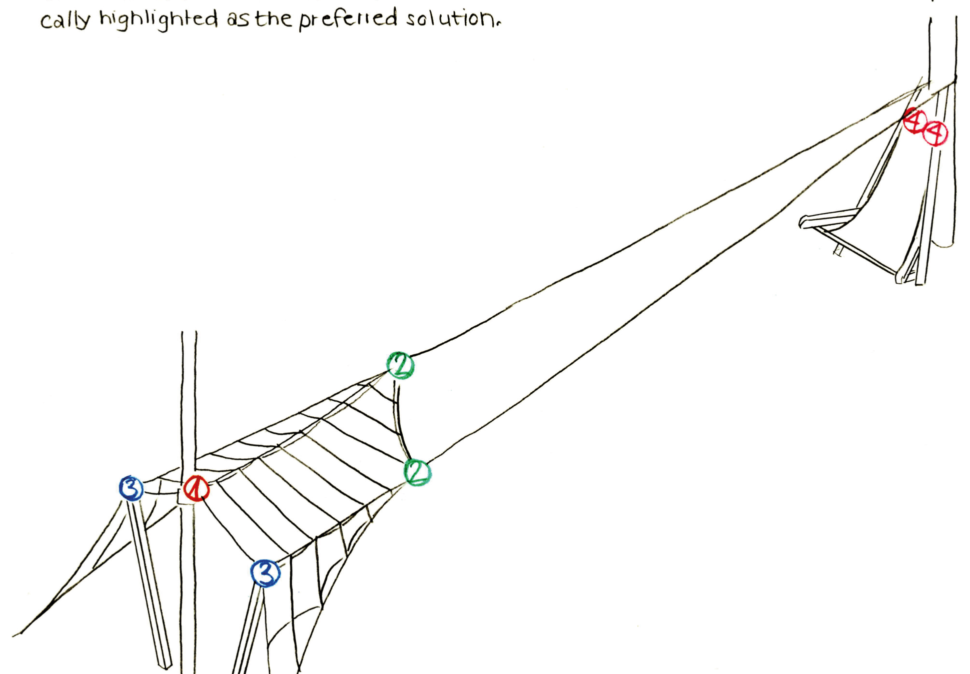
CONNECTIONS
KNOTS, STICHES AND JOINTS

The research investigates four complex knots from the project that were difficult to read and functionally challenging. Since multiple materials intersect al various points, the focus was placed on developing stable, simple and subtle connections. The knotting technique was explored most thoroughly, as it offers one of the most durable and minimal solutions.

Each knot was additionally evaluated based on four key criteria, considering its intended function within the project:
STABILITY – how well the knot holds under tension and in its structural context
RESOURCES – the amount of rope required to create the knot
FLEXIBILITY – whether the knot can be adjusted or reconfigured afterward
DESIGN – the visual quality of the knot and how strongly it supports the overall design concept.

Climbing ropes were used to test the knots' spatial behavior, and various knots were applied in both the mockup and small-scale model to assess their usability. Based on these evaluations, the most suitable knot for the current situation was selected and is specifically highlighted as the preferred solution.



