ROLLOR X

APPENDICES

DESIGNING A LOW-COST PACKAGE THAT ENABLES SUITS TO BE TRANSPORTED CREASE FREE.

MASTER THESIS INTEGRATED PRODUCT DESIGN.

Maarten Ornée • 2017

ROLLOR TECHNOLOGY

TU Delft

ROLLOR PATENT

GARMENT HOLDING DEVICE

The present invention relates to a garment holding device according to the preamble of claim 1.

Such devices are known, and serve to store and/or transport garments, such as suits and dresses or gowns. Their advantage is that they enable compact storage and transport and convenient handling of the garments.

The American patent US 5.624.026 issued March 20, 1995 discloses a garment holding device for use with various types of luggage comprising a substantially cylindrical hollow tube about which suits and other garments can be completely wrapped, a fabric cover for holding garments securely about the outer surface of the tube, and a flexible hanger which is capable of holding suits and other garments against the outside of the tube while being flexible enough to conform to the curvature of the tube. A fabric cover wraps around the garments and the tube and holds the garments securely against the outer surface of the tube. Because the garments will be rolled instead of folded over 180 degrees, wrinkling of the garments will be reduced. The hollow center of the cylinder is utilized to carry bulky and awkward shaped objects such as shoes. The way the suits and garments are wrapped around the outside of a cylinder allows the luggage to be compact and easy to carry. Additionally, the garments no longer have to be folded and incur wrinkling, but can be gently wrapped around the outside of the cylinder. This product is available on the market under the tradename Skyroller(R).

Although the known device of US 5.624.026 is an improvement over traditional garment holders that require a suit and other clothes to be folded into two halves or more parts, which almost certainly results in wrinkling of the respective piece of garment and is not compact, the known device still suffers from the disadvantage that it causes wrinkling of the suit or other garment transported and/or stored. Therefore it is a goal of the present invention to provide an improved garment holding device, in particular a garment holding device that prevents wrinkling, while maintaining the compactness of the known device described in US 5.624.026.

This goal is realized by a garment holding device having the features of claim 1.

Because the main sheet is provided with at least two elongated elevated zones on the front side of the main sheet, essentially mutually parallel arranged at or near the edges of said main sheet and parallel to said rolling direction, when the device is rolled up, a curved spacing is created in which a suit suits, or another garment. In this spacing, the garment is held without substantial forces being exerted thereto and without sharp bends. As a result, the garment is much less likely to wrinkle or crease than garments in the known garment holding devices, such as that of US 5.624.026 described above.

The elongated elevated zones preferably have a thickness of at least 4 mm, and in particular more than 9 mm, such that in a rolled up configuration, a garment storage space with a helix shaped cross section is obtained. In particular, the elevated zones are made from a somewhat resilient material, that closes the device at its sides such that no moist can enter, but is not compressed by the rolling force required for rolling up the device.

Another advantage of the device according to the invention is that it facilitates in making the rolled device that holds the garment closed for dust, water, etc. and therefore it facilitates a better protection of the garment (s) in the rolled device.

In particular, the elevated zones may comprise a moist absorbing material, strip, part or layer. These parts form the closure of the device once rolled up, and are then located at the position where the risk if incoming dirt or moist is the highest.

The main sheet is either continuously or at multiple bending lines bendable in the rolling direction. This embodiment offers a simple construction and very reduced folding of the garments, hence good anti-creasing effect.

The main sheet may for instance be made from a (reinforced) textile, but more rigid materials may be suitable, such as a plastics like PP, PE or PVC.

Another option is to use a paper or cardboard, or in particular ribbed cardboard. The elongated elevated zones may be from the same or another paper material, or for instance from a foam. This combination gives a very light result, which makes the device especially suitable for post order deliveries, or as a give away in shops.

In those cases wherein the device according to the invention, and in particular the lightweight versions such as the paper versions are to be shipped empty, but in large quantities, such as may be the case when shipping from a manufacturer of the device to a sales point, the device may be delivered in separate parts. An amount of main sheets may then be stacked, and the elevated zones may be delivered separately, and be mounted with double sided tape locally, before use. The same goes for a corus, which may for example be a card-board box with a polygonal cross section. This way, flat packages can be composed.

Yet another option is to use bamboo as a material.

In another embodiment, the main sheet has, in a direction perpendicular to the rolling direction, over at least a part of its length in the rolling direction, a rigidity sufficiently high to take up an external radial point load of 25 - 35 N on the outside of the main sheet when said main sheet is in a rolled up state, without deformation of more than 10 mm of each point on the surface area. Due to these measures, the device may be handled in normal traveling circumstances, such as occur when taking an airplane, without having to worry about the garments being pressed together and being wrinkled or creased. For instance, a suitcase of 23 kg, as is commonly used in airplane travel, may rest with a corner on the device according to the invention. These features may be realized in a main sheet of a single layer material as well as a multi-layered material of which at least a single layer is relatively rigid.

In yet another embodiment, the aforementioned rigidity is sufficiently high to take up an external radial load of 210 - 270 N equally distributed over a surface area that spans the outside length of the main sheet when said main sheet is in a rolled up state, without deformation of more than 10 mm of each point on the surface area. This allows for somewhat rougher handling of the device, e.g. by putting some other luggage on it, such as a suitcase.

In a further embodiment, a part of the main sheet has a higher rigidity than the rest of the main sheet. This may be realised by a higher density or thickness, another material, a combination or materials or an extra layer. The part of the main sheet with the higher

density is the part that forms the outer shell when the device according to the present invention is rolled up.

In another embodiment at least one of the elongated elevated zones and relief zones is provided with recesses in the direction perpendicular to the direction of rolling, for example V-shaped or rectangular shaped. The recesses may have various shapes, and sizes. In combination with sizes and shapes of the elongated elevated zones, the rolling up occurs in segments, i.e., into a prismatic rod with a number of sides .

In a further embodiment of the device, at least one of the elongated elevated zones and relief zones is inflatable. This allows for a more compact storage and transport when the device is not in use, i.e., when it holds no garments.

In yet a further embodiment, the main sheet is coupled to an essentially cylindrical corus, about which the device is rollable. The connection between the main sheet and the corus may be a hinge. The corus then may serve as a weight that prevents the device from rolling up automatically when laid flat on a floor, and it assists in rolling up the device. Its radius may be chosen such that the angle over which the main sheet and a garment are bent is limited to a desired allowed minimum. The corus may be rigid or hollow, and accessible to store objects within if desired.

Preferably, the at least one cloth attachment means is a clothes hanger, wherein the clothes hanger is flexible in the direction of rolling of the device; this allows for more compact rolling. We note that the term "clothes hanger" is to be interpreted in a wide sense, including anything attached to the main sheet that is suitable for carrying garments in or at the device. In particular, (elastic) cords or the like may be used.

In an embodiment, the device comprises a hook suitable for carrying the device in unrolled shape, wherein the hook is integrated with or attached to a clothes hanger. As such, it becomes possible to use the hook for hanging the device at a fixed location, e.g. in a hotel or at home, while meanwhile utilizing the clothes hanger - carried by the hook - for hanging clothes against the unrolled main sheet.

Another embodiment has two clothes hangers attached to the front side of the main sheet, and a folding line in the main sheet between and parallel to said two clothes hangers as well as a hook attached to the main sheet between said two clothes hangers or to a clothes hanger. With this embodiment, it becomes possible to fold the main sheet into two parts, with their backsides against each other, one clothes hanger on each main sheet front side. The hook then serves to hang the device at a cupboard, a stand, or the like. Each clothes hanger then may carry a piece of clothing. When such a device is to be transported, it may easily be straightened with the two pieces of clothing in it, and then be rolled up.

In a further embodiment, the main sheet has a covering sheet attached to it, which covering sheet is suited to cover at least part of the front side of the main sheet and to uncover the main sheet by folding away the covering sheet. Such a covering sheet is suited either separate two pieces of clothing, to further prevent them from wrinkling or creasing when they are being rolled up in the main sheet, or to cover a single piece of clothing before it is being rolled up, which also has an aesthetical function.

In a further embodiment, each of the elongated elevated zones of the main sheet has a higher elongated part and a lower elongated part, wherein each higher part faces the edge to which it is closest, and, when the covering sheet is covering the main sheet, it is positioned over the lower parts of the elongated elevated zones of the main sheet. This has as an advantage that two pieces of clothing fit in the device, each in its own compartment, meanwhile having a compact device. Relief zones may lie over the lower elongated parts when the device is in the rolled up state, for convenient guidance in rolling up.

The invention will now be clarified on the basis of a preferred embodiment, referring to the accompanying drawings and solely as an illustration of the invention and not in limitation thereof. In the drawings:

Figures la and lb show a first embodiment of the invention, respectively in a folded state for hanging, and an elongated state for packing and unpacking,
Figure 2 shows a second embodiment of the invention, similar to the first embodiment but provided with a flap,

Figure 3 shows a third embodiment of the invention, and
Figure 4 shows the cross-section A-A of part of the first embodiment,
Figure 5 shows schematically, not drawn to scale, a cross-section over a fourth embodiment of the invention, provided with a flap having rims;
Figure 6 shows a cross section of a perspective side view of the garment holding device according to the present invention, in a rolled up position;
Figure 7 shows a blank for a corus for a cardboard version of the device according to the present invention.

In Figures la and lb, a garment holding device 1 comprises a main sheet 2 of material rollable in a rolling direction R, indicated by an arrow in Figure lb. Attached to the main sheet 2 are two cloth attachment means in the shape of a clothes hanger 3 and a trouser holder 4.

The main sheet 2 is provided with two elongated elevated zones 5, 5' on the front side of the main sheet (top side in Figure lb) , mutually parallel arranged close to the edges of the main sheet 2 and parallel to the rolling direction R, and at a mutual distance of approximately 60 cm.

