ISSF
INTERNATIONAL STAINLESS STEEL FORUM

Stainless Steel - Benefits for Elderly People

Contents

1 INTRODUCTION

Life expectancy is increasing strongly. As more and more people are getting older and older, society must be prepared to cater for the specific needs of elderly people.

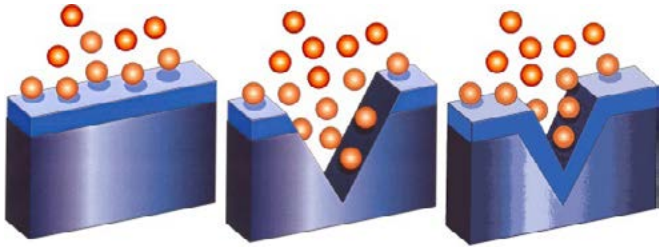
People want to remain independent for as long as possible. When houses and apartments must be adapted to changing needs, the necessary modifications should be made without giving the environment a “hospital look”.

Stainless steel is an ideal material to reconcile function and aesthetics. It is used for architectural features and in interior design world-wide. It blends nicely with natural materials like stone or wood or combines with glass and painted surfaces. Notwithstanding its aesthetic qualities, it has a high mechanical strength and optimal hygienic properties.

Many of the applications discussed here in the context of old age are also attractive to other users to make living environments safer, more comfortable and attractive.

2 BUILT-IN CORROSION RESISTANCE

Many materials need to be protected from water by metallic (galvanic) layers or organic coatings (paint). Stainless steel, by contrast, is insensitive even to permanent humidity. The corrosion resistance is an intrinsic property of the material and does not depend on applied surface layers, which are prone to damage and wear. Stainless steel parts are typically as good as new even after decades of intensive use.



A protective layer, which is only a few millionth of a millimetre thick, provides stainless steel self-repairing properties.
Photo: Euro Inox, Brussels, Belgium

3 KEEPING FIT

Keeping their physical condition at a high level is a priority for elderly people and stainless steel is present in some widely used equipment.

Sports equipment, often in public places like parks and promenades, makes it fun to practise suitable forms of physical exercise. If fabricated in stainless steel, the material will defy the weather for decades and provide optimum protection against abuse and vandalism.

Fitness can be fun.
Photo; Lübke/dpa

3.1 BASINS

A simple and efficient way to train the vascular system of the body is the use of cold-water arm baths or tread-basins. Many communities install them as a part of fitness trails or in parks but home owners may also want their own one in the garden. Stainless steel models are space-saving and can be purchased as pre-fabricated units.

Cold-water arm baths are an easy way to stimulate the cardio-vascular system.
Photo: Münsterlandzeitung, Dortmund, Germany

Tread-pools for cold-water treatment are available as pre-fabricated units.
Photo: Edelstahl Schmitt, Traubenheim, Germany

3.2 THERAPY POOLS

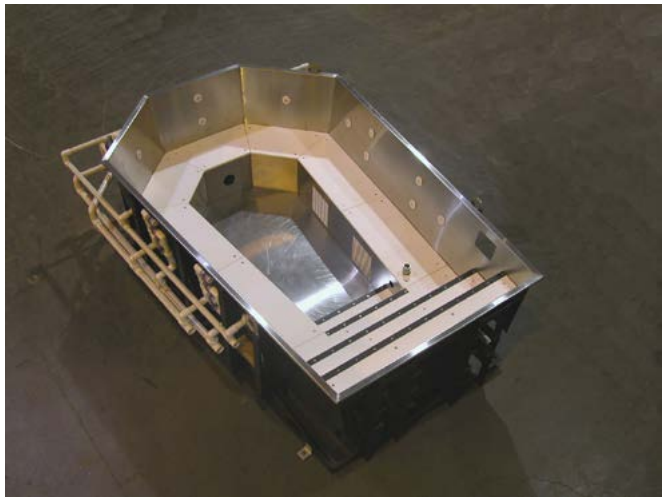
Stainless steel is a commonly used material for swimming pools, including therapy pools. The most common material grade is 316L, which performs well in contact with chloride-containing pool water.