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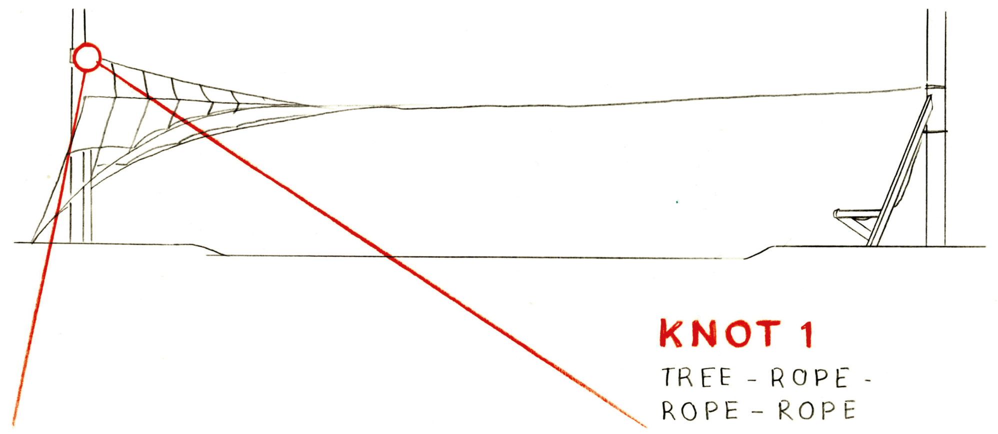
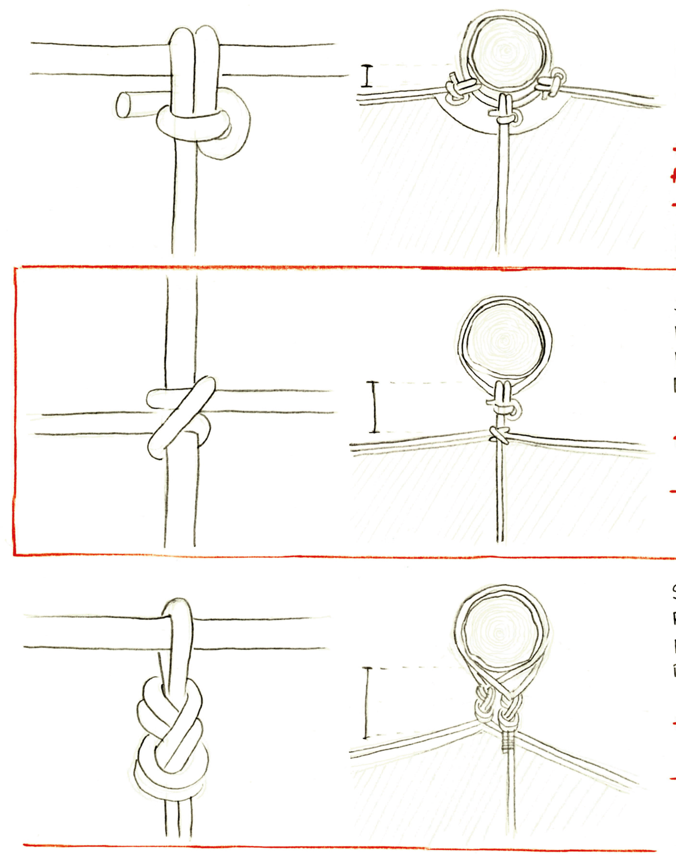


KNOT 1
TREE - ROPE - ROPE - ROPE



STABILITY ●●●●●
RESOURCES ●
FLEXIBILITY ●
DESIGN ●●

+ Sail can be placed close to the tree
+ Tree-friendly tensioning method
– Can look bulky due to 3 ropes and 3 knots

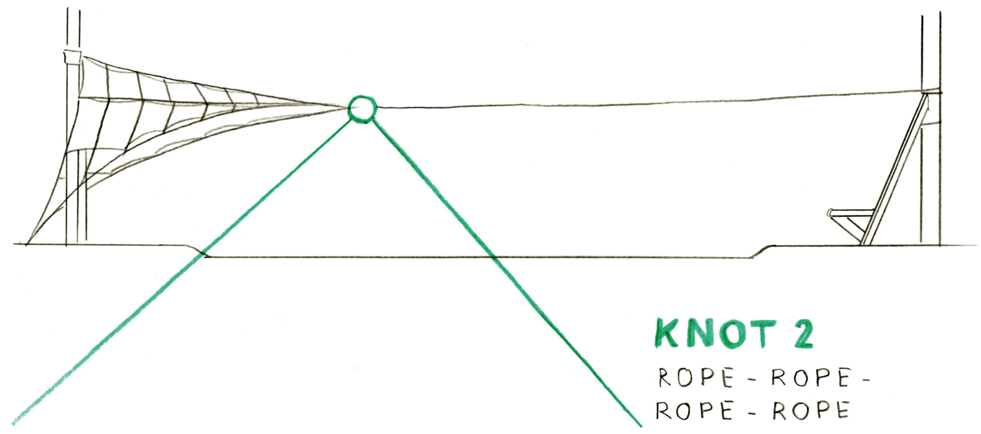
STABILITY ●●●
RESOURCES ●●●●●
FLEXIBILITY ●●●●
DESIGN ●●●●

