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URBAN FURNITURE DESIGN

Elena Nikoljski Panevski¹ Emilija Tashkova²

¹ Ss. Cyril and Methodius University in Skopje, Republic of North Macedonia,
Faculty of Design and Technologies of Furniture and Interior-Skopje,
e-mail: nikoljski@fdtme.ukim.edu.mk; elenanikoljski@gmail.com
emilija.tashkova@gmail.com

ABSTRACT

For the purpose of this work exterior furniture and urban equipment or set of exterior furniture is designed for arranging urban area (park, square). By analyzing this type of furniture and its needs, there comes the need for designing several different pieces of furniture, including: chairs (seating for one), two-person benches, three-person benches, flower pots, ambient lighting and bins. By analyzing outdoor furniture and its needs from material aspect, one can realize that there are certain reasons why there is use of oak wood for the first model of outdoor benches, and thermo wood for the second model of outdoor benches. This paper analyzes the benefits of using these types of wood.

In the process of designing, one starts from the square as a geometrically most stable shape, and its further development and integration in the shape of the outdoor furniture. The anthropometric standards researched for this type of furniture, as well as the choice of material, should meet the requirements and needs of the desired look.

The ultimate goal is to get a quality sitting and living outdoor in which the human factor is very important. Through better understanding of the parameters of ergonomics, the designer can improve the health and safety of the furniture users. Actually, the obligation and the task of the planner is to constantly monitor research in the field of ergonomics in order to implement, maintain and improve the design of furniture.

Key words: outdoor bench, lighting, litter bins, pot, construction, wood coatings.

1. INTRODUCTION

Design and art should always be created based on the needs of the society, and to solve the issues so as to provide people with a better living environment; that is why multi-function furniture and product design needs more attention and development.

Square is one of the three basic forms that can be found anywhere and everywhere. No matter how complicated some objects may seem at first glance, they can be reduced to basic shapes. If the object is reduced to its basic form, then it can be more easily drawn and understood. However, function and structure do not always generate the most attractive form. By designing the square as the basic starting point, all the elements of this design are shaped. If we start from the postulate that *Shape is a functional relationship between man and space*, then we understand even more specifically the subtle relationship between objects - the furniture - and people - the users.

All solutions have been developed by means of prior modular-proportional analysis. Symmetry has also been used as an important aesthetic factor. Man experiences the symmetrical image (composition in terms of an imaginary axis with two identical convergences i.e. sensations) as bilateral or rotational symmetry. Symmetrical shapes when shaping furniture are always associated with a proportional and harmonious relationship.

The main aesthetic idea behind the design of this set of urban furniture for cities, sidewalks, promenades or parks was simplicity. Then an attempt was made to maintain the repetition of the elements so as to simplify the product, but also for unity in vision and to make it fit better into different city environments, cultures, habits of use.

Observation of user behavior has also been important for designers in improving their designs. Here the focus has been on the difference between designers' intentions and consumers' experiences. Thus, various communication models aimed at reducing the gap between the two have been explored in the design discipline (Crilly, Maier, & Clarkson, 2008). Carroll, Kellogg, and Rosson (1991) emphasize the co-evolution of tasks and artifacts and the iterative nature of this process. However, the role of actual tasks remains limited to providing new requirements for design. Carroll (2004) expands the design process to actual uses. For her argument "designing for appropriation" and "designing from appropriation" remains limited to differences between expected and actual requirements, a limitation that has resulted in a dichotomy between production and use (Suchman, 1994). Breaking from this dichotomous view, this study builds on recent work by such scholars as Suchman and Wakkary by deconstructing the term "user", defining a user as a more creative and proactive agent. When usage is detached from design, people's behaviors in relation to designed artifacts are no longer the result of design. Rather, they are creative processes referred to in this study as everyday design.

Concept development and the phenomena of tradition and present due to our living, experience and education background, besides the esthetic of design, the way to eliminate the adverse impact on the environment, is not only about using less harmful materials, but also about how our products can change people's behavior and guide them to be concerned more about our environment. Outdoor furniture should be designed in a way to lead people to use it in an effective way in order to utilize the surrounding area. Meanwhile it would let users experience the entertainment of personalizing the goods and encourage them to maintain orderly lifestyle, thus causing subconsciously beneficial impact on the environment. The project of this paper was to design a chair (seating for one), a two-person bench, a three-person bench, flower pots, ambient lighting and a bin, which gave us the chance to challenge ourselves to create multi-function furniture.

The following stages of development were undertaken for design of this set of outdoor furniture:

- to research studying the square as a geometric shape, its features, meanings and semantics,
- anthropometric and ergonomic data for outdoor, public furniture,
- the choice of materials and their options, as well as the main features that would make them suitable for this type of furniture
- to design a project for each individual piece in this set of furniture
- constructive elaboration of each piece of furniture's cross sections and constructive ties
- Perspective three-dimensional view of the whole set.

