Durable types of wood

Wood is a raw material that has grown. By shrinking and swelling ('working'), it keeps parts of its vitality also after felling.
A multitude of organisms bring the raw material wood back to its basic substances in the course of time (seeds - earth - water - solar energy - tree - wood play equipment - end of use - earth).

This process is ideal in a world where issues about waste treatment are keenly discussed. In order to use wood in a proper and economically justifiable way, its lifespan should be maximised as far as possible through appropriate measures.

To increase the **durability** (lifespan) of the material wood, the following steps can be taken:

· Use of durable types of wood = types of wood with natural resistance against pests, e.g. larch, oak or robinia;

· Constructional wood preservation = avoiding or minimising unfavourable influences by constructional solutions (e.g. reducing wetness);

· Chemical wood protection = compensating missing natural resistance by chemical treatment (e.g. boiler-pressure impregnation);

· Maintenance and care.

Our Choice: Mountain larch

We use the words 'mountain larch'. Larch wood has been used successfully used for centuries in the Alpine region for outdoor structures, in spite of the fact that it is generally classified as moderately durable. The special suitability of mountain larch results from the growing conditions in the Alps. Particularly due to its slow growth and consequent close year rings, mountain larch develops its natural resistance to a much greater degree than is the case with lowland larch.

Due to the difference between the general classification and the traditional, descended as well as our own experience, we commissioned an investigation at the Forest Science faculty of the Ludwig-Maximilian University Munich on the evaluation of natural endurance of the Alpine mountain larch (larix decidua). This investigation has been discussed by Mr. Andreas Füller in his dissertation. The project was supervised by Prof. Dr. H. Schulz and Prof. Dr. D. Grosser.

The result of this investigation was:

Natural alpine mountain larch is well suited for the production of durable wooden play equipment, especially if the rules of constructional wood preservation are observed and – in addition – the tried and tested 'Richter wood quality criteria' are used (please also refer to page 116).

Larch

Richter wood quality criteria for larch wood

Origin
We exclusively use mountain larch (bot. larix decidua) from the Alps. It grows at a height of 800–1800 meters above sea-level and originates from sustainable cultivation. Our wood is PEFC certified according to PEFC ST 2002:2020 and PEFC ST 2001:2020. The certificates confirm that processed and treated coniferous sawn timber and log wood comes from sustainably managed forests. They can be examined on our website.

According to an official assessment, larch is a moderately rot-resistant type of wood, considerably more durable than, e.g. spruce and fir, however less durable than robinia.

However, there are different kinds of larch. The larch which we use for our production grows in the mountains at a height of more than 800 m above sea level. Therefore, it has considerably better physical properties (and thus should actually be called larix decidua montania). The advantages of this mountain-grown larch are considerable:

- Fewer resin galls
- Fewer splinters
- Closer year rings
- Mainly increased durability.

Felling time
Our larches are felled in winter so that the cut wood can dry before fertile fungus spores appear which can lead to early decomposition.

Corning
During the natural aging process of the tree, core materials are deposited in the wood. This corning is responsible for the rot-resistance of the larch. Our employees recognise good corning from the red colour of the wood.

Sapwood
In accordance with our wood quality criteria, mountain larch wood is delivered practically without sapwood.

Year rings width
Wood with close year rings is more resistant to rot. Wood for horizontal beams needs particularly close rings. Our poles have at least 8 year rings in the outer 2 centimetres.

Evenness
We ensure that poles (e.g. swing posts or platform posts) have centred growth rings, so that the close ring wood lies near the outer edge. We do not permit a pith eccentricity of more than 3 centimetres.

Fungal attack
Occasionally even a standing tree is attacked by fungus. Such wood only provides limited durability, which is why we ensure we discard it.

Wood moisture
Wood-destroying fungi require high levels of moisture in the wood. We increase the lifespan of our wood through natural open-air drying. Advanced drying in the poles is demonstrated by the appearance of cracking. Our sawn timber is already dried to 15–20% of original wood moisture before it is used for construction.