+ Knots can be placed where the forces require
– Sail can't be positioned as close to the tree

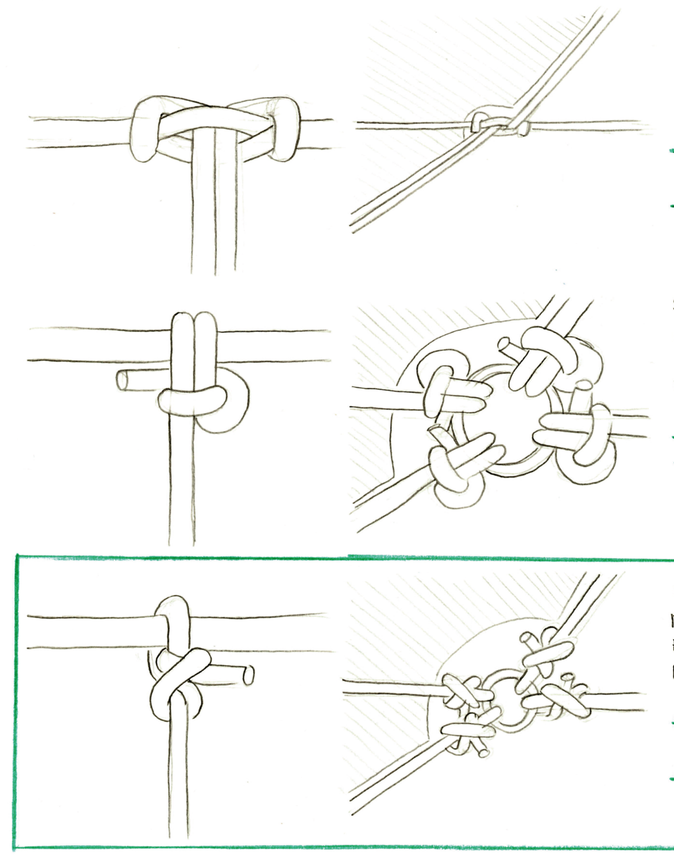
STABILITY ●●
RESOURCES ●
FLEXIBILITY ●●●
DESIGN ●●●

+ Supports the concept by wrapping the rope around the tree
– Not tree-friendly - three ropes slide around

Choosing between attaching all three ropes directly to the tree or guiding one over the roof's ridge was not an easy decision. Ultimately, the latter was preferred for its visually appealing effect and because it preserves the overall flexibility of the structure. This choice strikes a subtle balance between aesthetics and function.



KNOT 2
ROPE - ROPE - ROPE - ROPE



STABILITY ●●●●
RESOURCES ●●●●●
FLEXIBILITY ●
DESIGN ●●●

+ Very little rope used – no loose ends
– Knot forces fixed direction for the ropes

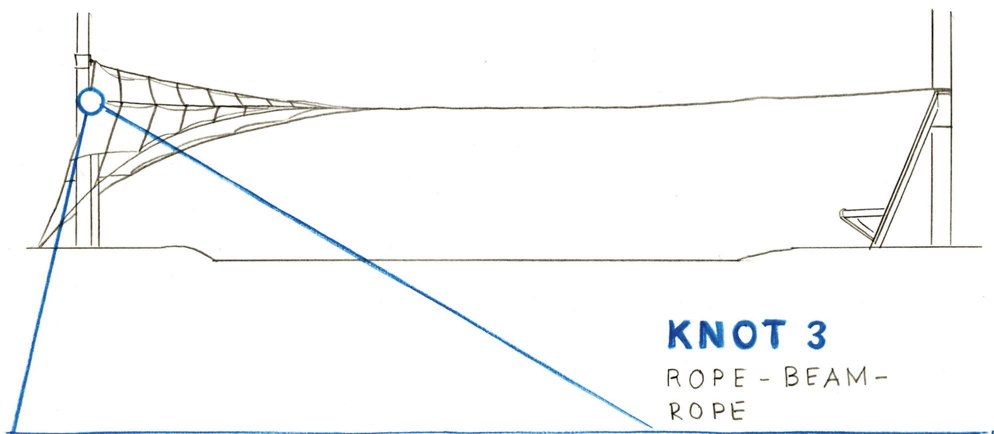
STABILITY ●●●●●
RESOURCES ●●●●
FLEXIBILITY ●●●●
DESIGN ●●