The inner linings of the pools and accessories are usually made from welded stainless steel sheet, tube or bar. The welded design avoids crevices or rough surfaces and is a hygienic advantage.

The material is also insensitive to cracking. Settlement in the ground or cracks in supporting concrete structures will not negatively affect the soundness of the pool, because the material is extremely ductile and adapts to the changing geometry.

Its tolerance to structural imperfections in the support structure is also one reason why stainless steel is used for the refurbishment of leaking pools, often after disappointing experience with other repair solutions.

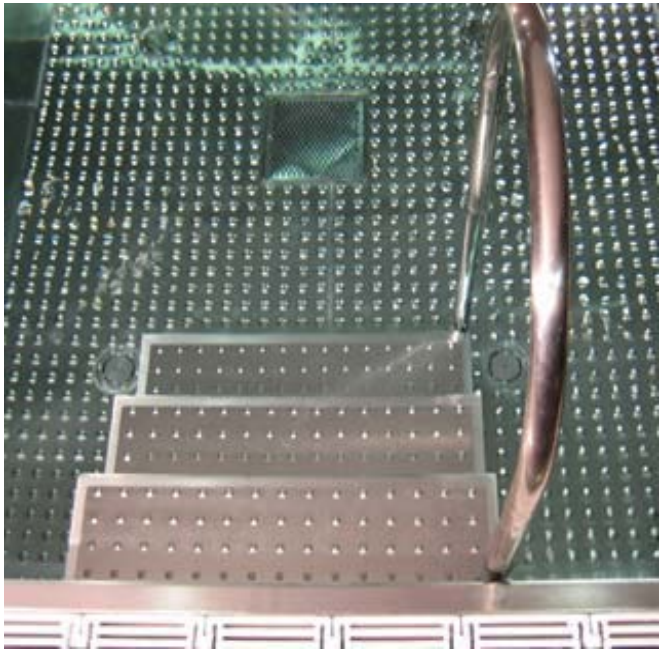
In elevated hydrotherapy pools, the thin-walled and lightweight design is an advantage: concrete pools can be 30 times the weight of stainless steel pools. Especially in retrofitting, where the maximum allowable weight load of existing floors can be a limiting factor, stainless steel is sometimes the only practical option.



Stainless steel pools are thin-walled, light in weight and insensitive to cracking.
Photo: Natare, Indianapolis, IN, U.S.A

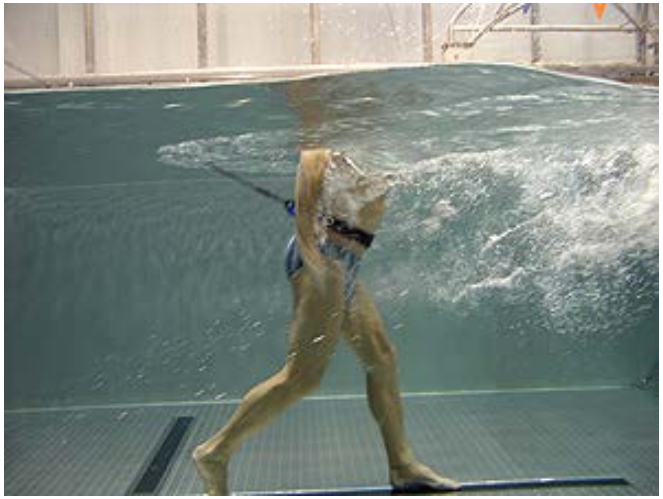
The ease of welding and polishing is a benefit when pools have to be assembled on site.
Photo: APSP, Alexandria, VA, USA

Embossed patterns enhance the stiffness of the thin sheet metal, which is used to line the pool. They also provide anti-slip properties which make stainless steel pools safer to use.