The main sheet 2 is continuously bendable over its entire length in the direction R. Alternatively, but not shown, it could be provided with stiff parts and a number, for example five, bending lines, each arranged perpendicular to the rolling direction R.
The main sheet 2 is provided with at least two relief zones 6, 6' on the back side of the main sheet, at locations opposing said at least two elevated zones 5, 5' on the front side of the main sheet .
In Figure 4, a part of the embodiment shown in Figure 1 is shown in cross-section. Here, the main sheet 2 is visible and the elevated zone 5 on the front side thereof, as well as the relief zone 6 at the rear side of the main sheet. The relief zone 6 is in shape complementary to that of the elevated zone 5, and has a recess 7 that cooperates with peak 8. These measures have as a result that the relief zone 6 cooperates during the rolling up with the elongated elevated zone 5 in guiding said rolling up. The same holds, mutatis mutandis, for the zones 5' and 6' . It is noted that the elevated zones 5, 5' and the relief zones 6, 6' extend along a large part of the length of the main sheet 2, in this embodiment. They are left away only in the zone that is rolled up as last zone, and that

serves are a cover of the device. It is not shown, but the main sheet 2 is (see Figure lb) at its rear side provided with stiffening material, providing it a high rigidity in a direction perpendicular to the rolling direction, in order to provide the device in its rolled up state, possibly with garments in it, with sufficient strength on its outside area to be able to withstand normal handling during transportation, such as carrying the device in busses, airports, airplanes and cars, etc, without substantially deforming and thereby wrinkling or otherwise damaging the clothes rolled up inside the device.

The clothes hanger 3 may hold suits, but of course may also carry a dress, including a ceremonial dress, or any other piece of clothing. Similarly, the trouser holder 4 may hold other things than trousers. The clothes hanger 3 is made of foam with rods inserted in it, in the lateral direction (R being the longitudinal direction) , in order to provide it with sufficient stiffness and strength and meanwhile maintaining the flexibility necessary to allow the main sheet 2 to bend and be rolled up.

Further, the clothes hanger 3 is integrated with a hook 9, by which hook 9 the device can be varied in unrolled shape; in this manner it may be hung on a cupboard or a stand (not shown) .

The clothes hanger 3 and the trouser holder 4 are both attached to the front side of the main sheet 2, and a folding line coinciding with the edge 10 in the main sheet 2 is located between and parallel to the clothes hanger 3 and the trouser holder 4. An opening (not shown) in the main sheet 2 allows the hook 9 to reach outside when the main sheet is in the rolled state; in this manner it becomes possible for a person to carry the device in its rolled state by the hook, or to hang it by the hook. Not discussed into detail, but present, are various straps and grips for securing the device in its rolled up state respectively for carrying the device in that state, either as a horizontal or vertical roll. Both positions may be beneficial, depending on the circumstances or environment. In particular a shoulder strap is mentioned (but not shown) , attached to or near the ends of the device in its rolled state, and long enough to enable a person to carry the device conveniently by putting the strap over her shoulder, while the rolled up device hangs horizontally are hip-height or approximately that height.

A tube 13 is present at the end of the main sheet 2 where rolling is started. Such a tube is convenient for rolling up with a larger radius, with as a result an even smaller risk of wrinkling of the garments. The tube, when given a larger volume, may also be convenient for holding objects, such as a tie or shoes, in it.

Figure 2 shows an embodiment almost identical to the embodiment shown in Figure 1, only differing in that it additionally comprises a covering sheet 12 attached to the main sheet 2, in the shape of a thin transparent plastic sheet. The covering sheet 12 covers, when it is folded over the main sheet 2, one part of the front side of the main sheet 2, viz. one of the two parts meant for one piece of garment, as separated by the folding line coinciding with the edge 10.

In Figure 5, in a fourth embodiment of the invention, each of the elongated elevated zones of the main sheet has a higher elongated part 13 and a lower elongated part 14, wherein each higher part faces the edge to which it is closest. The covering sheet or flap 15 has two elevated rims 16 on the side thereof facing away from the main sheet 2 and positioned on the lower parts 13 of the elongated elevated zones of the main sheet 2, when the device is rolled up. Not shown, is a hanger attached to the flap, on the same side thereof as the rims 16. In this embodiment, two pieces of clothing can be stored inside the device, in separate compartments, when the device is rolled up.

Relief zones 17 are attached to the rear side of the main sheet 2. They rest on the rims 16 when the device is in the rolled up state.

Due to the presence of push buttons (not shown) at the edges of the flap 15, the flap is detachable from the main sheet 2 and can be fitted upside down, i.e. with its rims 16 facing the main sheet, in the unrolled state of the device, in order to provide a single, larger compartment instead of two smaller ones.

In this embodiment, the flap 15 is made of stretchable material, which enhances anti-crease effect of the device.

It is noted that the rims 16 may also be omitted, while increasing the height of the relief zones 17. In this manner, the flap 15 is no longer reinforced by the rims, but this

function may be taken over by e.g. push buttons by which the flap is attached to the lower elevated parts 14, in particular when stretch material is used for the flap 15. The three illustrated embodiments may also comprise means for automatically rolling up, or stretching, the main sheet 2. These means may be integrated with the elevated zones 5, 5' and/or the relief zones 6, 6' . Such means are known per se, they are for instance applied in artificial satellites for unrolling RF-antennas and also in bracelets.

Figure 6 shows a perspective side view 20 of a cross section of the garment holding device according to the present invention, in a rolled up position. Visible are the optional corus 21 (dashed) to which the main sheet is connected by a hinge 22. In the closed positon, the elevated zones create a curved spacing 23 with a helix shaped cross section is created for holding a suit 24 or another garment, without substantial forces being exerted thereto and without sharp bends.

Variants can be made to the embodiments shown, without leaving the scope of the claims. For example, the main sheet may be made of bamboo rods arranged parallel to the axis of symmetry of the rolled product. Moreover, the elongated elevated zones and relief zones may be somewhat compressible and may have heights that vary in the rolling direction of the main sheet.

Figure 7 shows a blank 25 for a corus of a cardboard version of the present invention. The blank may be integrated with a main sheet, or attachable thereto, for instance by means of a adhesive surface 26. The corus has folding lines, that allow to form a polygonal shape from it. As a blank, the corus can easily be shipped, in particular in large quantities, as a stack. In a rolled up or folded state, the triangular extensions 27 are bent over their folding lines 28 to form a sidewall. Extensions 29 can be clamped in slits 30, to fix the corus in the folded position.

CLAIMS

1. Garment holding device comprising a main sheet of material rollable in a rolling direction and at least one cloth attachment means attached to said main sheet, wherein the main sheet is provided with at least two elongated elevated zones on the front side of the main sheet, essentially mutually parallel arranged at or near the edges of said main sheet and parallel to said rolling direction, such that when the device is rolled up, a curved spacing is created for holding a suit or another garment, without substantial forces being exerted thereto and without sharp bends.

2. Garment holding device according to claim 1, in which said main sheet is continuously bendable in said rolling direction .

3. Garment holding device according to claim 1 or 2, wherein the elongated elevated zones have a thickness of at least 4 mm, and in particular more than 9 millimeter, such that in a rolled up configuration, a garment storage space with a helix shaped cross section is obtained.

4. Garment holding device according to any of the preceding claims, wherein the elevated zones are made from a at least somewhat resilient material, that closes the device at its sides such that no moist can enter, but is not compressed by the rolling force required for rolling up the device.

5. Garment holding device according to one of the claims 1-4, in which said main sheet has in a direction perpendicular to the rolling direction, over at least a part of its length in the rolling direction, a rigidity that is sufficiently high to take up an external radial point load of 25 - 35 N on the outside of the main sheet when said main sheet is in a rolled up state, without deformation of more than 10 mm of each point on the surface area.

6. Garment holding device according to one of the claims 1-4, in which said main sheet has in a direction perpendicular to the rolling direction, over at least a part of its length in - li the rolling direction, a rigidity that is sufficiently high to take up an external radial load of 210 - 270 N equally distributed over a surface area that spans the outside length

of the main sheet when said main sheet is in a rolled up state, without deformation of more than 10 mm of each point on the surface area.

7. Garment holding device according to one of the preceding claims, the main sheet is made from a (reinforced) textile, a plastics like PP, PE or PVC, a paper or cardboard, in particular ribbed cardboard, bamboo or combinations thereof.

8. Garment holding device according to any of the preceding claims, wherein the elevated zones comprise a moist absorbing material, strip, part or layer.

9. Garment holding device according to claim 7 or claim 8, in which at least one of the elongated elevated zones and relief zones is provided with recesses in the direction perpendicular to the direction of rolling, for example V- shaped or rectangular shaped.

10. Garment holding device according to one of the preceding claims 7-9, in which at least one of the elongated elevated zones and relief zones is inflatable.

11. Garment holding device according to one of the preceding claims, wherein a part of the main sheet has a higher rigidity than the rest of the main sheet, for instance realised by a higher density or thickness, another material, a combination or materials or an extra layer .

12. Garment holding device according to claim 11, comprising a hook suitable for carrying the device in unrolled shape, wherein the hook is integrated with or attached to a clothes attachment means .

13. Garment holding device according to one of the preceding claims, comprising two clothes attachment means attached to the front side of the main sheet, and a folding line in the main sheet between and parallel to said two clothes attachment means as well as a hook attached to the main sheet between said two clothes attachment means or to a clothes attachment means .

14. Garment holding device according to one of the preceding claims, wherein the main sheet is coupled to an essentially cylindrical corus, about which the device is rollable, and wherein the connection between the main sheet and the corus may is a hinge.

15. Garment holding device according to claim 14, wherein each of the elongated elevated zones of the main sheet has a higher elongated part and a lower elongated part, wherein each higher part faces the edge to which it is closest, and, when the covering sheet is covering the main sheet, it is positioned over the lower parts of the elongated elevated zones of the main sheet.

16. Garment holding device according to claim 7 and claim 15, wherein the relief zones lie over the lower elongated elevated parts when the device is in the rolled up state.

17. Method for shipping a plurality of garment holding devices according to any of the preceding claims, comprising the steps of:

- Stacking an amount of main sheets;
- Packing an amount of elevated zones;
- Shipping the main sheets and elevated zones together or separately; for assembly by a receiving party.