– Large rings are hard to find
– May draw more attention than intended

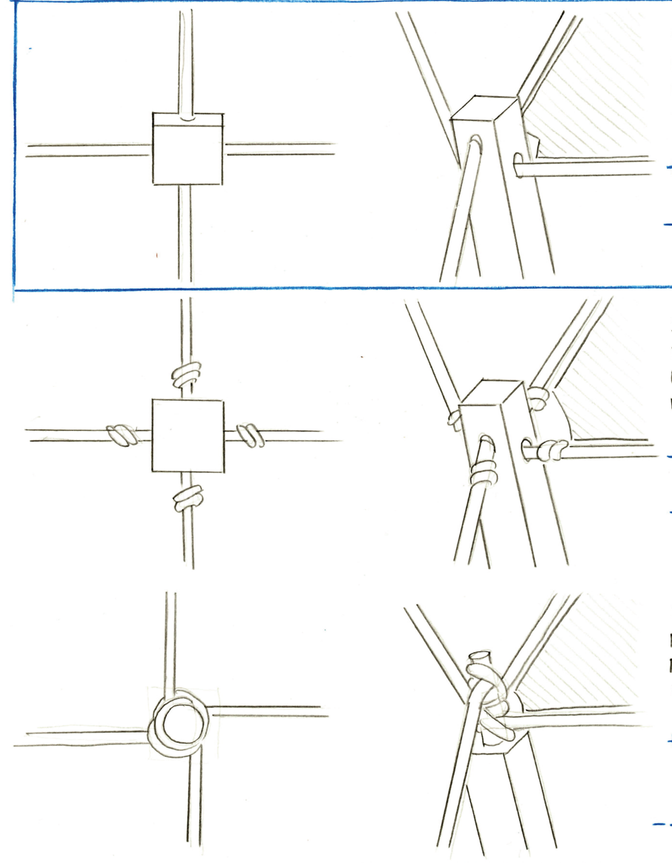
STABILITY ●●●●
RESOURCES ●●●●
FLEXIBILITY ●●●●
DESIGN ●●●●

+ Practical, small rings availlable at hardware stores
+ Ropes can move in all directions

The knot was designed to handle strong forces from four directions, prioritizing both durability and stability. It also needed to allow flexible rope movement without restricting angles or becoming a visual distraction. This solution achieves all three goals with a minimal yet technically sound approach.



KNOT 3
ROPE - BEAM - ROPE



STABILITY ●●●
RESOURCES ●●●●●
FLEXIBILITY ●●●●●
DESIGN ●●●●●

+ No distractions or unnecessary fittings
– Difficult to set up, everything must be at the exact angle

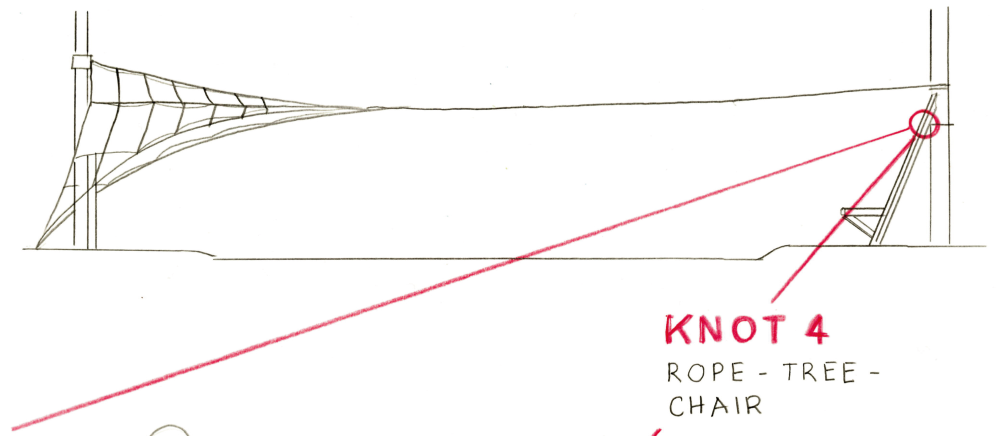
STABILITY ●●●●●
RESOURCES ●●●●
FLEXIBILITY ●
DESIGN ●●