Embossed stainless steel sheet provides anti-slip properties.
Photo: Brookforge, Cheltenham, Gloucestershire, UK

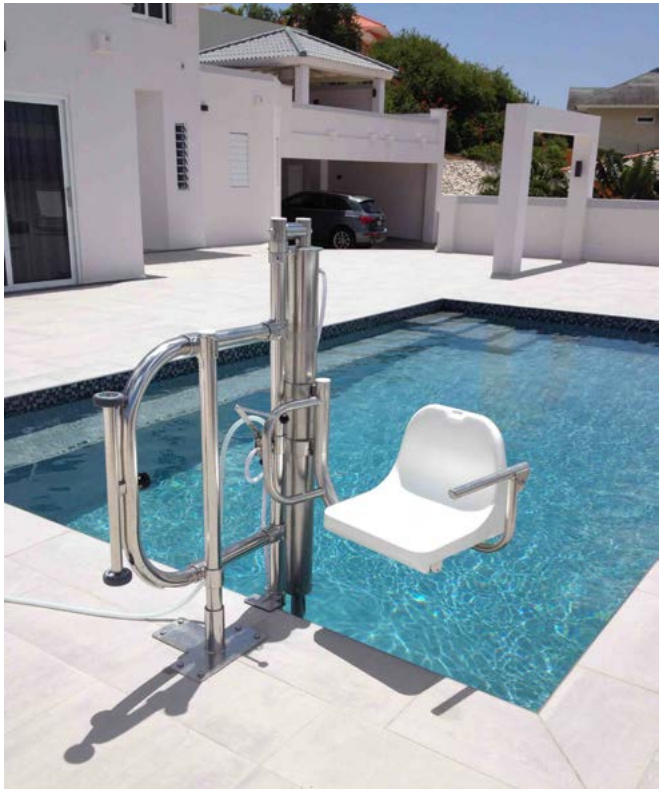
The same technology that athletes use to analyse and improve their swimming techniques is also used for keeping elderly people fit or making it easier for patients with orthopaedic problems to train their motor systems: streaming pools. Flow rates can reach as much as 2.5 meters per second. Underwater windows and cameras enable physiotherapists to observe or record a person's movement patterns. The massage effect is an extra benefit.



Streaming pools are used for both diagnostic and therapeutic purposes.
Photo: ESM, Pirna, Germany

3.3 POOL LIFTS

Pool lifts make it easier for people with reduced mobility to get into the water safely and comfortably.



By using pressure from the water mains (min 3.8 bar), pool lifts can be independent of electrical power.
Photo: Lehner Lifttechnik, Neukirchen am Walde, Austria

The mechanical parts of the lift are in the splash zone. Contrary to common belief, corrosion resistance requirements are higher outside than inside the pool. Accessories are exposed to splashes of chloride-containing water which consequently dry up. As the water evaporates, the dissolved salt is left behind. Repeated wetting and drying can increase the chloride concentration on exposed surfaces to levels several times higher than that in the pool water itself.

A corrosion resistant material is therefore needed, which must also have high mechanical properties. Stainless steel ideally fulfills both requirements and is therefore a common material for pool lifts.

Indoor swimming pools are among the most corrosive environments and require corrosion-resistant materials.
Photos: Hoyer Lifter, Butzbach, Germany

4 MOBILITY

Improved accessibility is not only a necessity for elderly people, but also user-friendly for other users.

4.1 RAMPS AND WALKS

Ensuring support and removing stairs are the most obvious measures to make access easier. Stainless steel handrails, parapets and ramps provide aesthetically pleasing options for both new buildings and retrofitting.

Grade selection should be given careful attention. While permanent humidity is not a problem for stainless steel, potentially corrosive substances in the environment can be a point of concern. In cold climates de-icing salt may be applied in winter. Splashes of salt containing melting snow or spray water can deposit on stainless steel surfaces and make them corrode, including the common type 304. Under such conditions, molybdenum-alloyed grades such as 316 are to be preferred.