18. Method according to claim 17, wherein the garment device comprises a corus, which is shipped as a flat blank.

1/5

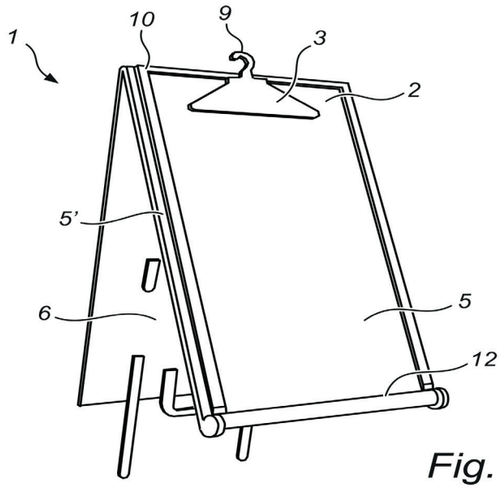


Fig. 1a

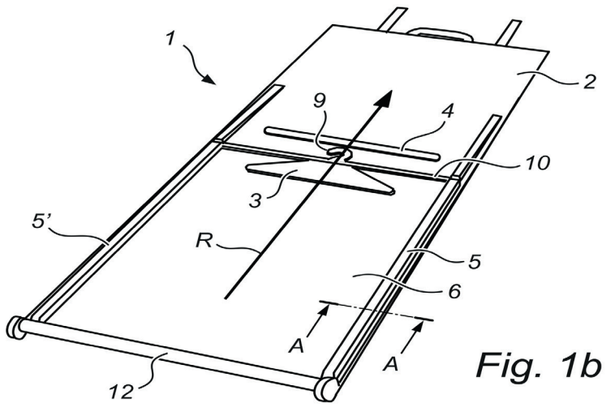


Fig. 1b

2/5

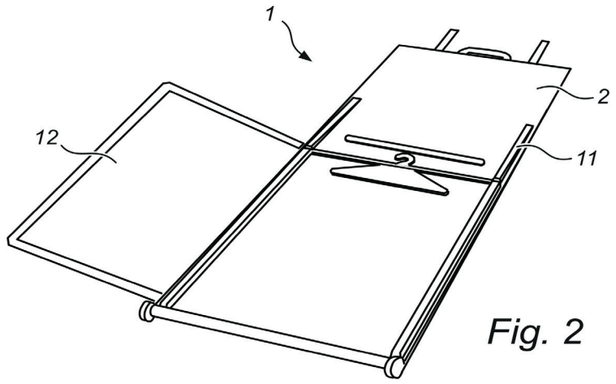


Fig. 2

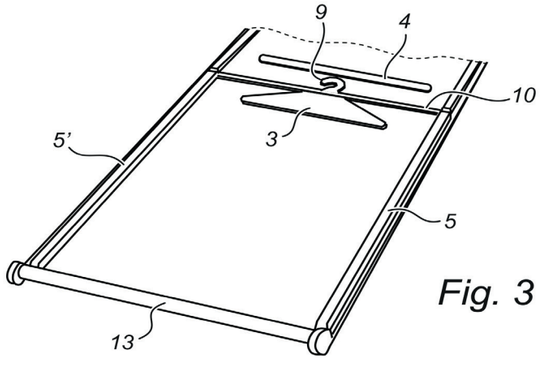


Fig. 3

3/5

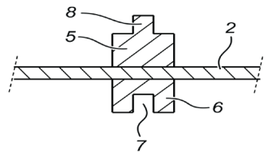


Fig. 4

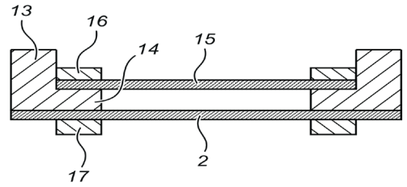


Fig. 5

5/5

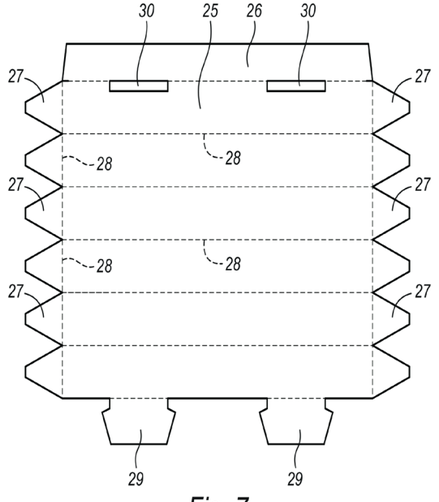


Fig. 7

4/5

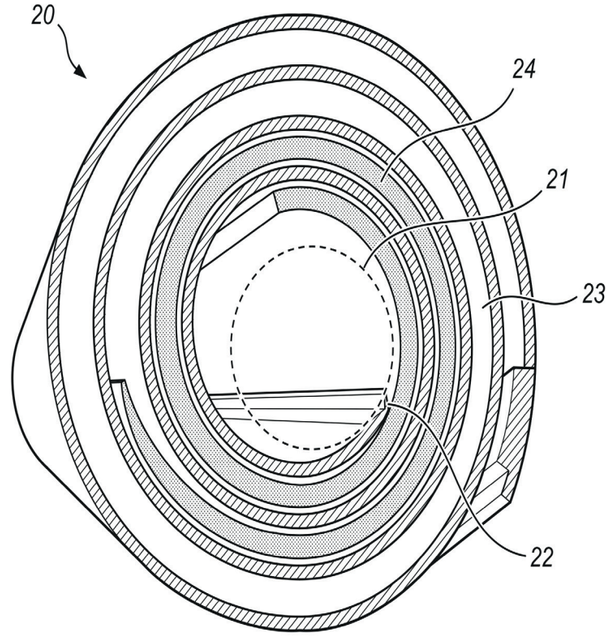
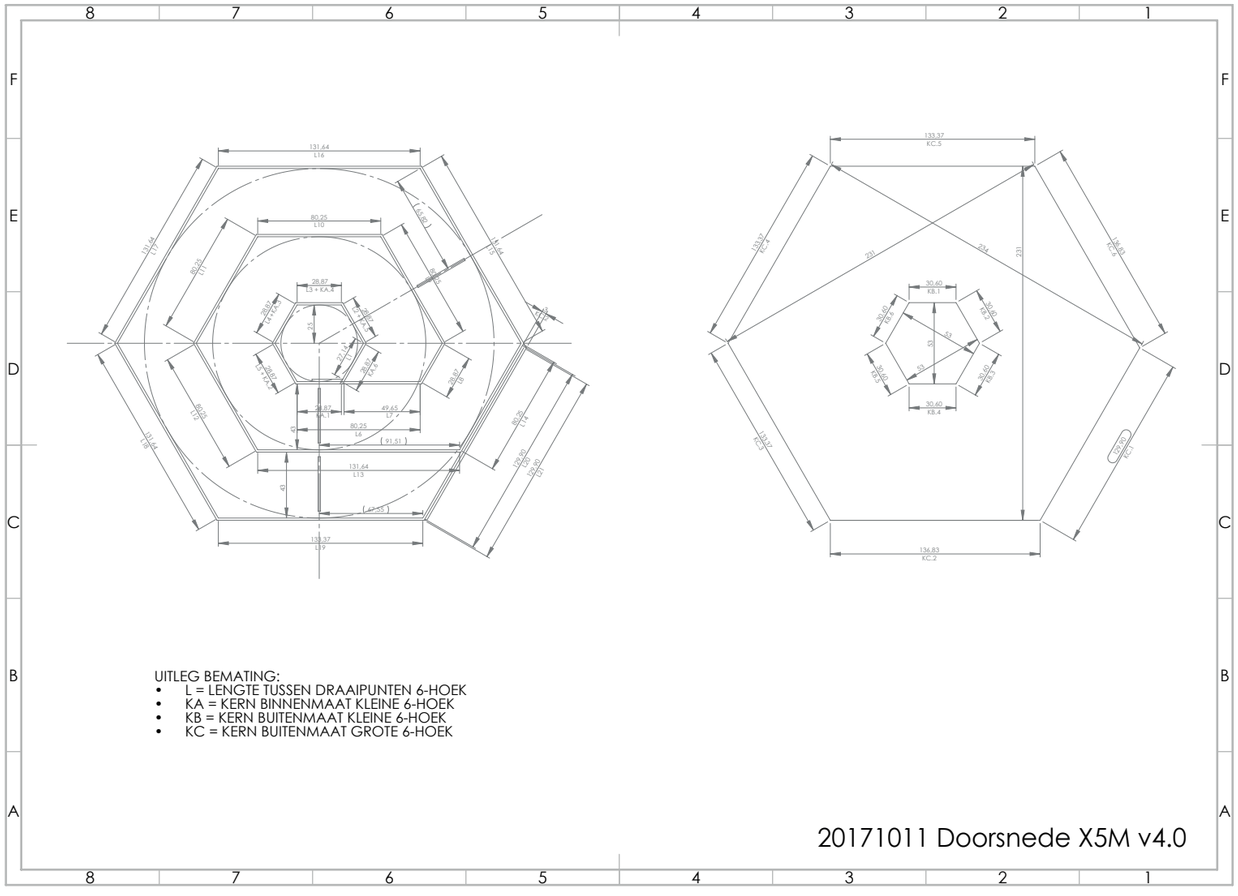
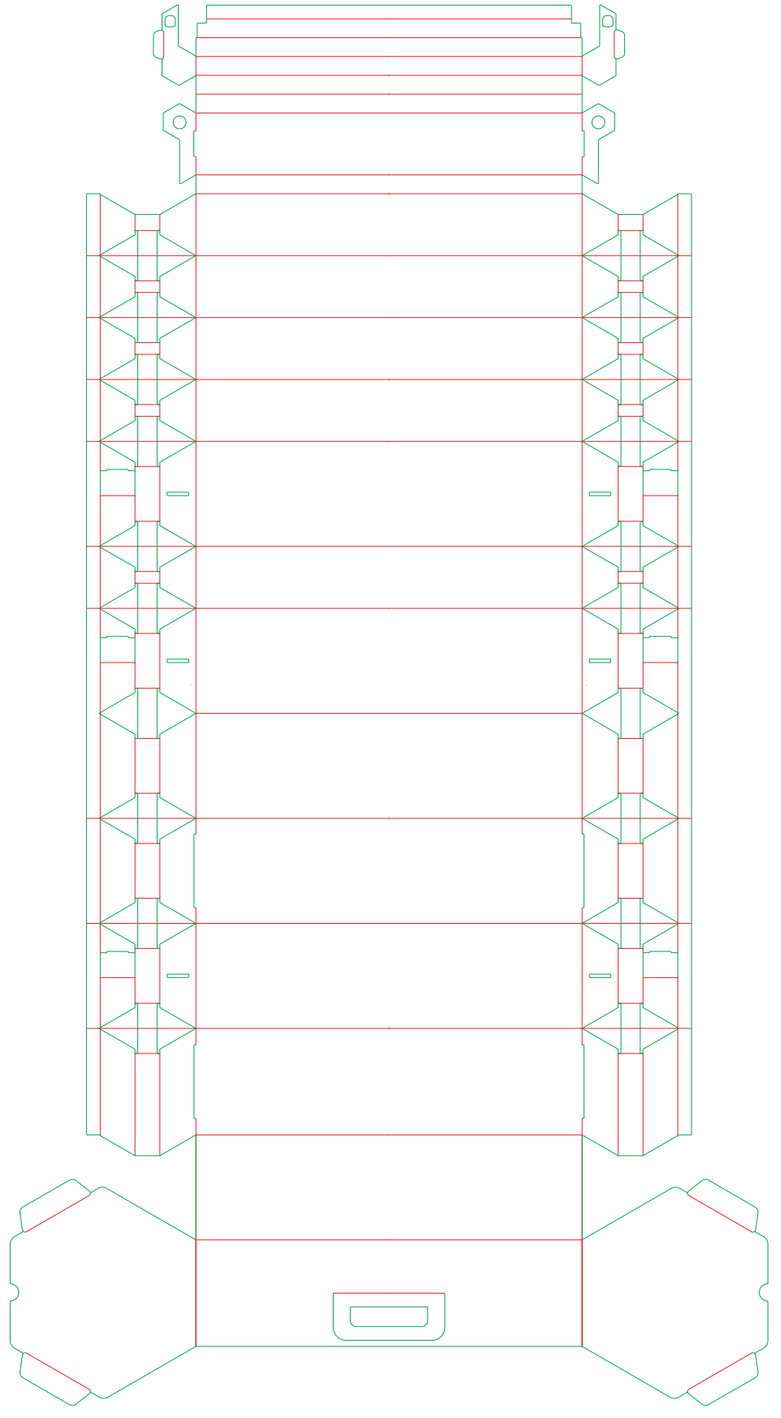


