

ASPECTS OF DESIGNING A SCA FOLDING CHAIR USING THE CAD-SOLIDWORKS PROGRAM

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Abstract:

This paper presents the design of a folding chair which can be used for camping, gardening and public spaces as well. The SCA folding chair is easy to carry and takes up little space.

Key words: folding chair, strut, upper backrest, wooden rod, fittings

INTRODUCTION

The SCA folding chair has been made because the woody raw material became very expensive and the projects as well. SCA chair is a concept which appears because the woody raw material is easy to process and the parts to make it are designed at certain dimensions on certain parts if they do not respect the dimension that part can be used in another part for the same chair.

SCA is a folding chair designed for camping, gardening and also for public use. It is easy to transport and takes little place. In many companies, the transportation of materials is quite expensive, but this chair also has very good transporting capabilities, reducing these costs by 20% compared to a regular folding chair.

MATERIAL AND METHODS

To create this project has been used a CAD program - SOLIDWORKS 2010 Professional, which helped a lot for the projection test and the needed of raw material. In the first phase was created the 3D model that was assembled checked and tested after which were calculated the production and transport costs in this program. In the next phase the chair had to be modified so that it could be made at lower production costs without interfering with its structure or resistance. By making these changes, it was possible to check and test the seat again after the last changes. After all these modifications have been approved and verified by the designers, we have also analyzed the machines that will produce this chair and time calculations have been made to see the company's capacity for this product.

The machinery for creating this seat must not necessarily be a CNC in 5 axes even in 3 axes, but it is enough to process this seat on 2-axis machines.

Following the operations must be decided for every machine and the phase description in SOLIDWORKS program for making the necessary of materials and workers

RESULTS AND DISCUSSION

To generate all this information, we must describe each program and each operation that must be executed on the machine.

1. Front element 1 (2 bench seats S + D)

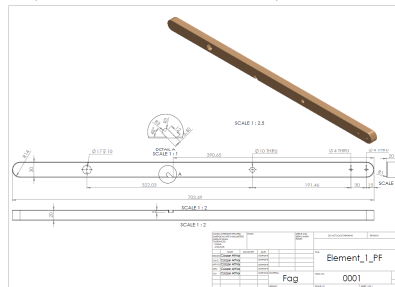


Fig. 1 Front element 1

It is recommended to use beech timber of 25 mm class A dry.

- In the first phase, the lumber is cut on a splitting machine with a distance of 31 mm of the canvas and the multiple of the panels depends on the machine.
- After cutting, this mark must be cut at a length of 760 mm on a double circle that will have 760 mm distance between the teeth of the two blades.

Cutting must be done before ripping because the ends of the parts are not cut at 90 degrees and the marks do not exactly fit into the head on the 4-sided planing machine and will deform the marker or have traces or milling bites.

- This reference is made on 4-sided planing machines at a size of 21mm per edge and 31mm on the surface. The addition of 1 mm to the net size is left for the final grinding.
- Rounding at the ends is done with the automatic milling machine that rounds off a copier. At this working phase, the net length of the 703.5 mm mark shall be respected
- Drilling will be done on an automatic drilling machine that will drill or drill multiple holes. Followed the technical documentation.

- The milling of the wooden rod can be done with a milling cutter of at least 6.4 mm. You can also use a standard 8 cutter, but keep the dimensions at the center of the operation.
- The sanding is done on an automatic 4-sided sanding machine and rounding the R1 edges. The abrasive bands used will be 150 or 220 respectively. Non-polished surfaces other than rounding at the ends are not acceptable.
- The sanding of the heads is done on automatic brushes that will use abrasive paper of 250.

2. Front element 2 (2 bench seats S + D)

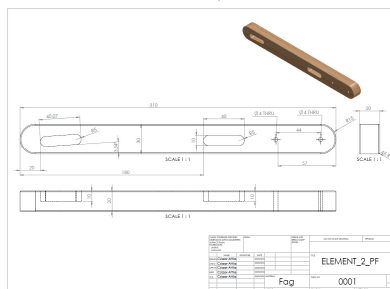


Fig. 2 Front element 2

It is recommended to use beech timber of 25 mm class A dry.