Grade 316 stainless steel is particularly corrosion resistant and also suitable for environments in which de-icing salt is used in winter.
Ohoto Bättig Design, Laviolette Trois-Rivières, Quebec, Canada

4.2 FLOORS

Contrary to common belief, metallic flooring is not necessarily smooth and slippery. In public areas stainless steel tread plate with a tear-shaped, non slip, "chequer" pattern is a preferred solution.

The original application for this type of material was in industrial environments, mainly in the petro-chemical industry, where slippery floors can be a safety risk. Architects and interior designers quickly discovered the aesthetics of this surface pattern and are now applying it to public buildings, shops and private homes.

However, the rough profile of floor plate is not the only solution to give stainless steel anti-slip properties. Non-directional vibratory finishes can result in a texture that is suitable for flooring in public buildings like museums, where safety is a high priority.

Stainless steel tread plate in a coffee shop in New York.
Photo: Euro Inox, Brussels, Belgium

Stainless steel flooring in a visitors centre, Koblenz, Germany.
Photo: Euro Inox, Brussels, Belgium

Despite its reflective character, stainless steel sheet can be made slip-resistant, as shown in the Caixa Forum exhibition hall in Madrid, Spain.
Photo: Euro Inox, Brussels, Belgium

4.3 STEPS

In traditional Asian houses, the living space is often elevated from the level of functional rooms such as bathrooms. The steps between the floor levels may be too high for elderly people. For that reason a special type of stair was designed whose base plate can be fastened mechanically to the floor. This is made from ferritic stainless steel which is cost effective and at the same time corrosion resistant to withstand wet conditions. The handrail is made from type 304 stainless steel tube because it is easy to form and weld and is painted to enhance visibility.

Although painted for visibility and covered with rubber for slip-resistance, this mobile step was manufactured from stainless steel.
Photo: JSSA / Yazaki Kako Corporation

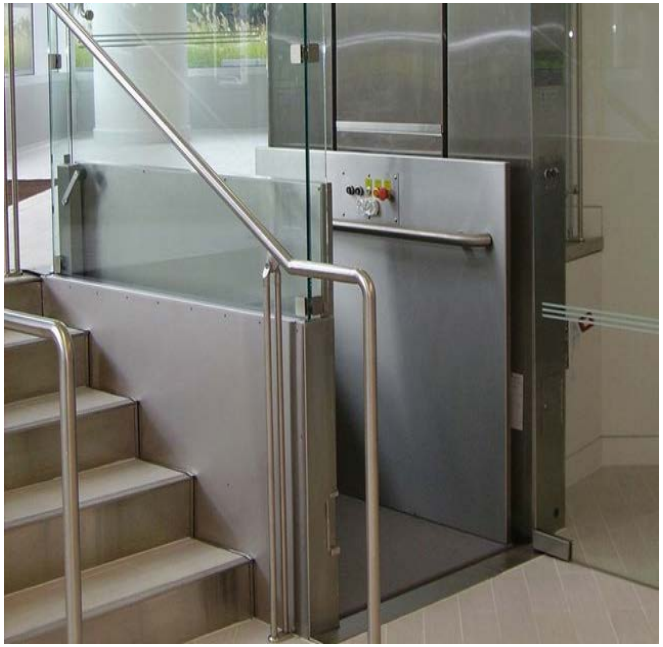
4.4 LIFTS

Stainless steel lifts are available in a wide range of designs and dimensions.

Exterior Platform lifts are designed for entrances that have a substantial height difference between the yard and the entry floor. These mechanical lifts can be integrated into the façade of a building.

In outdoor lifts, stainless steel can be exposed to the weather without deteriorating.
Photo: Ascendor, Niederwaldkirchen, Austria

Residential Lifts provide access between floor levels independently of the stairs. They are either cable operated or hydraulic and travel on a single, side mounted rail. To install a residential elevator an open shaft must be provided through the structural frame at all floors which will be served by the unit.