Fig. 6

DESIGN DRAWINGS





RAIL SAMPLES

It is examined whether the current rail material is still suitable for the redesign and what kind of material can be a possible replacement. To make sure that the wheel is not reinvented, all previous foam samples and first rail prototypes were looked into (see Figure 63).

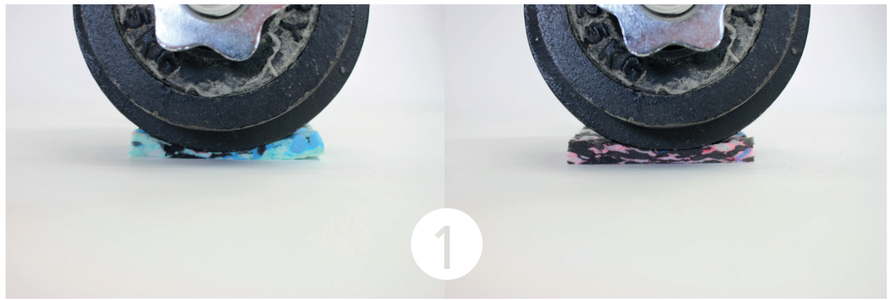
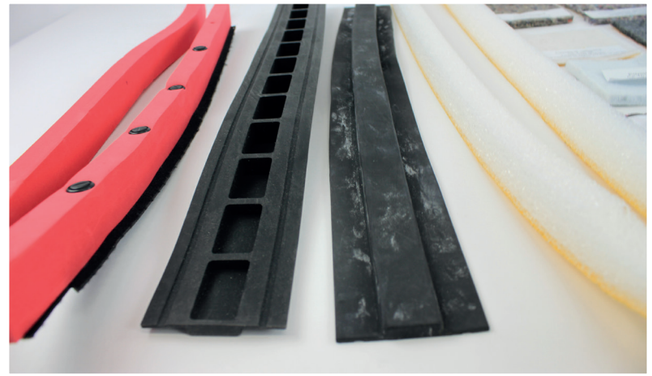
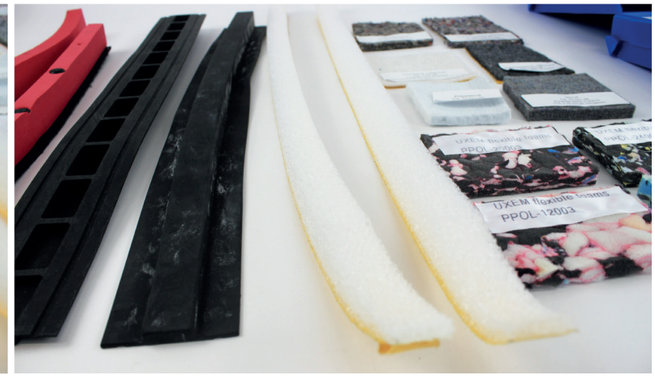


Figure 1 Small pressure test with two possible interesting recycled foam samples.

The large variety of foam samples gave a very good insight in the possibilities one has with foam. Although, at first sight, the amount of samples gave the impression that a lot more was possible than the current foam material. The current Express foam material still seems to be the best foam for the job. It was very interesting to see what kind of rail prototypes have been designed, but none are interesting for this project.
Something that does showed to be interesting were the recycled foam samples. A quick pressure test was conducted (Figure 62). The blue sample seemed to have a better density than the pink sample, which was more dense. One of the properties the rails need to have is to be easily reduced in size. The blue sample was easy to be pressed together and went back to its original size when the pressure was taken of. This test showed that recycled foam could have the right properties in order to be interesting for this project.

It can be concluded that the current foam used on the Express still has the most interesting properties, however, recycled foam could have the same properties and therefore will be further looked into





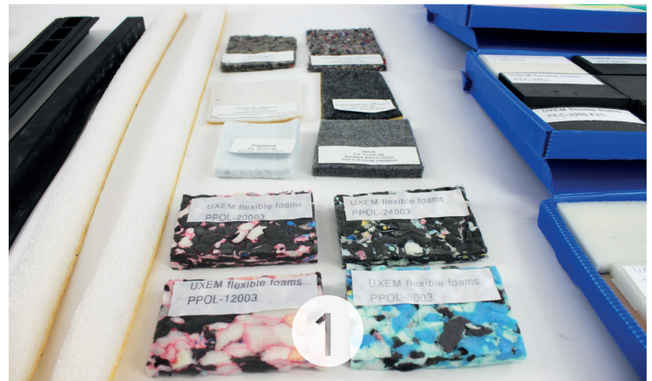


Figure 2 Collection of the first rail prototypes and foam samples that are in possession of Rollor.

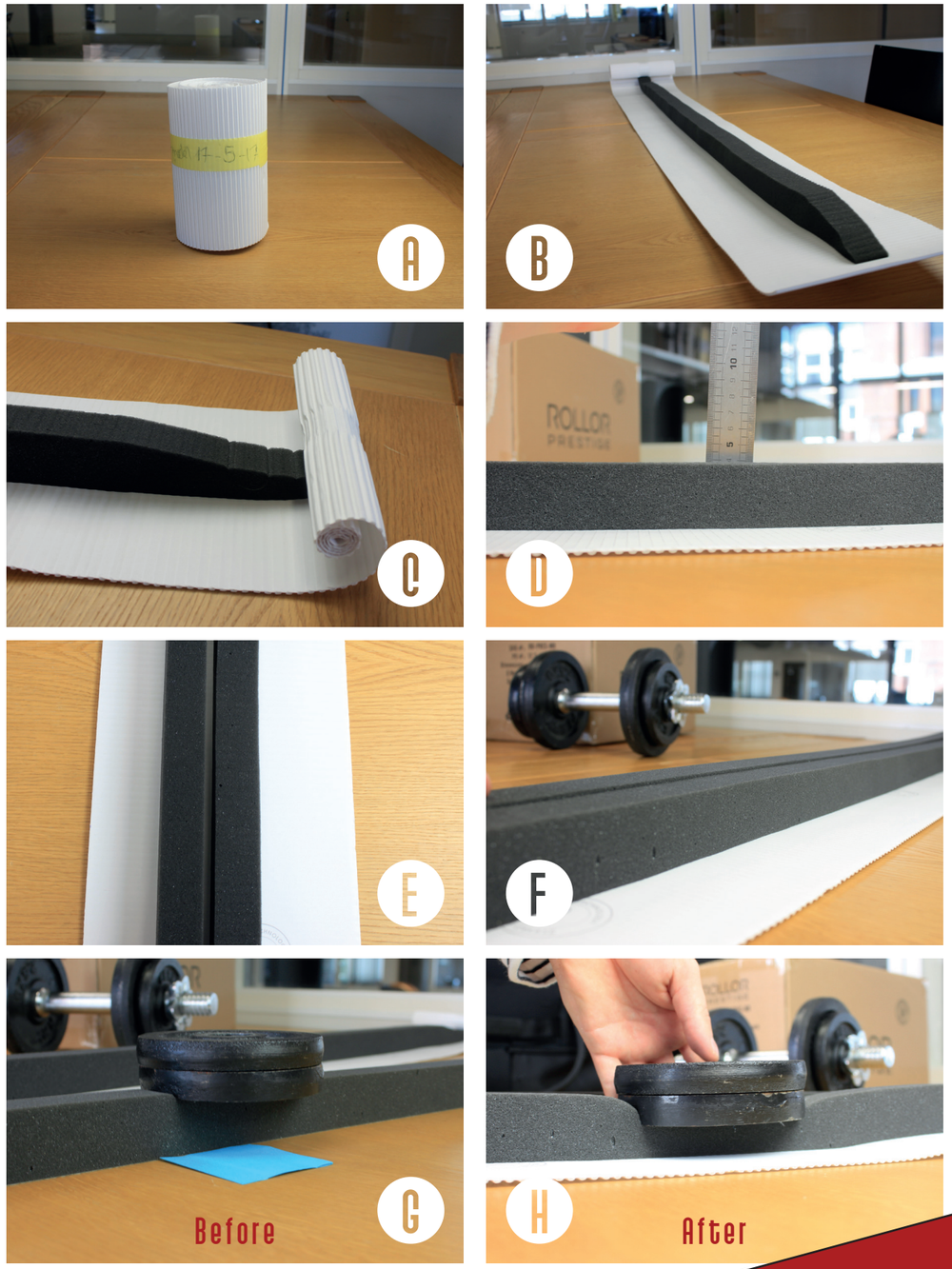


Figure 3 Collage of the 4 week rolled up rail test.