– Knots on both sides limit beam movement for force allignment
– Harder to adjust afterwards

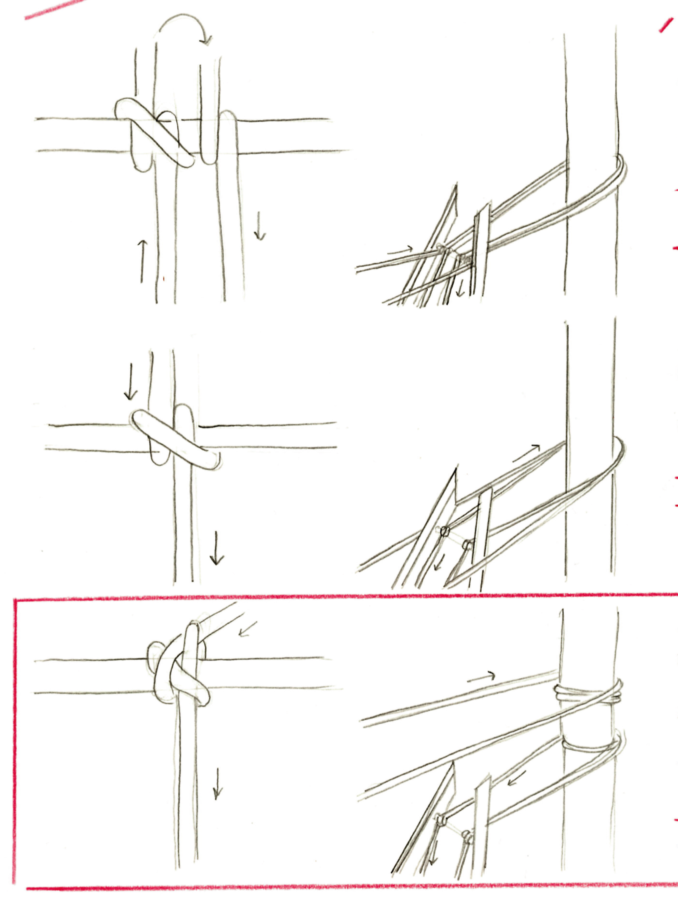
STABILITY ●
RESOURCES ●●●●
FLEXIBILITY ●●●●
DESIGN ●●●

+ Easy to build, no threading needed so the turnbuckles can be attached from the start
– – Ropes can slip upwards

Striking the right balance between stability and flexibility was crucial, as the wooden beam needed to align naturally with the flow of forces - minimizing the need for deep ground anchoring. The chosen solution enables this movement while maintaining structural integrity. Though not the easiest to install, it offers an elegant and effective answer to the challenge.



KNOT 4
ROPE - TREE - CHAIR



STABILITY ●●●
RESOURCES ●●
FLEXIBILITY ●●●
DESIGN ●●●●

– Ropes hang too low when going directly to the chair
– Double stress on the wooden bar