In combination with glass, the decorative stainless steel surfaces can make a residential elevator an unobtrusive part of the interior design.
Photo: Nationwide Lifts, New York, USA

Stair lifts are a less expensive alternative to residential lifts. However, the user must be capable of gaining access to the lift seat. In many existing homes a stair lift may be the most practical option because of the space restrictions and budget limitations. Stair lifts can be retrofitted to most stair configurations but installation costs increase exponentially for complex stair layouts.

However, **inclined platform lifts** do not require users to transfer from their chairs. These installations require a wide, straight single-run staircase with an extra-long lower landing, which limits the inclined platform retrofits in existing homes. In addition, a reinforced wall must be available along the stairway and bottom landing for structural support.

With some models, the guide rail of the inclined platform lift additionally serves as a general-purpose handrail.
Photo: Ascendor, Niederwaldkirchen, Austria

4.5 LIFTING AND MOVING ABOUT

Lifting systems allow people to be moved with minimal effort. Stainless steel holding bars are mechanically resistant, can be immersed into water and are easy to keep hygienically clean. Ceiling-mounted versions enable people to move independently within or between rooms.

Lifting people makes nursing a strenuous task. Wall or ceiling-mounted lifting gear can mean a huge improvement.
Photos : Handi-Move International, Ninove, Belgium

4.6 WALKING FRAMES

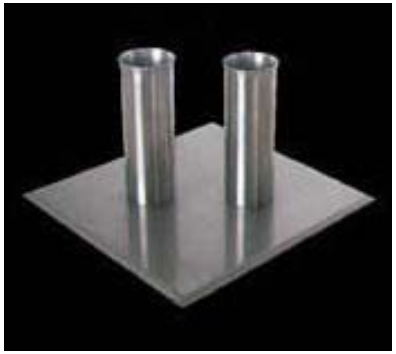
Walking frames should be light in weight for manoeuvrability but structurally strong and stiff for maximum support. With stainless steel, these requirements are not mutually exclusive. The material only requires small tube diameters and wall thicknesses to achieve the required load-bearing properties. Welding provides joints which can have the same level of mechanical resistance as the base material. Skilled polishing can make them invisible. If the metallic lustre of the original material is unwanted stainless steel walking frames can be painted.

Bariatric models can take loads of up to 250 kg and more.
Photo: Safety and Mobility, Hornsby, NSW, Australia

In the case of stainless steel, light weight and high mechanical strength are by no means contradictory design requirements.
Photo: Bendtec, Slacks Creek, Qld., Australia

4.7 CRUTCH STANDS

Securing walking sticks or crutches when they are not needed is a common problem for people who depend on them. Stainless steel stands composed of a solid base plate and mechanically fastened flutes, provide an efficient solution. The material is insensitive to soiling and mechanical damage. The components are easy to assemble and disassemble for cleaning, transport or storage. In homes, doctors' surgeries, hospitals and public places they ensure that crutches stay where they are.



Crutch stands are a good solution to prevent crutches falling over.
Photo: Physion Health Ltd., Greerton, Tauranga, New Zealand

Cleanability benefits are a reason why stainless steel wheelchairs are used in hospitals.
Photo: Bendtec, Slacks Creek, Qld., Australia

4.8 WHEELCHAIRS

Wheelchairs may have multiple uses and users. Flexibility in design and good cleanability are paramount and stainless steel makes contributions to both these requirements.

Stainless steel structural components of wheelchairs can be a good choice when the chairs are used in permanently humid environments, such as swimming pools surroundings. The surface topography of stainless steel makes cleaning easy. The good wettability of the surfaces also makes disinfection agents spread evenly over the surface so exposure time is long enough for the products to be efficient.

Stainless steel is made for permanently humid environments and therefore an ideal material for aquatic wheelchairs.
Photo: DB Perks & Associates, North Vancouver, B.C., Canada

4.9 LIGHTWEIGHT DESIGN

Some types of stainless steel reach exceptionally high levels of mechanical strength. Stainless steel provides various options to minimise weight by reducing wall thicknesses without compromising the strength of the wheelchair.