ROLL UP TESTS

The current express rail has shown to have the right material properties to be rolled up tightly and have little volume loss when it is rolled out again. Some tests are conducted to see what the effect is when such a rail is rolled up for a longer period of time.

Four Week Test

In these test it is examined how the foam material from the rail reacts when it is compressed for a longer period of time. Multiple rails are compressed by being rolled up tightly(as the concept would be when being transported or stored) and each for a different timespan. The test, seen in Figure 64, is the 4 week test. The model still rolled out smoothly, with a bit more curvature in the tail of the model (Figure 64-C). The wavy pattern of the corrugated cardboard made an imprint in the rail, clearly visible but not bothersome(Figure 64-B). The height of the rail is now 38 mm (Figure 64-D). This is a 3 mm difference with the original rail height and also the rail has become 2 mm wider (Figure 64-E and F).
The results mentioned above are very positive. The rail quickly returns to (almost) his old form with little change. Although, so it seemed. The real difference was noticeable when the model was rolled up as it would with garments inside. The rail was significantly less rigid than before (Figure 64-G and H). However, as seen in Figure 65, the sturdiness that the rail initially had, seems to return after the material has had some time to recover from its compressed state. It still shows to be more sensitive to pressure than its original state, but significantly better than right after the model is rolled out.

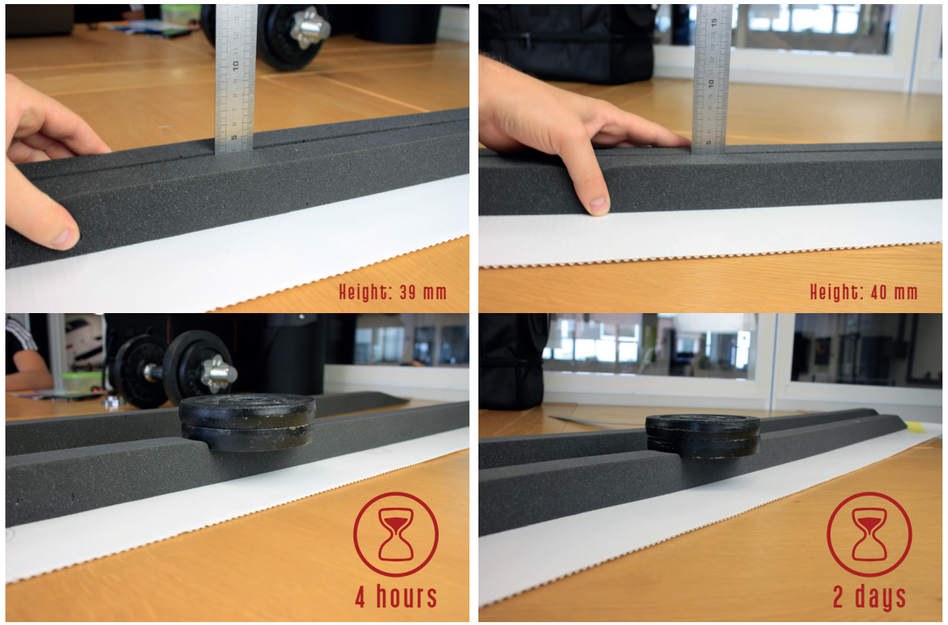


Figure 4 On the left, the result when the test model is rolled out for four hours. On the right, the result after two days. It can be seen that foam keeps getting more rigid as more time passes by.

Insights

1. Shape and size are limitedly affected after four week.
2. Foam rails are very sensitive to pressure after compression.
3. This sensitivity decreases significantly after restoring for a few hours

IFG VISIT

IFG Foam Applications is a foam process company which already manufactures some of the Rollor rails. On a visit to the company the team sat down with two foam experts, that could answer a few questions about the application of foam for this project.

The visit

Rollor had a planned visit to IFG. Which was a perfect opportunity to join and asked some project related questions to foam experts. Present at the meeting were: Peter Hoogland, Rollor Head of Design; Maarten Ornée, graduate at Rollor; Ton Grutters, Location Manager IFG and Adrie van der Berg, Account Manager Recticel b.v. (Recticel is the foam supplier).

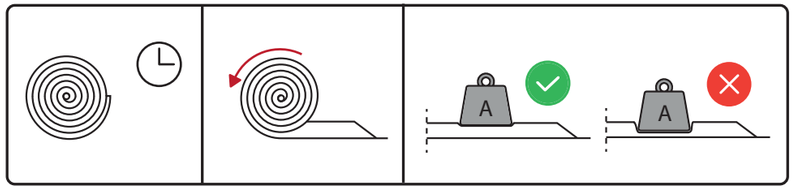


Figure 5 After being compressed for a certain amount of time, it is desired that, when the Rollor is unrolled, the rail is (as good) as firm as it was pre compression.

The goal of the questions was to get a clearer picture of what the possibilities were of the application of foam rails within this project. The project was briefly described. The ideal foam, currently, for the project is a foam with a rather high compression resistance (it needs withstand the pressure of rolling), that can still be significantly be reduced in size (i.e. by compression or vacuum pulling) and needs to quickly return to its original size, with the original properties after it has been reduced in size (see Figure 66). The current foam on the Express, a polyurethane foam called T33260, showed to be a good candidate in earlier tests. However, in a longer lasting test it showed to lose a lot of compression resistance (Figure 67). Although this was as good as restored after two days, ideally, this would restored almost immediately after the foam was released from its compressed state.
It was asked to the experts whether such a foam, or something that comes close, exists. The answer: No, it does not. A foam that quickly returns to its original state after being compressed for a longer period of time is hard to find. One that also has a rather high compression resistance does not exist (Van der Berg, 2017). Let alone that the search is for a cheap solution. To combine these properties, comprises have to be made in all sections. Funny enough, the T33260 foam seems to be the best option already.

Price reduction

So the type of foam will not differ much from the T33620 foam. A slightly cheaper foam could possibly be found, but this will not significantly decrease the production price (Van der Berg, 2017). Recycled foam would be interesting price wise, however it will never have the right properties (Van der Berg, 2017). But a price reduction is still possible. Namely, the adhesive tape is a rather expensive. When removed from the equation, the price is almost reduced in half (Grutters, 2017). However, the adhesive tape offers the advantage that the rails and sheets can be transported separately. Saving a lot of space during transportation and storage. If this would not be a problem. The rails could be attached by a supplier of some sort and a cheaper solution could be found for attaching the rails to the sheet. Such as glue. The tip was also given that this kind of assembly work could be done in some kind of social workplace. This also saves a lot of assembly costs.

Another possibility was to give the rails a subtle coating. This could have influence on the preservation of the compression resistance. This will be tested when a coated sample arrives.

Express rail properties

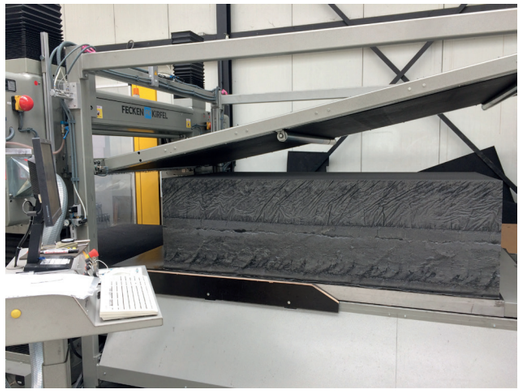
Figure 6 Result of the T33260 foam being compressed for four weeks. Full result of test can be found in Chapter Roll up test.

Insights

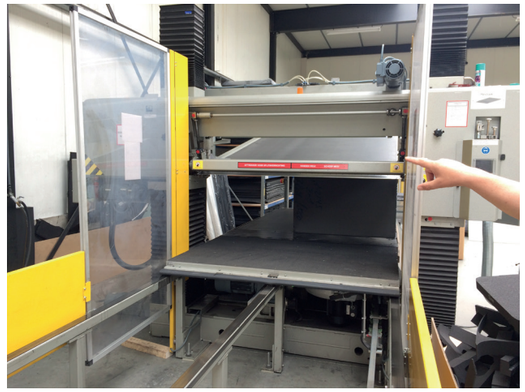
1. The Express foam currently seems to have the best properties for the concept.
2. Price reduction best achievable by replacing adhesive tape.
3. A light coating of the rail can have influence on the compression resistance.

The meeting room had a large variety of samples, showing the possibilities of what IFG can do.

IFG receives foam in big blocks, which are delivered by their costumers.