Since 1989 we have manufactured much of our wooden play equipment from unimpregnated mountain larch. Our play equipment made of unimpregnated poles of mountain larch stands on steel feet. The end-grained timber surfaces of our stand posts of larch are given an angle cut covered with paraffin wax to avoid absorption of water. The underside is also treated in the same way.

We manufacture all equipment printed in red from untreated mountain larch which is selected according to the eight Richter quality criteria.

Chemical wood preservation

As the play equipment is exposed to the elements, wood species that are not naturally resistant to decay can only be impregnated with fixing salts (i.e. salts that are difficult to leach out).

Despite the exclusive use of officially approved wood preservatives, these are unfortunately not only toxic to wood pests, but ultimately also have an effect on people and the environment.

This has prompted us to increasingly abandon the use of impregnated wood and instead to use almost exclusively durable wood species (mountain larch, robinia, oak) in conjunction with constructive wood protection measures.

However, we still have a few pieces of play equipment made of pressure-treated poplar wood (such as our wobbly animals) in our range. Poplar wood has properties that give the animals a unique appearance.

For the subsequent professional disposal of impregnated wood, it is crucial to know how and by what means the wood was treated during production and possibly during well-intentioned maintenance measures. We therefore mark all impregnated components with nails indicating the impregnation used.

- Before use, please check for any allergenic or prohibited ingredients for the „play equipment" area of application (REACH regulation)
- A coat of paint is recommended at the earliest 6-8 weeks after installation so that the product can be absorbed as effectively as possible into the wooden surface or pores.
- Coatings must be renewed regularly in accordance with the manufacturer's instructions. Otherwise there is a risk that the wood may become more susceptible to water absorption and rot.
- When using wood preservatives with synthetic components, microplastics can be released during weathering and pollute the surrounding environment.

The graying of wood outdoors

Without UV protection through surface treatment, the color stability of wood is limited. If it is exposed to sunlight and, in particular, its UV radiation, wood components, especially lignin, are broken down on the surface. This leads to yellowing of the wood and, over time, to an intense brown coloration. If the wood surface is also exposed to direct weathering, the now water-soluble degradation products of the lignin are washed out, leaving behind the silvery-white cellulose. Moistening the wood with dew and rain, however, leads to the colonization of tiny, dark-coloured fungi, which do not cause any damage to the wood, but contribute to the surface becoming discoloured over time and appearing grey when viewed from a distance. As a result of uneven washing out by the rain, this often leads to irregular weathering, which depends on the direction of the sky, facade projections, etc.

We regard wood as a natural product and accept its discoloration processes as a natural law. In contrast to us adults, children at play are highly satisfied with the colors of nature. If color accents are nevertheless desired for a children's playground or individual pieces of equipment, we apply them to areas that are not played on by the children and are therefore not exposed to abrasion processes, for example on the back strips of our caterpillars (see article no. 5.00010ff., p. 44ff.).

Wood and play value

The choice of material and the decision to use particular procedures in the manufacture of our equipment are a conscious decision to increase the play value.

Play value

Play value is not an easily defined quality and can only be approached through the observation of children.
- Do they play frequently and intensively with the equipment?
- Does the equipment trigger a sequence of play activities?
- Are the children having fun and enjoyment?
- Is their need to play being satisfied?

We are convinced that wood significantly increases play value.

Handcrafted production

1. Careful selection of wood and individual treatment → Unique product even if it is a standard item
2. Every piece is completely assembled, labelled and then disassembled for transport → Everything fits together
3. Comradeship in the workshop → 'Happy' equipment

Wood appeals to the senses.

Wood is a friendly, pleasant material. As an organic building material, it differs substantially from metal or plastic as it appeals to the senses.

Children absorb the whole world around them. A child sees, hears, smells, feels, perceives – and *simply does this* without differentiating or deliberating. Wood is an experience field for the development of the senses.

Wood combats dulled senses.

Wood gives the child's senses something to do. Therefore it works against the dulling process which children are exposed to for a variety of reasons and which cause the senses to wither.