Furniture designing is a multidisciplinary profession that requires good understanding of various aspects of the furniture production process: materials, technologies, marketing, market placement, economic profit, sociological and anthropological aspects (people, their way and culture of furniture use), the city's urban landscaping policy and probably many more points. Among all these factors we also distinguish the factor or relationship tradition - modernity, because we wanted to create furniture with identity, origin and certain semantic messages

2. OBJECTS MATERIAL AND METHODS

After studying outdoor furniture at current market, a conclusion was made that there is a great number of multi-function pieces already existing, but some of them have lost the uniqueness of the design when

being under the control of material usage, and the quality of these facilities is poor. They are more like contemporary cheap solution for 'urban people' instead of bringing good use and atmosphere. On the contrary, Macedonian traditional outdoor furniture uses precious hard wood as material and contains a significant authentic style and design, and it is the design that contributes to the sustainability in the environment (Nikoljski P.E. 2016). As a result, we got the idea to carry forward the extraordinary strong points from traditional Macedonian furniture (such as visual wooden cuts and stability) and to simplify the forms, improve them and create modern sustainable Macedonian outdoor furniture.

After assembling the form board pieces of the furniture together, the structure weakness is revealed at the connection point between the bench legs and the base (Fig.1-12). To reinforce the structure, for the final product, both benches are constructed and can be produced out of oak wooden pieces, and the second model of bench could be produced out of thermo wood and have metal legs made of steel or aluminum. Wooden parts are produced to enhance the whole structure; it can give the base more support, and keep the safety of the users when they sit on the bench. Laser cutting rapid automation gives the designer the possibility to improve the form, and save material costs at the same time.

With the concept of contemporary design we could use contemporary materials and coverings such as oak with penetrative wood treatments and thermo wood. Heat treatment significantly improves the properties of natural wood and extends the range of its use. As a result of the modification, a thermo wood of Finnish wood species turns into a very durable and reliable building and finishing material. Finished products and sawn timber made of thermo wood have high moisture resistance and stable dimensions. The popularity of designing outdoor furniture with thermo wood has increased and continues to grow, because all of the products can be used outdoors, in any climate.

Material chosen for producing the first model of two-seat and three-seat benches is oak wood. The use of oak wood has no tradition in exterior furniture as teak wood, but the price of teak wood is still higher and the possibilities to work with oak wood are bigger in North Macedonia. The oak wood used must have a similar moisture level to the environment it is used in, otherwise it will absorb water, leading to swelling, or dry out further causing shrinkage. This can seriously affect the structural integrity and stability of the structure.

Usually, the kiln drying process results in moisture content of only 8-10% (even 12%) after what the wood will be protected with predominantly oil and wax based products.

The second model of the two-seat benches has wooden seats and aluminium legs. One of the most important technical characteristics of thermo wood is its dimensional stability. Lowered equilibrium moisture content of Thermo wood makes it dimensionally stable and the material retains its shape far better than untreated wood. Furthermore, it is a non-toxic material. Thermo wood is produced using only natural methods, heat and steam. All the products are completely natural and free of chemical additives. It's resin free because resin is removed from the wood during the thermal modification process. As a result, the wood does not secrete resin even in high temperatures. Thermo wood does not react to changes in temperature or humidity as drastically as untreated wood. Material is proven to work well in different climates. Tests have shown that thermal conductivity of Thermo wood is reduced by around 20-25% compared to untreated coniferous wood.

Essentially, there are two types of exterior wood treatments, those that are absorbed into the surface of the wood, such as oil-based products, and those that form a protective coating on the surface of the wood, both of which have their own unique characteristics and benefits.

Penetrative wood treatments are type of products that penetrate deep into the wood and protect it from inside, such as decking oils, shed & fence treatments. These products are predominantly oil and wax based. They work by penetrating into the wood and then drying the surface grain of the timber to provide a tough, durable, weather resistant surface.

The key benefit of this type of product is that they are very easy to apply and maintain. When the finished surface starts to look tired and worn, it's simply a case of re-applying a fresh coat. No need to sand, strip back or remove the old finish.

Wood oils are very forgiving for patch repairs, meaning that localized areas of wear are very easy to repair and blend in with the surrounding areas (brands that specialize in these types of exterior wood finishing products include Osmo, Ronseal, Barretine, Cuprinol and Holzol).

What was once the realm of paints and exterior wood varnishes is now dominated by an array of ultra modern wood coating systems. Whereas old paints and varnishes had a reputation for cracking, flaking and peeling, modern coating systems have been scientifically developed to withstand the effects of weathering and the constant movement of the timber as a result of moisture and temperature changes.

Exterior wood coatings are flexible and durable, meaning that they rarely need to be stripped back to bare wood if maintained correctly. Suitable material for exterior joinery such as wooden furniture, window frames and doors (such as Sadolin specially Superdec Opaque Wood Protection Dulux Trade Crown Paints and Sikkens) are designed in such a way that as the top coat wears over time, it starts to lose some of its color and shine. This is an indicator that the finish needs maintenance.