During the forming process chromium-nickel alloyed (austenitic) stainless steels undergo a transformation known as "work hardening": when the material is formed, its mechanical strength increases. Some grades, especially 301LN (EN 1.4318), are optimized for this effect and widely used for weight reduction.

So-called duplex stainless steels are another option: their mixed austenitic-ferritic structure is coupled with particularly high strength values, which can be twice as high as those of standard 304.

Martensitic grades are found in fasteners and other heavy-duty components.

Manufacturers report lighter frame weight than with titanium or titanium-aluminium alloys with 80 % lower material cost compared to those light metals.

High strength stainless steels such as work-hardened austenitic or duplex stainless steel grades can be instrumental in reducing materials thickness and hence weight in structural components of wheelchairs. Photo: KVA Stainless, Escondido, CA, USA

Hygienic considerations are also why stainless is found in toilet wheelchairs.
Photo : Luci Wheelchair, Singapore

5 ACCESSIBLE BATHROOMS

Bathrooms with their wet and slippery surfaces can be a particularly difficult terrain for people with reduced mobility. Seats and grab rails are indispensable accessories for a safe bathroom environment. Materials used here have to meet three requirements: They must be long-term resistant to water, they should withstand common cleaning and sanitizing agents and they require a high level of mechanical strength. Stainless steel, providing all three benefits, is an ideal choice.

5.1 GRAB RAILS

Stainless steel grab rails are available in a variety of shapes and dimensions: wall-mounted, floor to ceiling or wall to wall; in straight, angled or bent geometries.

Stainless steel tube can easily be bent to the desired geometry and welds can be polished to a point where they become indistinguishable from the original surface.
Photo: Mediclinics, Barcelona, Spain

5.2 EASY TUBE BENDING

One thing which makes stainless steel different from other metallic materials is its exceptional formability. Grab rails can involve narrow bends. Especially the nickel-alloyed austenitic stainless steels have excellent formability. Bathroom accessories can be produced with minimal bends, making them lighter and more elegant than counterparts in other materials.

Stainless steel tube has high mechanical strength, is intrinsically corrosion resistant and easy to bend. Photo: Home and Medical, Bingley, West Yorkshire, UK

5.3 INVISIBLE WELDS

Bars and flanges are typically welded together. This design is structurally robust and avoids crevices which may harbour dirt, lime and micro-organisms. The welds can be ground and polished to the point of blending perfectly with the original surface. The fabricated component may then appear seamless.

5.4 BARIATRIC APPLICATIONS

Average life expectancy is growing – and so is average weight. Increasingly, equipment for barrier-free homes must also take into account increased mechanical load. Bariatric variants of grab rails are designed, for instance, for dynamic loads of up to 300 kg.

The panoply of stainless steel grades includes tailor-made solutions for enhanced mechanical properties: Type 301 stainless steel, otherwise used for low weight – high-strength rail applications is one option, austenitic-ferritic ("Duplex") stainless steel is another. They exceed the classic stainless steel grades in terms of mechanical properties and often make it possible to reduce material thickness by as much as one third compared with conventional designs.

Depending on customers' wishes and needs, rails are also available in highly reflective polished finishes. Smooth surfaces make the cleaning particularly easy.

Stainless steel can have high-strength properties making it ideal also for bariatric applications. Photo: Bendtech, Slacks Creek, Qld., Australia

Fold-up support bar with integrated toilet roll holder. Photo: Advanced Healthcare, Virginia, Qld., Australia

5.5 EXCELLENT DEEP-DRAWING PROPERTIES

Formability is an asset in the design and manufacture of built-in bathroom components, for instance recessed soap bowls. In showers, protruding elements should be avoided wherever possible because they can hurt the user. Stainless steel can be deep-drawn with a minimal bending radius to provide thin-walled, space-saving components that can be sunk into wall cavities.