Wood is interesting It has
- Differing structures
- Various shades of colour
- Signs of growth
- Traces of workmanship

Wood can be toched It has
- Irregular surfaces
- Changeable surfaces
- Teperature
- Moisture
- Surface structure

Wood creates a sense of spatial awareness Children are able to recognise the areas created from the space and thus can assign terms to them, such as house, tower etc.

Wood creates structure and Experience It helps children understand how things are related, because children want to know everything. Their natural curiosity helps them to explore their natural environment. The junior discoverer can clearly see in our wood constructions how everything fits together and even recognise how something works through closer examination. Wood constructions are often suitable for making technical solutions understandable through their simplicity.

Quality criteria of wood
Treatment and processing information

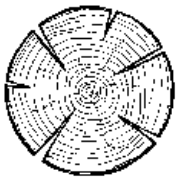
Wood is a natural, non-homogeneous material. It remains 'alive' even after felling, i.e. it reacts to changes in the surrounding humidity by varying its volume and thereby its shape.

When taking up moisture, the wood swells, i.e. it increases its volume.
When it discharges the moisture, it shrinks and decreases its volume.

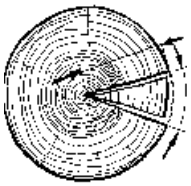
These changes in volume affect some parts of the wood more than others in different directions. This not only varies the volume, but also the timber itself can change shape (buckling, twisting and cracking).

The extent to which wood warps is not equal in all directions:

- In the direction of the fibres (length)	Insignificant
- In the direction of the medullar ray (from the core outwards)	< 5%
- In the direction of the year rings	< 10%

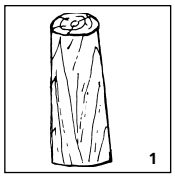


The effects of warping are most apparent when the timber has just been cut and the trunk begins to dry. At first no change can be observed in the shape of the timber since during this period and up until reaching the saturation point (approx. 30 % wood moisture) only "free water" is diffused from the cell cavities. When the air humidity becomes so low that the wood can release moisture into the air around it, the wood begins to lose moisture from its fibres and cell membranes. This is the period during which changes in volume and shape of the timber occur (shrinkage reaction). The trunk becomes just a little shorter in length. Its diameter decreases too – in dry conditions (WH = 0%) up to 5% – and it often splits in the process. In the direction of the year rings, in other words tangentially, this value is 10%.



What happens?
The atmospheric moisture drops or is very low. The humidity in the wood also drops until it is equal to the degree of humidity in the air. Simultaneously, the wood tries to contract: in length very little, in width (radial medullar rays) several times greater and in the direction of the year rings (tangential circumference) double the magnitude of the radial-medullar rays. Due to these variations in shrinking in different directions stresses occur around the neutral core, which can cause the wood to crack in the event of great moisture loss. When the timber has dried, the 'piece of pie' in the diagram will be smaller and slimmer.

Quality criteria of wood
Treatment and processing information

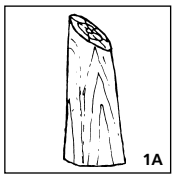


Roundwood palisade - white peeled

During the peeling process, the log is rotated under two rotating cutter heads, with a probe tip in front of each tool sensitively limiting the chip removal. All around, our palisades are peeled almost sapwood-free with this process.
Due to the minimal removal, the irregularities of the trunk are preserved, as well as the original cross-sectional shape of the trunk and its conical growth form. Natural curvatures in the trunk axis are only slightly straightened.
The white-peeled wood brings much of the originality of a living tree into the play equipment and offers an intensive sensory stimulus through its naturalness, in addition to the play value. This fact has persuaded us to prefer a peeling process to the process of round milling, although the irregular trunks require more attention in the subsequent machining processes and preclude industrial series production.

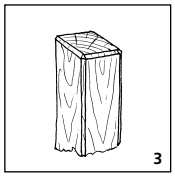
Difference to circular milling

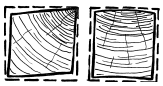
In round milling, the logs are brought to a cylindrical cross-section using a cutter and a predefined diameter. Irregularities disappear and the result is a uniform round timber that can be further processed industrially with templates and gauges. Apart from the waste of wood that round milling entails, the outer wood fibres are also cut off, which can then open up and absorb more moisture. This is particularly problematic if the palisade is installed upside down, as the moisture can no longer drain off optimally and the rotting process is promoted. Upside down means against its natural direction of growth, which is no longer clearly visible after milling. These disadvantages are not known with white peeling. This is why we use white-peeled instead of round-milled logs apart from a few exceptions due to technical reasons.



