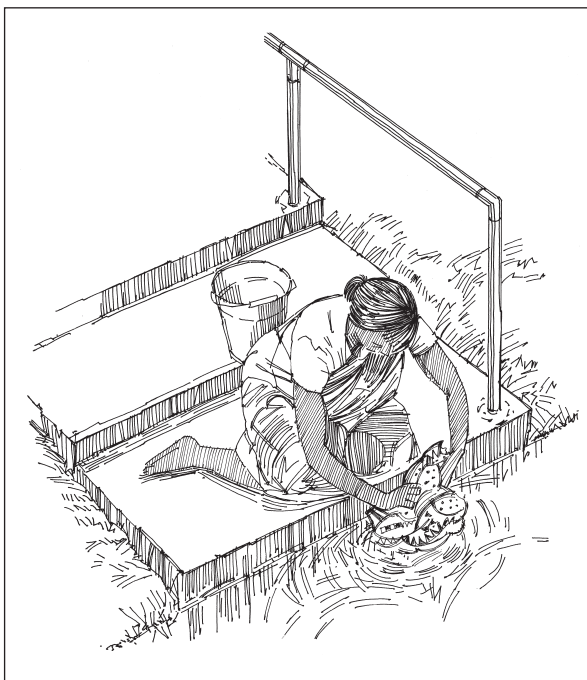


Figure 6.81. Disabled woman washing clothes at a natural water source.



Figure 6.82. Wooden bench for bathing and washing clothes.
(Case-study 9.18, page 214)

6.7 Washing clothes and dishes

Household tasks such as washing clothes and dishes are often carried out at facilities, including washrooms and water points, where a range of water-related activities take place.

Where it is usual to wash clothes and dishes at floor level, whether at a handpump or a tap, providing a place to sit can improve accessibility for many users, including disabled people. This may be designed and constructed as part of the facility, such as the low level concrete platform described on page 86 (Figure 6.48). Low stools (10-25cm) are also suitable for a number of floor level tasks, such as preparing vegetables and cooking, and are widely used throughout the world. A metal-framed seat is durable, but costly (Figure 6.52), whilst wood or bamboo is less durable, but usually cheaper (Figure 6.51).

Washing clothes

Clothes washing is often carried out next to the same water source as bathing. It is therefore helpful if bathing equipment, such as benches, can be designed for more than one function, including bathing, washing clothes and dishes. This can be done by providing enough space on the seat next to the user for objects such as washing bowl, clothes and soap (Figure 6.82). (See also the section on Bathing benches, page 89).

A height of 30 – 60cm is convenient for wheelchair transfer, and for those who have difficulty lowering themselves onto a low seat (check the best height with the person concerned). The user needs to have good sitting balance.

For wheelchair users who prefer to stay in their chair, a concrete laundry slab at waist height is a useful option, with enough space beneath for the user's knees to fit under (Figures 6.83 and 6.84). It can also be used



Figure 6.83. Concrete slab for washing clothes.
(Case-study 9.3, page 166)

Source: Werner, 1987 (2)



Figure 6.84. Concrete or wooden washstand with
ridged bottom for washing clothes.



Figure 6.85. A dish draining rack made of split
bamboo.
(Case-study 9.12, page 191)

by people standing up. Both these options need to be located as near as possible to a water point for convenience.

Containers used for washing may be commercially available plastic or enamel bowls or, more cheaply, adapted from used food cans or large jerry-cans with the top cut off.

Washing dishes

Washing dishes can be carried out at floor level using a low-level stool, as described above (Figure 6.86).

A dish draining rack can be made at little or no cost out of wood or split bamboo attached to a frame (Figure 6.85). This promotes general good hygiene and can be constructed at a height suitable for the user, either high enough for a wheelchair user to get their knees under, or low enough for a person to use while sitting at ground level.

Issues for blind people

As with bathing, an orderly environment is helpful for blind people, and for people who have difficulty learning or remembering everyday tasks, such as confused elderly people (see page 96 for suggestions).



Figure 6.86. A floor level dish-washing facility in
the corner of the kitchen.
(Case-study 9.4, page 169)

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