- In the first phase, the lumber is cut on a splitting machine with a distance of 31 mm of the canvas and the multiple of the panels depends on the machine.
- After cutting, this mark must be cut at a length of 326 mm on a double circle that will have 326 mm distance between the teeth of the two blades.

Cutting must be done before ripping because the ends of the parts are not cut at 90 degrees and the marks do not exactly fit into the head on the 4-sided planing machine and will deform the marker or have traces or milling bites.

- This reference is made on 4-sided planing machines at a size of 21mm per edge and 31mm on the surface. The addition of 1 mm to the net size is left for the final grinding.
- Rounding at the ends is done with the automatic milling machine that rounds off a copier. At this working phase, the net length of the 310 mm mark shall be respected
- Drilling is done on an automatic drilling machine that will drill or drill multiple holes. At this stage the technical documentation will be followed.
- The toothed ridge can be made with a 10 mm cutting machines. And at this stage the technical documentation will be followed.

- The sanding is done on an automatic 4-sided sanding machine and rounding the R1 edges. The abrasive bands used will be 150 or 220 respectively. Non-polished surfaces other than rounding at the ends are not acceptable.
 - The sanding of the heads is done on automatic brushes that will use abrasive paper of 250.
3. Rear leg (2 bench seats S + D)

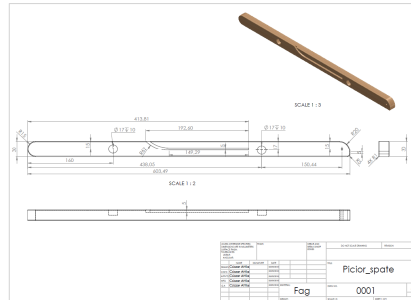


Fig. 3 Rear leg

It is recommended to use beech timber of 25 mm class A dry.

- In the first phase, the lumber is cut on a splitting machine with a distance of 31 mm of the canvas and the multiple of the panels depends on the machine.
 - After cutting, this mark must be cut at a length of 620 mm on a double circle that will have 620 mm distance between the teeth of the two blades.
- Cutting is done before ripping because the ends of the parts are not cut at 90 degrees and the marks do not exactly fit into the head on the 4-sided planing machine and will deform the marker or have traces or milling bites.
- This reference is made on 4-sided planing machines at a size of 21mm per edge and 31mm on the surface. The addition of 1 mm to the net size is left for the final grinding.
 - Rounding at the ends is done with the automatic milling machine that rounds off a copier. At this working phase, the net length of the 603,5 mm mark shall be respected
 - Drilling is done on an automatic drilling machine that will drill or drill multiple holes. At this stage the technical documentation will be followed.
 - The wooden rod should be milling on an automatic milling machine after the copier. Here as well, the technical documentation will be followed.
 - The sanding is done on an automatic 4-sided sanding machine and rounding the R1 edges. The abrasive bands used will be 150 or 220

respectively. Non-polished surfaces other than rounding at the ends are not acceptable.

- The sanding of the heads is done on automatic brushes that will use abrasive paper of 250.

4. Thin wood for sitting (7 benchmarks)

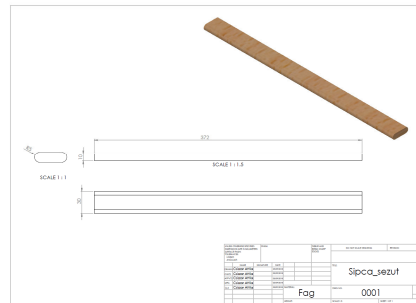


Fig 4 Thin wood for sitting

It is recommended to use beech timber of 32 mm class A dry.

- In the first phase, the lumber is cut to a length of 412 mm on a pendulum or double circular.
- Splicing and rounding the slats is done on an automatic carousel that grinds, rounds and splits the slats. This carousel can produce 13,000 slats in 8 hours.
- Net cutting is done on a double cutter circle having a distance of 372 mm between the teeth of the paners
- Sanding of the slats is also done on automatic sanders both on the surface and on the edge with abrasive strips of 220 or 250.

5. Strut (2 bench seats S + D)

It is recommended to use beech timber of 25 mm class A dry.