Bevel cut

Vertical posts are cut diagonally as a constructive wood preservation measure. This contributes to the greater durability of wood, as less moisture is retained in the end-grain wood surfaces and fungal attack is limited. For additional protection, the end-grain wood surfaces are coated with paraffin wax.

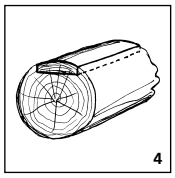




Core-free

Even after processing into boards and beams, the wood's ability to „work" continues. Especially around the pith (heart), tensions arise during drying, which can lead to cracking. Since stresses build up around a centre not in an open but in a closed, ring-shaped system, the change in shape here usually means cracking. In order to reduce these cracks in installed timber, care is taken when cutting timber to create cross sections without pith tubes.

Quality criteria of wood
Treatment and processing information

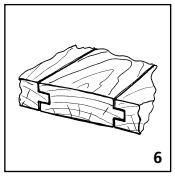

4

Claddings

Claddings: Claddings are edge boards, sawn on three sides, which are produced when cutting strong logs. The outside of the tree is then peeled white by hand on a rotating knife disc. This treatment produces an irregularly structured surface. Processing the rind by hand is very cost-intensive in production and further processing. All known machine processing of boards and/or planks, which are supposed to imitate the rind structure, destroys these important characteristics and at best a crowned, rustic form without natural structure is achieved.

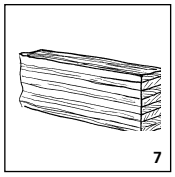
Stability

In addition to the advantage of the rind structure, there is a considerable improvement in quality compared to the use of halved weak woods, as the material input per unit area is greater. In towers, for example, the rinds are 3 - 6 cm thick and 14 - 18 cm wide and at least 1 cm thick at the weakest point of the semi-circle. They therefore allow a greater screw spacing, walls and roofs become more angularly rigid.


6

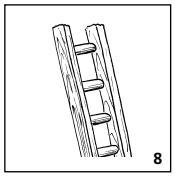
Tongue and groove

The floors of our play platforms consist of 4 cm thick planks. The profile on each plank makes the floors sand-proof, so that children playing underneath are not bothered or endangered (eye injuries). The strong floors of the platforms allow a free span of up to 2.50 m. The spaces created underneath can also be used as a second play level. We use the same material to build walls, planking, platforms and water channels.


7

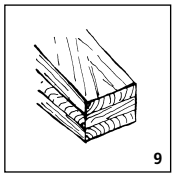
Laminated wood beams

For use with various large playground equipment, e.g. tractor tyre swings or science fiction city. For static reasons, wood cross-sections are required here which are no longer feasible from naturally grown wood or which swell or shrink too much in these cross-sections. That is why we use glued laminated timber beams there, which are glued according to EN 14080:2013.


8

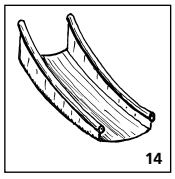
Hardwood rungs

We use hardwood (ash) rungs with a diameter of 4.2 cm for all ladders to towers and platforms. These rungs are easy for children to grip and are more durable than softwood. An alternative would be metal rungs, which we avoid due to the „cold“ nature of the material and the resulting unfriendliness of the grip. Our rungs are mortised by hand and secured against twisting.


9

Plywood

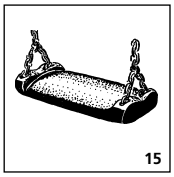
Our multi-layer panels made of mountain larch are available as three-layer panels (3 cm thick) and five-layer panels (4 cm thick). They are used where normal sawn timber cannot be used due to constructional reasons. Weatherproof glued according to DIN EN 13353:2011.