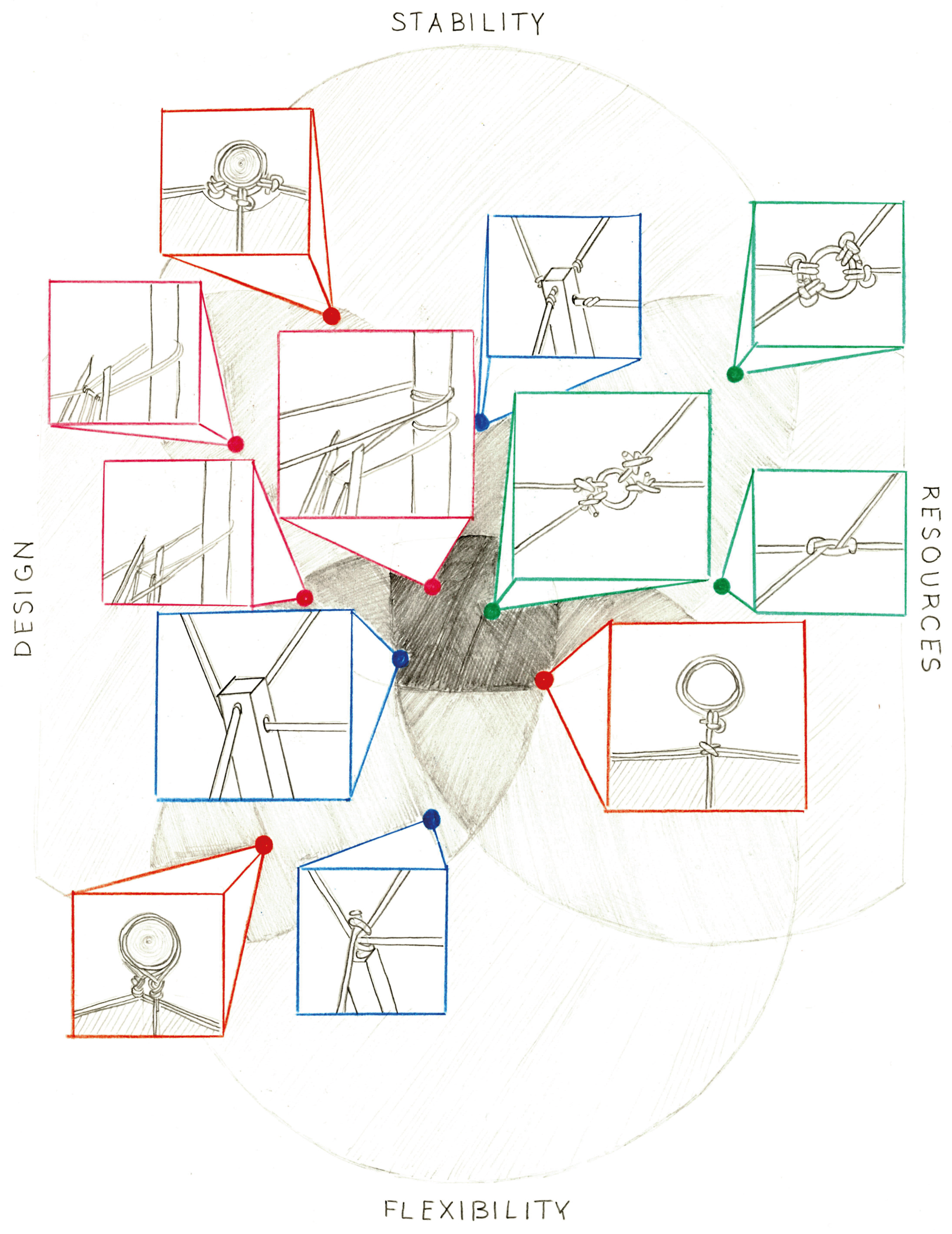
STABILITY ●●
RESOURCES ●●●●
FLEXIBILITY ●
DESIGN ●●●●●

– Ropes slide down around the tree
– End up too low and can damage the tree

STABILITY ●●●●●
RESOURCES ●
FLEXIBILITY ●●●●●
DESIGN ●

+ Allows more stable and secure chair fixation
+ More space for tying knots
– Not the best fit for our concept

The primary requirements for this knot were stability and tree protection, as it is one of the few parts of the project that bears direct human weight and poses potential safety risks. In this case conceptual design considerations had to take a back seat to ensure a secure and reliable attachment. The chosen solution allows for a strong knot on the wooden bar while keeping the rope securely in place at the top.