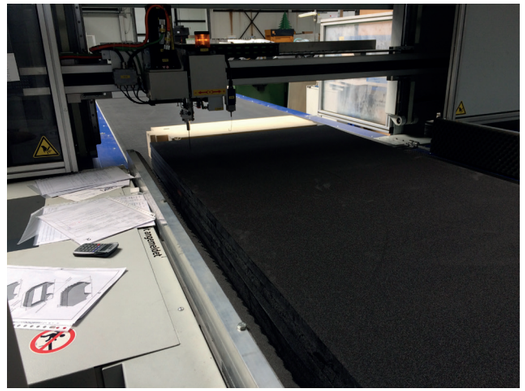


These blocks are put on the cutting machine and are cut in the preferred size.



The razor sharp blade can cut of slice down to the millimeter.

After the slice is cut , it can be put in the other cutting machine.



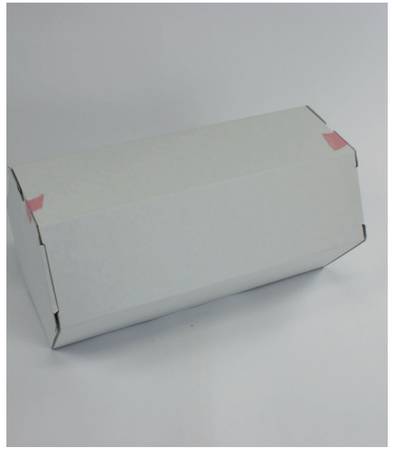
This machine can cut the slice in any desired shape with a saw that can turn 360 degrees.

ZALANDO TEST

Testing with suits from Zalando. A clear difference can be seen between the suits that came from the Zalando package and that of the Rollor X. Some hard creases could not be removed with the steamer and are still visible. Also it can be seen that the suit in the prestige had not dried enough before it was laid in the Rollor.

Zalando

Prestige (2 days)



Rollor X (2 days)

Zalando

Prestige (2 days)

Rollor X (2 days)

Zalando suit 1

Zalando suit 2

Reconditioned suit 1

Reconditioned suit 2

Prestige (2 days,suit 1)

Rollor X (2 days,suit 2)

M&S TESTS

Testing with suits from Marks & Spencer. Test one with the Rollor showed some bad results. The suit had not dried enough after reconditioning and was badly laid in the Rollor. The second test was done more carefully and the results were much better.

Marks & Spencer

Rollor X (2 days)

Rollor X test 1

Rollor X test 2

PRESTIGE VS ROLLOR X

Multiple test were done to see wether the hexagonal shape of the Rollor X had a influence on the creasing of the suit. At some suits, clear line at the back can be seen. However with other tests, the same line were in the suits from the prestige. The problem laid with how neatly the suit was laid in. Further no clear difference has been seen.

Prestige

Rollor X

Prestige

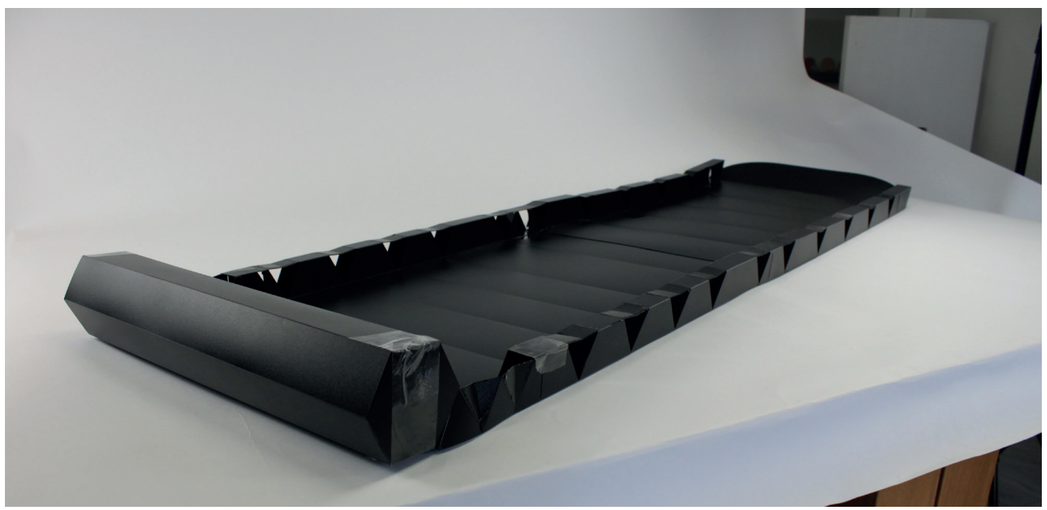
Rollor X

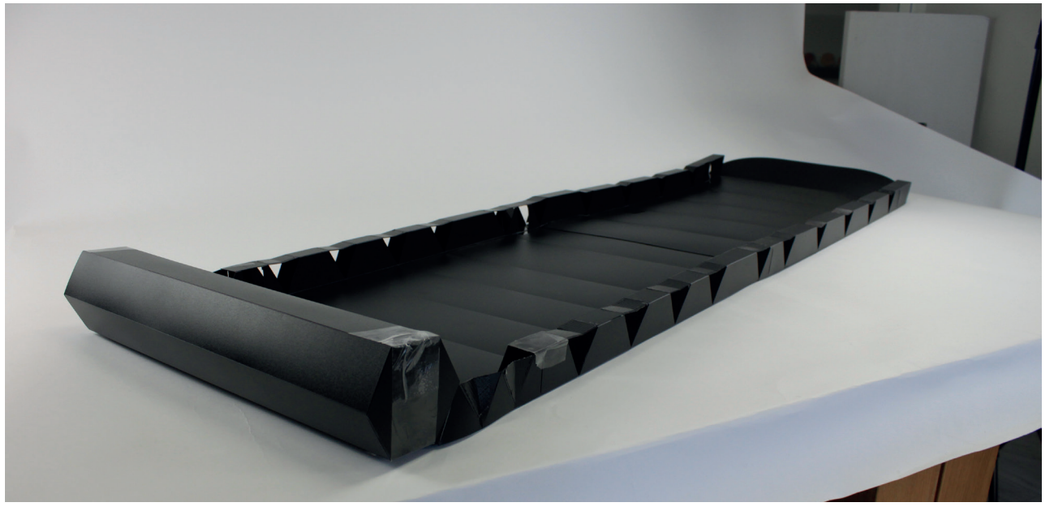
Prestige

Rollor X

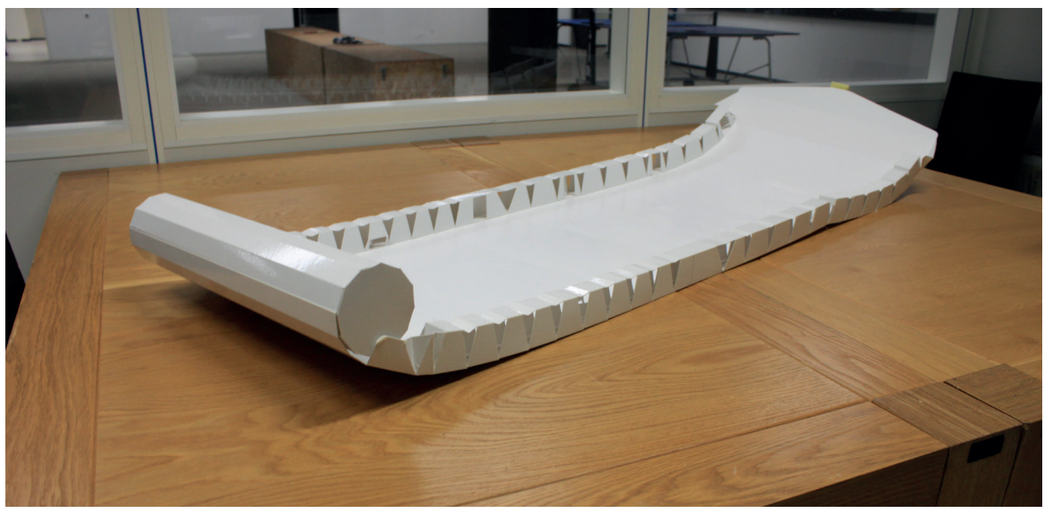
OTHER PROTOTYPES

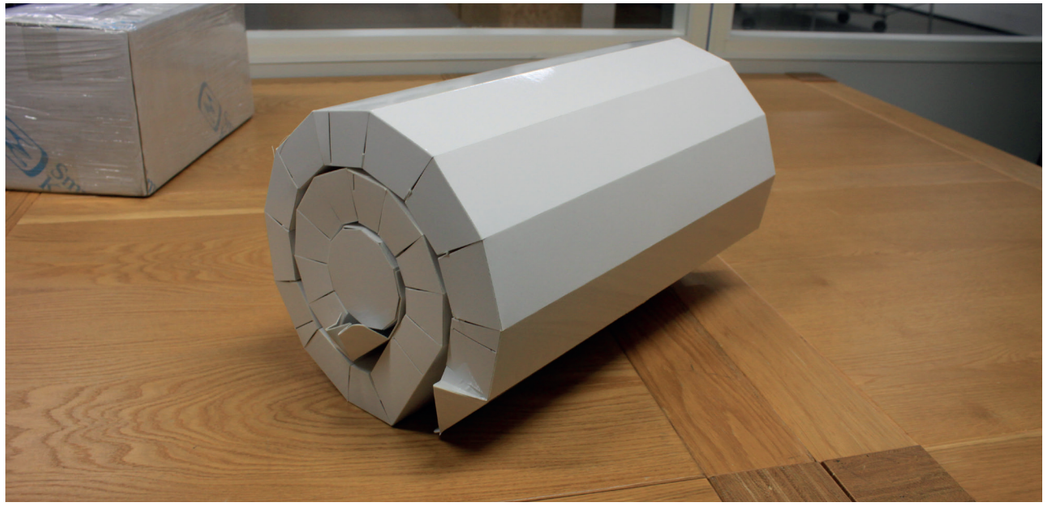
Two other prototypes were made. One Rollor X made from polypropylene and a version with 12 sides instead of 6.