14

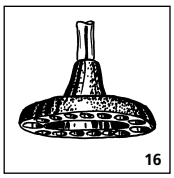
One-piece construction

The whole construction of this slide is made of stainless steel, thickness of the metal sheets 2 mm, handrail tubes Ø 4,2 cm. Before further processing, the slide sheet is profiled in a trough shape in longitudinal direction and thus gains more inherent stability. Over the entire length of the slide surface, the seat and cheeks are seamlessly manufactured from a single sheet. The surface is glass bead blasted.

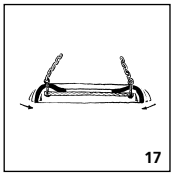
Other quality characteristics


15

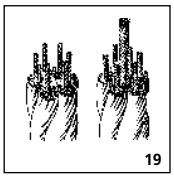
Swing seat
Our swing seat has a soft bumper edge, so there is no danger for children from an empty swinging seat. The seat is very comfortable due to its ergonomic design. A strong, profiled steel inlay protects against wilful destruction. The spread suspension stabilizes the rocking process.


16

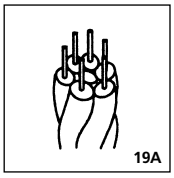
Pendulum seat
We use the large, soft, light and yet stable seats wherever a seat with only one suspension is needed. Technically it is designed like the swing seat, it is made of rubber with soft impact edge and profiled steel insert.


17

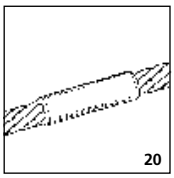
Impact absorbing
The anti-slip swing platform is covered by a special tyre-like element for impact absorption.


19

Richter Hercules type rope
Richter Hercules ropes are a combination of galvanized six-strand steel ropes and polyester yarn, diameter at least 20 mm. The polyester yarn is laid around each strand and glued. Richter Hercules ropes are characterised by very good abrasion resistance and are largely cut and fire resistant. Further features are the good UV resistance and the high metallic cross-section, which provides additional stability. Due to a short lay length, our ropes can be steered around particularly small radii without opening. Since each individual wire (at least 114) is embedded in an adhesive layer, the ropes achieve a particularly high number of bending cycles. Depending on the application, we use flexible or particularly stiff rope constructions.


19A

Hercules rope
Hercules rope, for spliced net connections. The sheath yarn and the steel core are firmly joined together in a special bonding process to ensure high abrasion resistance. In 4- or 6-strand version.

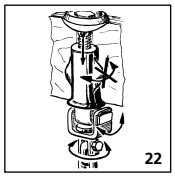

20

Aluminium rope pressing
Aluminium rope press, cylindrically pressed, with rounded ends.

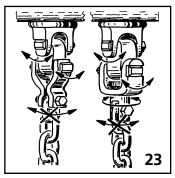

21

S-connectors
The S-connectors serve as a universal connecting element in climbing nets. They are cold drawn from high-quality stainless steel from 10 to 8.1 mm diameter. Both ends of the connectors are rounded and pressed around the rope with a positive fit. All S-connectors are pressed onto the ropes with special hydraulic tools and cannot be removed with normal tools. At highly stressed points of the nets the ropes are connected with 2 S-connectors each.

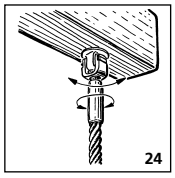
Other quality characteristics



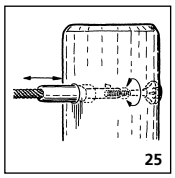
Swing joint
The rocking joint consists of a drop-forged and hot-dip galvanized connection to the wood with an M 16 screw and profile disc, a sintered bush (self-lubricating when in use) and an integrated swivel (to avoid chain knots). The hinge bolts are made of stainless steel.



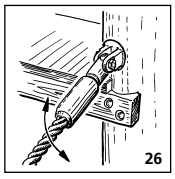
Universal joint
Joint fork and wood connection are drop-forged and hot-dip galvanized. The cardan insert consists of two sintered bush (self-lubricating when in use) and thus allows free swinging in all directions, e.g. with pendulum seat suspensions.