- In the first phase, the lumber is cut on a splitting machine with a distance of 31 mm of the canvas and the multiple of the panels depends on the machine.
- After cutting, this mark must be cut at a length of 466 mm on a double circle that will have a distance of 466 mm between the teeth of the two blades.

Cutting is done before ripping because the ends of the parts are not cut at 90 degrees and the marks do not exactly fit into the head on the 4-sided planning machine and will deform the marker or have traces or milling bites.

- This reference is made on 4-sided planning machines at a size of 21mm per edge and 31mm on the surface. The addition of 1 mm to the net size is left for the final grinding.

- Rounding at the ends is done with the automatic milling machine that rounds off a copier. At this working phase, the net length of the 450 mm mark shall be respected
- Drilling is done on an automatic drilling machine that will drill or drill multiple holes. At this stage the technical documentation will be followed.
- Edging for slats can be done with a 10.5 mm cutting machine on an automatic machine with seven angularly adjustable milling groups. And at this stage the technical documentation will be followed.
- The sanding is done on an automatic 4-sided sanding machine and rounding the R1 edge edges. The abrasive bands used will be 150 or 220 respectively. Non-polished surfaces other than rounding at the ends are not acceptable.
- The sanding of the heads is done on automatic brushes that will use abrasive paper of 250.

6. Link (3 benchmarks)

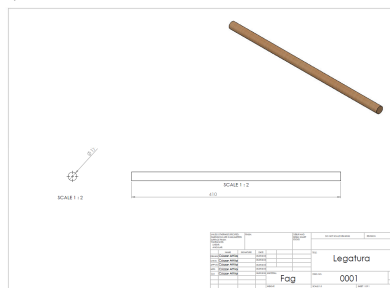


Fig. 5 Link

It is recommended to use beech timber of 25 mm class B dry.

- In the first phase, the lumber is cut on a splitting machine with a distance of 19 mm of the canvas and the multiple of the panels depends on the machine.
- Rounding the bindings is done on a wood CNC milling machine that will have the cutter adjusted so that the diameter is 18 mm
- Cutting to the net size is done on a double circle which will have the distance between the teeth of the 410 mm
- The sanding of these parts is made on the orbital with conveyor belts 220 or 250.

7. Backrest (2 benchmarks)

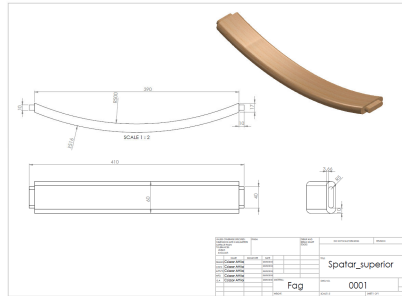


Fig. 6 Backrest

It is recommended to use beech timber of 25 mm class A dry.

- In the first phase, the lumber is cut on a splitting machine with a distance of 65 mm of the canvas and the multiple of the panels depends on the machine.
- The thickening is done on a 4-sided machine that will be adjusted to a height of 19 mm and a width of 62 mm.
- Planning is done with straight cuts on the surface and with milling cutters. They will be set at a height of 18mm and a width of 60 mm
- The bending of this mark is done in presses with high frequency current after boiling. The mold of the press must have the following radii: The lower mold must have a radius R500 and the upper mold must have a radius R517.
- The sanding is done on a flat-roller machine with a 250-gauge ribbon.
- Chopping is done on the 2-axis automatic machine with the technical documentation.
- Varnishing is done on finishing and varnishing lines that apply spray paint to an electrostatic field.

Assembling this seat into the mounting sections is done as follows:

- ❖ The two legs with the two links are mounted
- ❖ Mount E1d with E1s with a link
- ❖ Mount E2d with E2s with the two backrests
- ❖ Mount the struts with the seven glue slats and staples in the automatic press and then insert the wooden rod into place.
- ❖ Install the 4 subassemblies with fittings that include rivets and metal plates.
- ❖ Test the resistance to 100 chairs
- ❖ Check the gloss and paint for every 200 seats.

CONCLUSIONS

In conclusion, this chair is having all the quality and strength standards but is also very reliable in terms of production.

The SCA Folding Chair is a project that deserves to be implemented at any chairmanship, because the used items have a fairly low cost compared to other folding chairs on the market.

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