For safety reasons recessed soap dishes are preferable to protruding counterparts.
Photo: Bradley Corporation, Menomonee Falls, WI, USA

5.6 DEDICATED TEXTURES AND FINISHES

Ideally, grab rails should have a surface structure to increase grip. In the case of stainless steel, embossed surfaces are available which have two effects: firstly, they increase the friction between the hand and the rail and provide a firm grip. Secondly, the work-hardening effect described above adds to the strength of the component.

Profiled surfaces look good and provide a firm grip.
Photo: Easa, Moira, Co. Armagh, UK

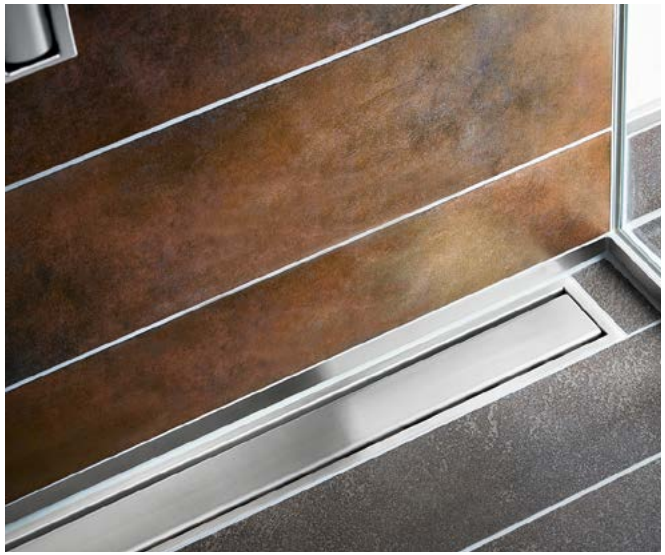
5.7 WALK-IN TUBS

Walk-in bathtubs are a practical solution, also for retrofitting. They do not take more space than conventional tubs. Some models rely on stainless steel for the frame of the inward-opening, self-sealing doors. The dimensional stability of the material ensures that the doors will still close tightly after years and years of use.

Long-term dimensional stability ensures that the doors of walk-in bathtubs close tightly.
Photo: Home Safe Homes, Carmel, IN, USA

5.8 BARRIER-FREE SHOWERS

Taking a shower instead of a bath has safety benefits because it avoids the difficulties and risks associated with getting in an out of a bathtub. Floor-level showers, however, require an efficient and reliable drainage system. Stainless steel solutions are functional, durable and elegant.



Stainless steel floor drainage systems are a key element of walkable showers and a main feature of barrier-free bathrooms. Photos: Schlüter Systems, Iserlohn, Germany

5.9 FOLDING SHOWER SEATS

Stainless steel folding shower seats have become a general-purpose feature. The mechanical properties of stainless steel are the reason why the construction is slender and only takes minimal space in the shower. Stainless steel is made for permanently wet environments and will easily survive years and decades of use.

Stainless steel folding seats combine space-saving design with exceptional mechanical and corrosion resistance. Photo: SuperQuip, Wanganui, New Zealand

5.10 SANITARY EQUIPMENT

Besides its hygienic properties and mechanical strength, stainless steel sanitary equipment – otherwise mainly used in public and vandal-prone environments – has an asset which can also be useful in private homes: it is space-saving. Washbasins, bathtubs and toilets made from ceramic materials or polymers require large wall thicknesses. For the same inner dimensions, stainless steel equipment can be more compact than conventional counterparts. Especially for people depending on walking aids or wheelchairs, space is critical. When existing bathrooms, whose overall size cannot be changed, are converted to become barrier-free, every inch counts and stainless steel can make the difference.