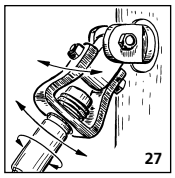
Rotating rope connection
The U-bracket pressed with the rope fits exactly into the fitting in the wooden part. This creates a connection without dangerous openings (no finger traps). With sintered bush (self-lubricating when in use) and integrated swivel, which allows the cable to be unscrewed.



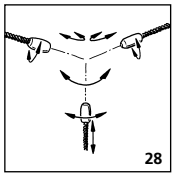
Rope connection fixed
Ropes without major movement are connected to the structure with this fitting avoiding finger entrapment. The connection can be adjusted by approx. 20 mm.



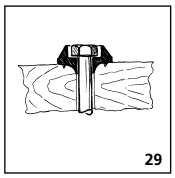
Rope connection with joint
The eyelet pressed to the rope fits exactly into the fork in the wood. This creates a connection avoiding finger entrapment. The bearing itself consists of a sintered bush (self-lubricating when in use) and a stainless steel hinge pin.



Ball joint rope connection
Ball joint rope connection with tailored fitting avoiding finger entrapment allows free swinging in all directions. Rotating suspension with a combination of plain and roller bearings prevents the rope from untwisting and thus premature wear. The screw connection is adjustable and recessed in the wood.

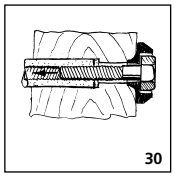


Double rope connection
With complicated swinging and turning movements, this connection removes any „wrong" load from the rope. It allows free swinging and makes the construction particularly durable.

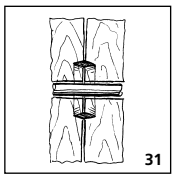


Profiled washer
Specially developed profile disc has various functions:
a. Standard-compliant covering of protruding screw heads.
b. Better pressure distribution by increasing the contact surface, thus minimising the risk of unintentional screw loosening.
c. Cone protects drill hole from water ingress = constructive wood protection.
d. Unauthorised loosening of the screw connection is more difficult.

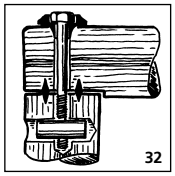
Other quality characteristics


30

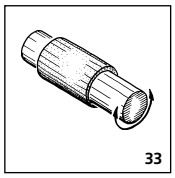
Adjustable
When adjusting our sleeve connections, it is guaranteed that no protruding threads are created. Without this detail, the resulting thread protrusions would have to be laboriously filed off, rounded off and re-galvanised during maintenance work. With thread diameters of 12 or 16 mm this would be a considerable amount of work.


31

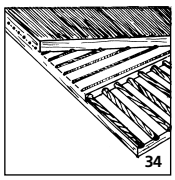
Interlocking
In the case of bolt connections that are stressed transversely to the grain direction, we increase the bearing surface by means of large milled metal rings or serrated disc plugs. This takes the transverse force off the bolt, which cannot bend and the hole in the wood does not wear out.


32

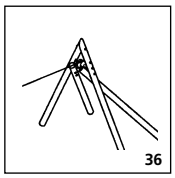
End grain connector
With this special fitting we realize the connection of horizontal on standing wood. This connection can be adjusted by means of the drilled threaded piece.


33

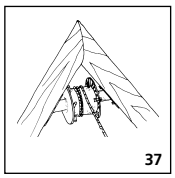
Sintered bush
We use sintered metal plain bearings to support back and forth movements, these are more suitable than rolling bearings. Rolling bearings are generally preferable for full rotary movements, but they wear too much under one-sided load. By using sintered bronze slide bearings, the joint lubricates itself during use. These can be easily replaced if necessary.


34

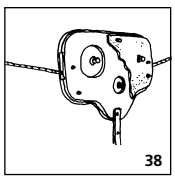
Steel reinforced rubber belt
Rubber belt double steel-reinforced, approx. 11 mm thick and 80 cm wide with solid rubber edge protection. This is almost indestructible.