This prototype was made at a stage were it was still not desided what kind of material the Rollor X would be. But after this test, plastic was excluded from that equation. The construction of the Rollor X with the folding of the rails and then folding the entire Rollor causes for a lot of tention. The plastic broke under this tention at almost every place possible.

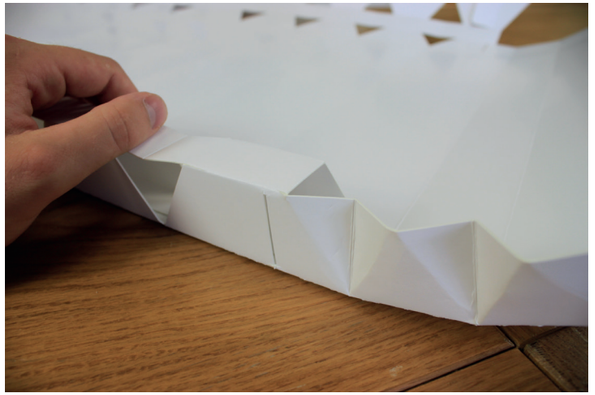


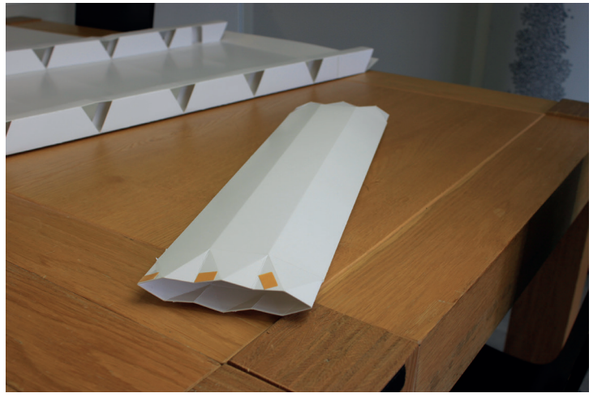


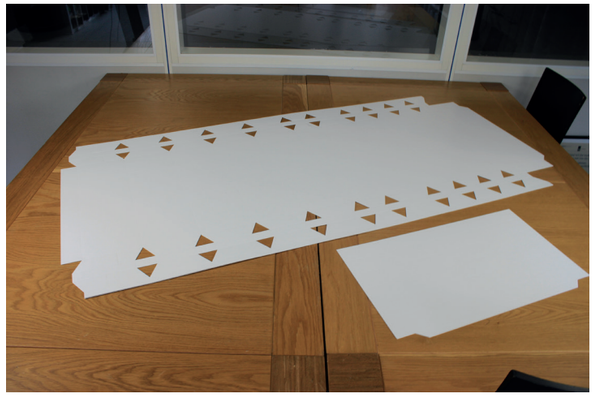
One of the managers was against the hexagonal shape of the Rollor X. In order to make it more round, a prototype was made that consisted of 12 sides instead of 6. It was tought that the more sides the Rollor would have, the more rigid the construction would become. This was not the case. Not only was folding it up a complete nightmare, the 12 sided Rollor was a lot weaker than the 6-sided.

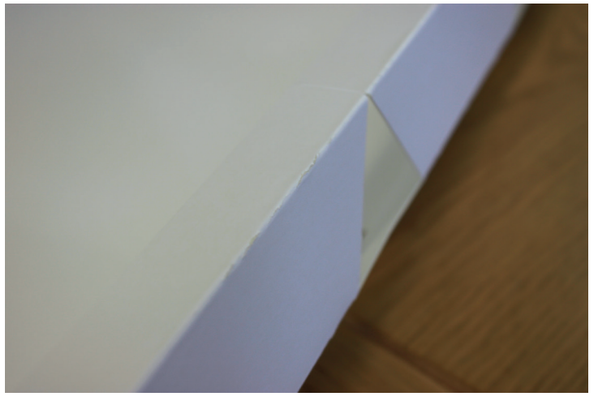
FIRST PROTOTYPE

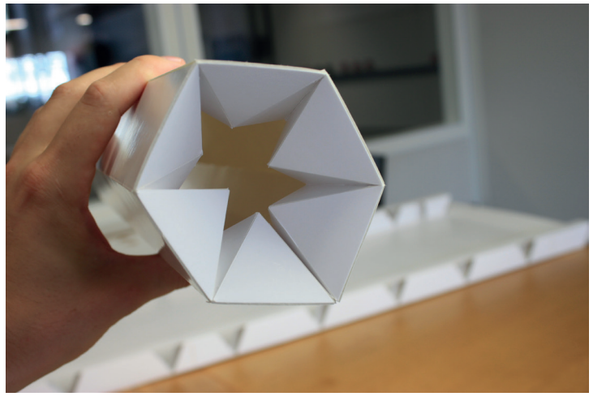
This was the first protoype, cut out by Doosopmaat.