CONCLUSION

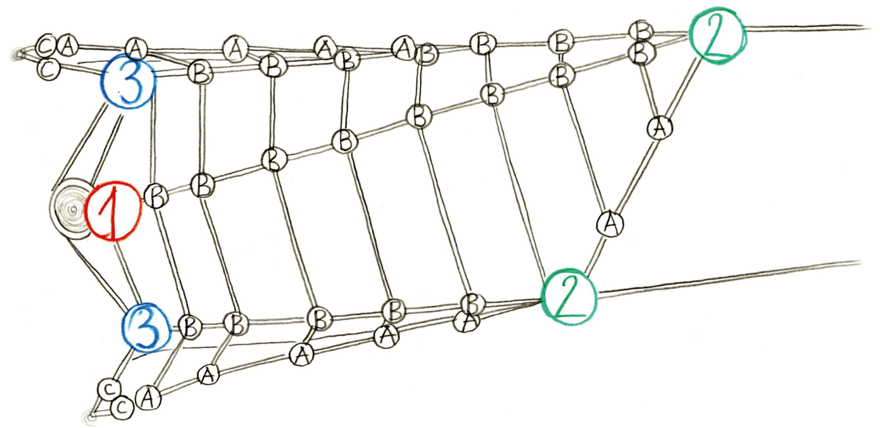
The analysis showed that no single knot fulfills all four criteria – stability, resource efficiency, flexibility and design quality – simultaneously. Each option involved trade-offs; stable knots use more rope and look bulkier; flexible ones lack security; and visually refined knots are often harder to execute.

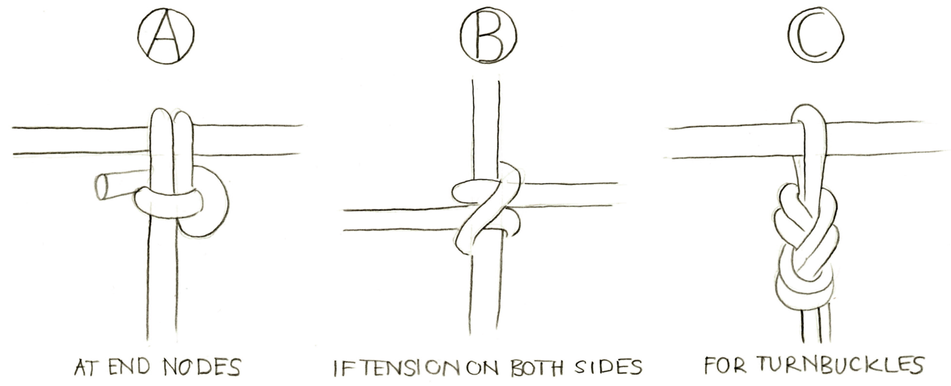
While each knot has a defined role, they must be understood within the structure's interdependent logic. Whether a knot can be tied often depends on sequence and existing rope tension, making isolated assessment insufficient.

Additional factors like material behavior, spatial constraints and construction sequence also proved critical to a knot's success.

Despite these complexities, a well-balanced knot was chosen for the current situation.

THREE KNOTS DEMONSTRATED PARTICULAR VERSATILITY AND HAVE PROVEN APPLICABLE IN OTHER PARTS OF THE PROJECTS. OFFERING CONSISTENT PERFORMANCE ACROSS VARIED STRUCTURAL DEMANDS.