36

Large gated cableway
With its protruding construction, the bottom station encloses the necessary safety space. The arrangement of the top and bottom stations (difference in height) and the rope sag (counterslope) means that the trolley comes to a jerk-free stop.

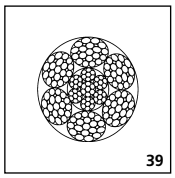

37

Tensioning device
Large winch radius and an additional bend protection protect the rope and ensure a long service life. Un and re-tensioning can be carried out by one person, with an additional helper the rope sag can be precisely adjusted.

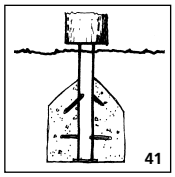

38

Cableway carriage
Our cableway carriage is made in a sandwich construction; its isolated mechanism ensures quiet operation; the cableway carriage can be installed without disassembling the cable.

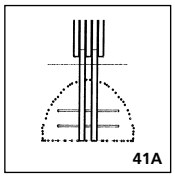
Other quality characteristics



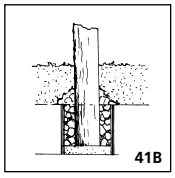
Special steel cable
High-density steel cable made of high-strength hot-dip galvanised wire. It provides longitudinal stability and durability, and allows the cableway carriage to travel smoothly.



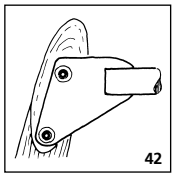
Ground anchor
All parts used for anchoring to the ground are made of hot-dip galvanised steel or stainless steel.



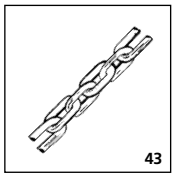
HPL ground anchor
Foundation anchor made of phenol resin paper-based laminates.



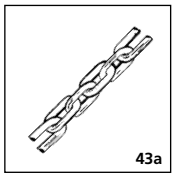
Concrete-free casing foundations
Palisades are placed in formwork rings and backfilled. The elimination of concrete results in easier maintenance, a longer service life, immediate use after installation, reusable formwork rings and residue-free dismantling



Cross beam made of steel
For swings, we are using almost exclusively a cross beam made of hot-dip galvanized steel, also to avoid horizontal wooden parts in whose cracks water can remain standing. An optimised geometry, including rigid corner joints, provides additional stability, which allows for smaller foundations. The requirements for the foundation covers (fall protection) are also simplified.

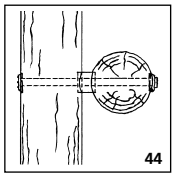


Chains
Short-linked chains, welded before hot-dip galvanizing (type 1.4571 on request at extra charge or for special constructions), without eyelets on the connecting parts, thus individually, without additional parts, replaceable. The last link of the swing chain is clamped directly into the swivel, thus it can be shortened without any problems. The chain holder is designed to protect the first moving link from unnecessary wear.

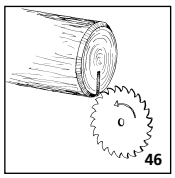


Stainless chains
Short-linked chains made of 1.4571 steel. Used for increased corrosion stress. Without eyelets on the connecting parts, thus individually replaceable without additional parts and easy to shorten.

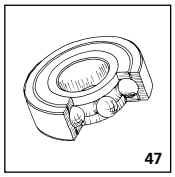
Other quality characteristics



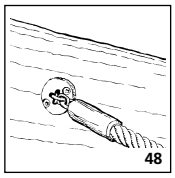
Distance fitting
Screw connection with spacer fitting to avoid trap points.



Relief cut
Wood adapts to the surrounding air in its state of moisture. Wood with larger cross-sections tends to crack during drying due to natural internal stresses. Drying cracks in roundwood lead from the outside towards the center of the trunk (pith). An effective countermeasure is a targeted relief cut over the entire length of the component. By means of relief cuts we define in advance where the stress equalisation in the trunk will lie and minimise the natural crack formation.



Roller bearings
For devices with rotating elements we prefer to use high-quality low-maintenance rolling bearings made of chrome steel or stainless steel.



Fastening of nets
Fastening of net by means of adjustable stainless steel chain fixation, easy assembly and maintenance.