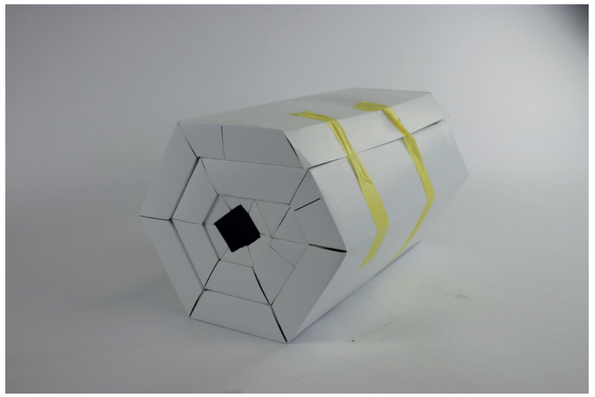


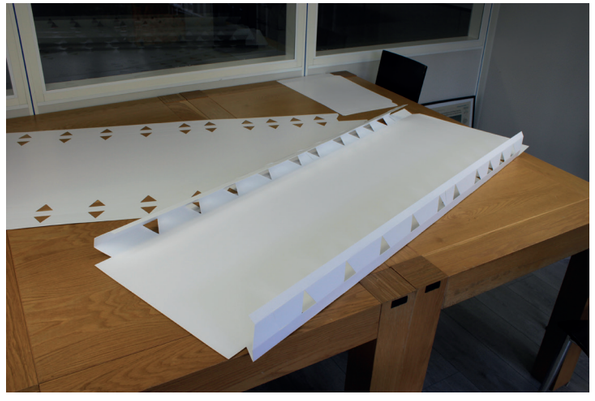


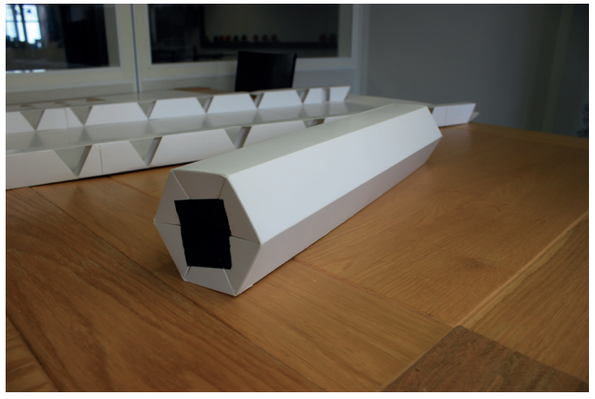


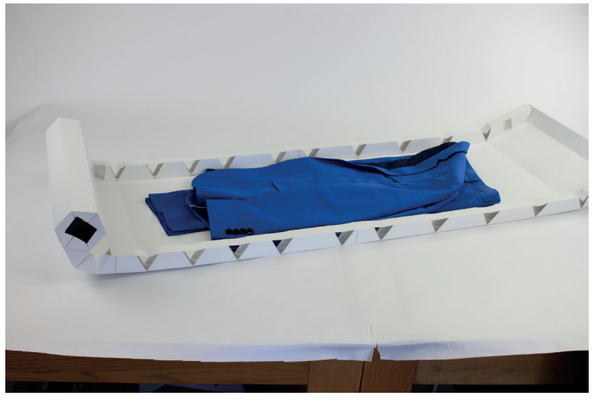






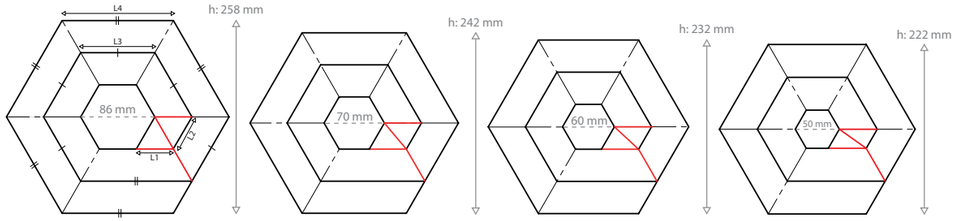


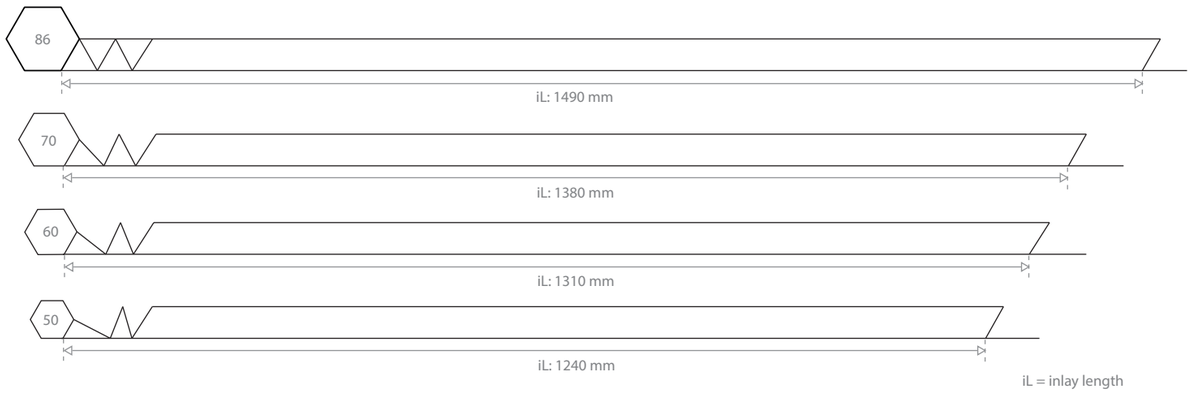




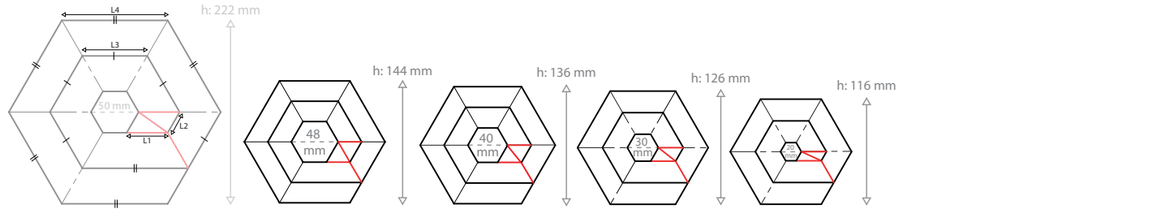
CONCEPT SIZES

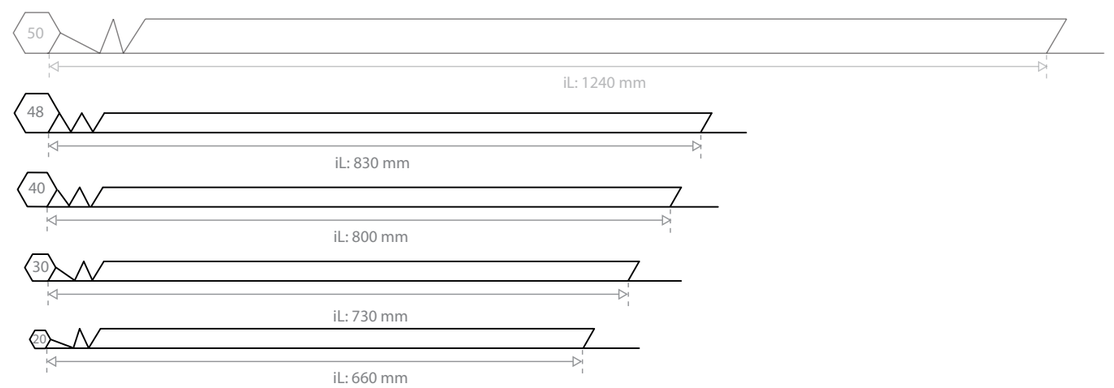
It was researched what the effects would be if the core would be smaller. How would this affect the total lenght and was the core-rail connection still feasable.

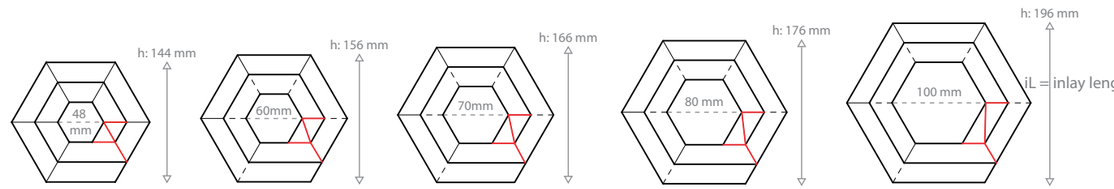


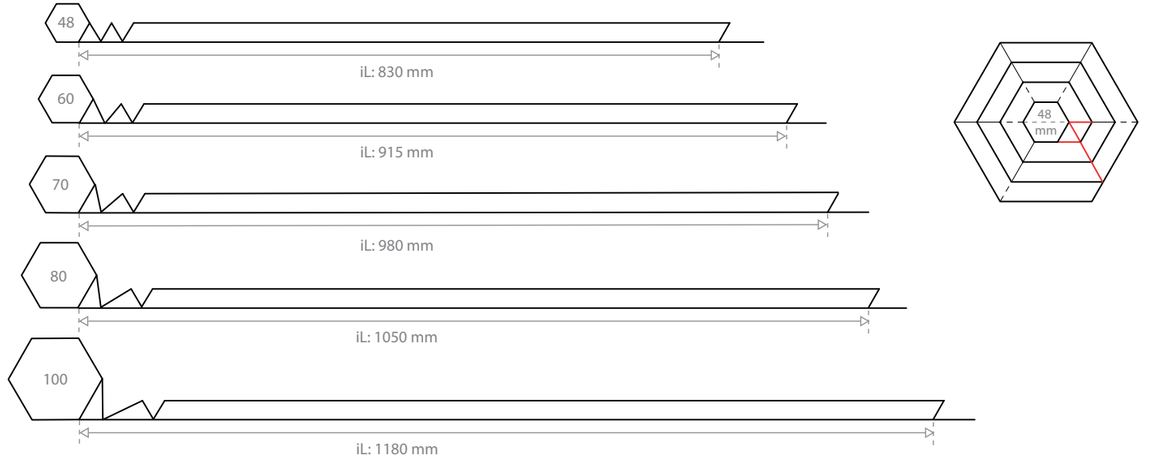


iL = inlay length





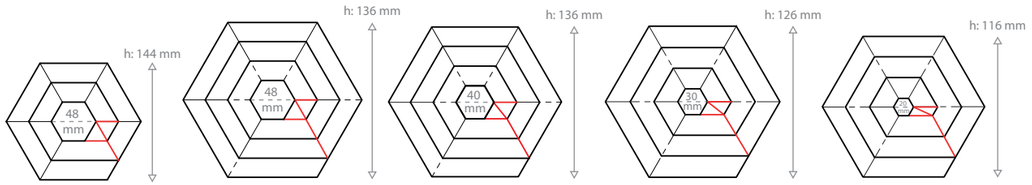


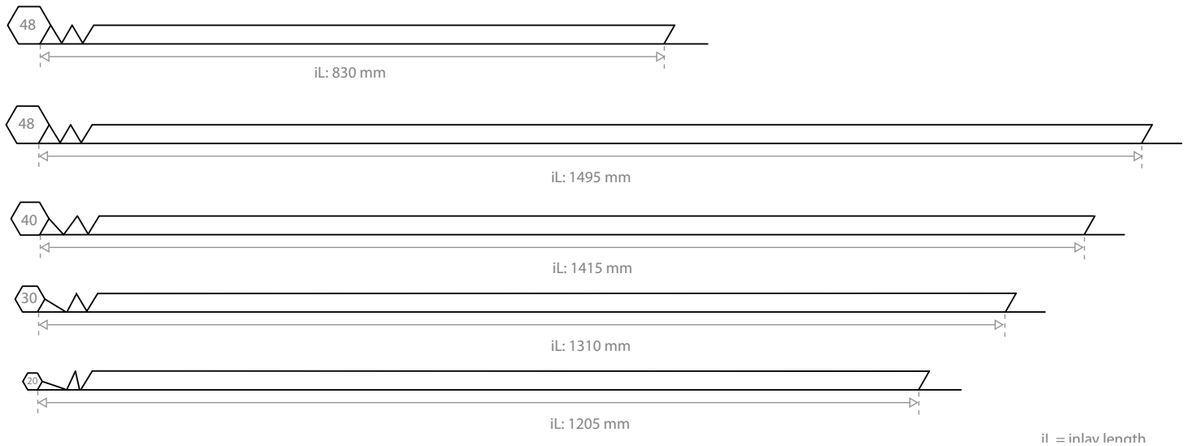


iL = inlay length

CONCEPT SIZES

The same as the previous page, only this time a female version of the Rollor X is presented.





iL = inlay length

Afmetingen X5M

Diameter	86			60			30			25	
	L4	148.96		L4	139.72		L4	133.95		L4	128.17
	L3	99.3		L3	90.07		L3	84.29		L3	78.52
	L2	49.65		L2	40.41		L2	34.64		L2	28.87
	L1	49.65		L1	49.65		L1	49.65		L1	49.65
	Hoogte	258		Hoogte	232		Hoogte	202		Hoogte	197
	iL	**1489.56**		iL	**1378.73**		iL	**1309.44**		iL	**1240.14**

Afmetingen X5F

Diameter	48			40			30			20	
	L4	83.14		L4	78.52		L4	72.75		L4	66.97
	L3	55.43		L3	50.81		L3	45.03		L3	39.26
	L2	27.71		L2	23.09		L2	17.32		L2	11.55
	L1	27.71		L1	27.71		L1	27.71		L1	27.71
	Hoogte	144		Hoogte	136		Hoogte	126		Hoogte	116
	iL	**831.41**		iL	**775.97**		iL	**706.68**		iL	**637.38**

Diameter	60			70			80			100	
	L4	90.07		L4	95.84		L4	101.61		L4	113.16
	L3	62.35		L3	68.13		L3	73.9		L3	85.45
	L2	34.64		L2	40.41		L2	46.19		L2	50.01
	L1	27.71		L1	27.71		L1	27.71		L1	27.71
	Hoogte	156		Hoogte	166		Hoogte	176		Hoogte	196
	iL	**914.52**		iL	**983.81**		iL	**1053.06**		iL	**1183.93**

Afmetingen X5F, extra rij

Diameter	48			40			30			20	
	L4	83.14		L4	78.52		L4	72.75		L4	66.97
	L3	55.43		L3	50.81		L3	45.03		L3	39.26
	L2	27.71		L2	23.09		L2	17.32		L2	11.55
	L1	27.71		L1	27.71		L1	27.71		L1	27.71
	L5	110.85		L5	106.23		L5	100.46		L5	94.69
	Hoogte	144		Hoogte	136		Hoogte	126		Hoogte	116
	iL	**1496.51**		iL	**1413.35**		iL	**1309.44**		iL	**1205.52**

ROLLOR ARCHIVE

The archive from Rollor was completely taken out and searched for any possible inspiration for this project. Some “old school” Rollor were found.