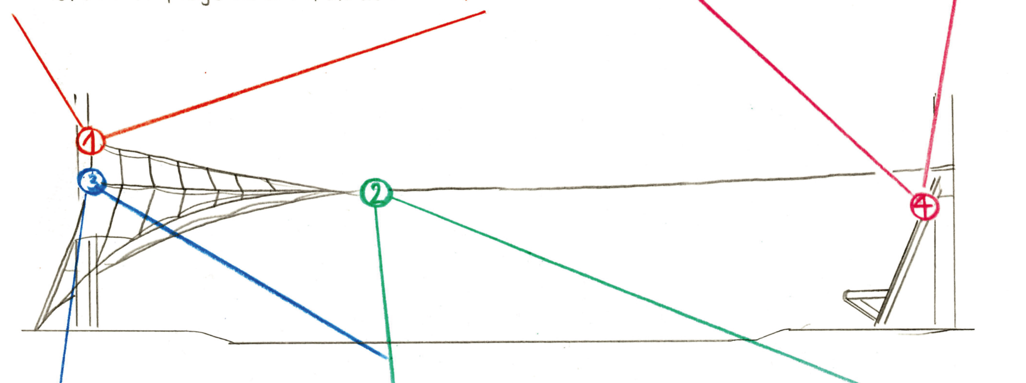
OBSERVATION

MANUAL EFFORT ●
ERROR - PRONENESS ●●●
EASE OF UNTYING ●●●●
REAL LOAD PERFORMANCE ●●
VISUAL CLARITY ●●
PRECISION ●●

– High tension required to keep the chair stable – knot needed significant force
– Took several attempts to position the knot correctly
– Knot was tied to a round piece of wood, causing it to slip backward and loosen tension

MANUAL EFFORT ●●●
ERROR - PRONENESS ●●●●
EASE OF UNTYING ●●●●●
REAL LOAD PERFORMANCE ●●●●●
VISUAL CLARITY ●●●●●
PRECISION ●●●●

– Required tension on the rope during tying needed more than one person
– Additional force on the cross rope due to routing over the roof ridge instead of the tree



MANUAL EFFORT ●●●●●
ERROR - PRONENESS ●●●●
EASE OF UNTYING ●●●●●
REAL LOAD PERFORMANCE ●●●●●
VISUAL CLARITY ●●●
PRECISION ●●

– Difficult to place the knot precisely due to rope tension requirements
– Multiple rope ends make the knot look visually messy

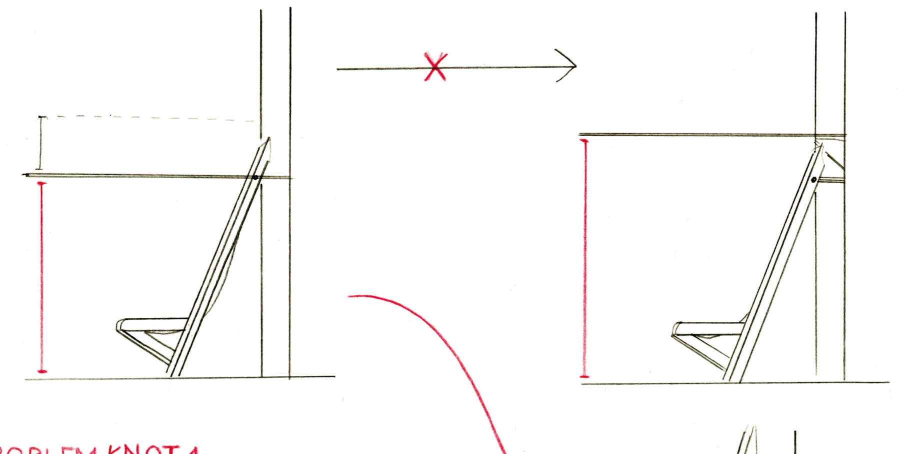
MANUAL EFFORT ●●●●●
ERROR - PRONENESS ●●●●
EASE OF UNTYING ●
REAL LOAD PERFORMANCE ●●●●●
VISUAL CLARITY ●●●●●
PRECISION ●●●●

– Posts had to be set before attaching turnbuckles and ropes – no disassembly possible afterwards
• Poles turned out stable, no additional fittings or buttons needed

REFLEXION

Knots 1 through 3 largely met functional expectations during hands-on testing, confirming the validity of their conceptual designs. However, several unforeseen practical challenges became apparent during implementation, necessitating reconsideration of procedural and structural elements:

COLLABORATIVE EXECUTION	PRECISION CONSTRAINTS UNDER TENSION
Because the rope was under tension, knot tying required coordination by two to three people to manage tension and form the knot effectively.	The knots had to be tied precisely despite the pre-tensioned rope, making it difficult to maintain accuracy and consistency, during assembly



PROBLEM KNOT 4
The rope hung too low when tensioned directly to the chair, making knot tying difficult.

SOLUTION
Instead of adjusting the knot, the chair legs should have been made longer to elevate the wooden rod and raise the rope's attachment point.

LESSON
This highlights the importance of addressing structural design issues early, rather than relying solely on knot adjustments.