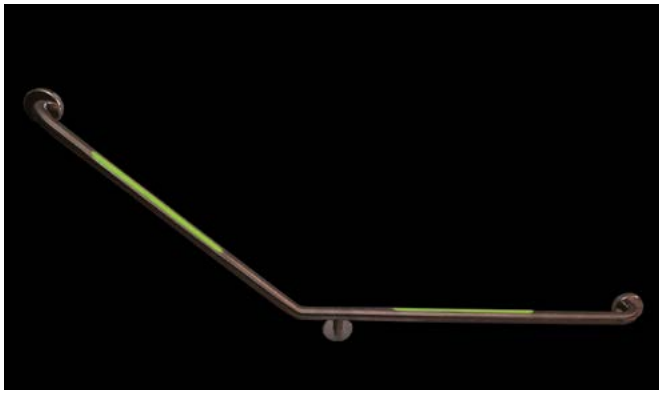
Stainless steel sanitary equipment can be more compact in outer dimensions than conventional models.
Photos: Healey and Lord, Norwich, Norfolk, UK (above); Euromodul, Viskovo-Rijeka, Croatia (below)

6 VISIBILITY

The field of vision may naturally narrow with age and wearing strong glasses can reduce it further. Besides mobility, high visibility is another dimension of safety

6.1 GLOW RAILS

Grab rails are available with luminous strip inserts. They provide orientation in low light areas of buildings and in case of power failure. Exposed to light during the day, the luminous trips may glow for as long as 10 hours at night.



Inserted luminous strips provide orientation in the dark.
Photo: Bendtech, Slacks Creek, Qld., Australia

Other models are equipped with integrated LED lighting. This energy-saving technology reduces the electricity cost when the light is kept on permanently to make the rails easier to find.

LED lighting can be integrated unobtrusively in stainless steel rails.
Photo : DW Lighting, Ware, Herts., UK

6.2 ORIENTATION FOR PEOPLE WITH IMPAIRED VISION

For people with impaired vision, handrails and tactile guiding aids on the floor provide information about the direction and possible obstacles.

Tactile floor guidance systems in stainless steel are durable and attractive.
Photos: Euro Inox, Brussels, Belgium

Yellow is the easiest colour to detect for people with impaired eyesight. Coloured inlays make it possible to combine the grip and cleaning-friendly properties of stainless steel with the requested colour effect.

In contrast to common protruding profiles, which are made for optimized grip, other models have recesses, which are coated in a high-visibillity colour to make them easier to find for people with impaired vision.
Photo: Rimex, Enfield, UK

7 EATING AND DRINKING

Stainless steel is omnipresent in food preparation and serving. Therefore it is not surprising to find stainless steel products that are specifically designed for people with motor restrictions.

7.1 TABLEWARE

Various accessories are available that make eating and drinking easier for people with motor problems and give them greater independence. A plate guard, for instance, can help arthritis patients to scoop their food. Stainless steel resists the high temperatures typical of institutional dishwashers.

Stainless steel plategards resist the conditions in institutional dishwashers.
Photo: Steinberg, Bottrop, Germany

8 SUMMARY

Life expectancy will continue to go up, but so will age-related health problems. The market is adapting to this trend as elderly people become a more and more important group of consumers. Solutions originally designed to help the elderly are gradually accepted as comfort and safety features – for instance lit handrails, slip-resistant floors or bathroom equipment. Stainless steel is well positioned to respond to changing consumer preferences. It has a high profile of performance and attractiveness that makes it an appreciated companion for any phase of life.

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About ISSF

The International Stainless Steel Forum (ISSF) is a non-profit research and development organisation which was founded in 1996 and which serves as the focal point for the international stainless steel industry.

Who are the members?

ISSF has two categories of membership: company members and affiliated members. Company members are producers of stainless steel (integrated mills and rerollers). Affiliated members are national or regional stainless steel industry associations. ISSF now has 65 members in 25 countries. Collectively they produce 80% of all stainless steel.

Vision

Stainless steel provides sustainable solutions for everyday life.

More information

For more information about ISSF, please consult our website worldstainless.org.

For more information about stainless steel and sustainability, please consult the sustainablestainless.org website.

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