3. RESULTS AND DISCUSSION

Macedonian traditional furniture and its decorations, for instance woodcarving, feature an archaic expressiveness. In spite of the unbelievable achievements, after the western culture was gradually infiltrated into our tradition culture, our traditional furniture was forgotten, since contemporary living style is different. In the past, since the areas were scarcely populated, the large-scale furniture could easily be placed outside. Due to the technology limitations, the pace of working and living was slow, so the artists and craftsmen had more time to develop the traditional ornaments in architecture and all kinds of products. Moreover, the sophisticated decorations on furniture were also considered as proof of art and craftsmanship. As time goes by, now the younger generations get influenced by the high-pace living style, and they prefer to see the exaggerated shapes and rich colors in contemporary art and design; the products that contain geometric shape and minimalist design immediately attract people. As a consequence, the conventional Macedonian household furniture that included historical patterns and decorations has got discarded and given way to the heavy visual effect. The traditional culture should be kept inside designer's mind. No matter which country the designers come from, they should not forget the spirit and the strong point of their own tradition and craft technique, and our duty is to discover an efficient way to protect the advantage in our culture by using leading technology.

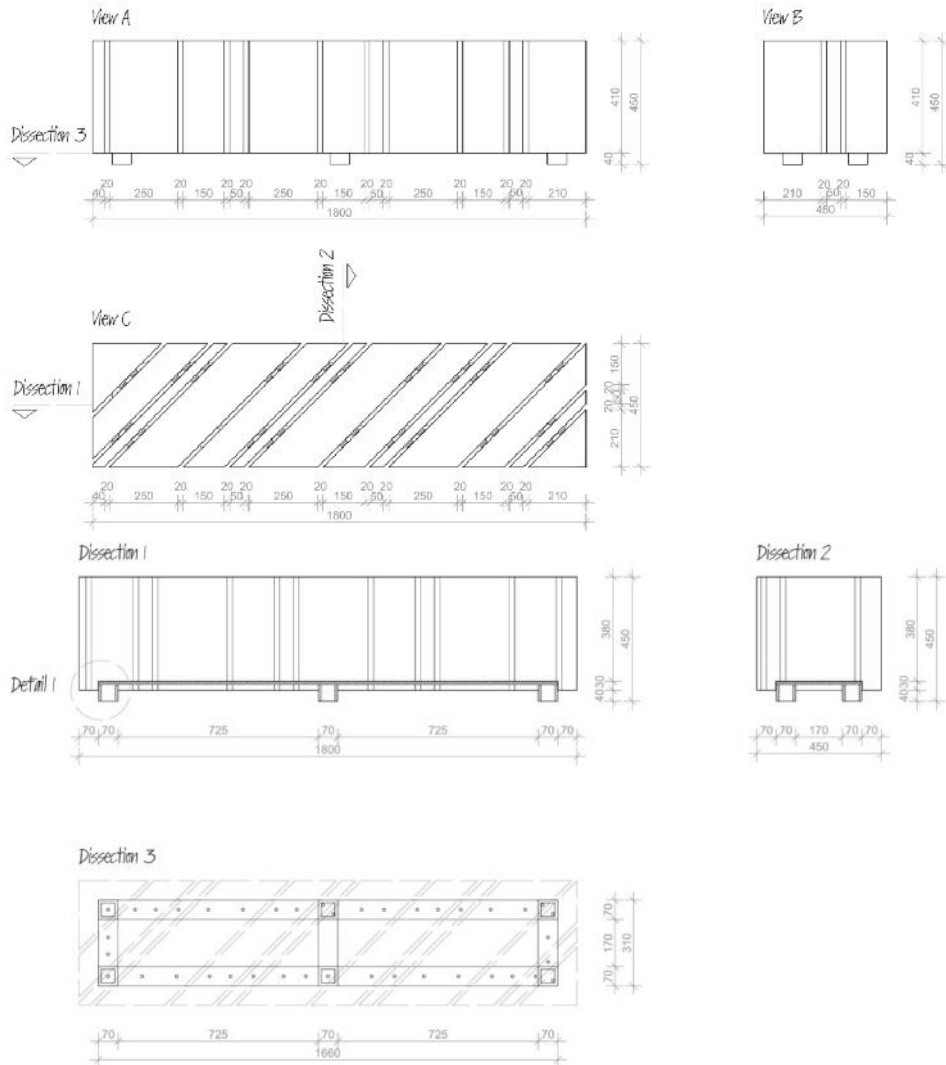
Research leads to the fact that the minimalist style in nowadays design, apart from the attempt to save construction material, tries to meet the aesthetic appreciation at this moment after removing all the tedious details. In this way the design maintains the spirit of traditions and sustainability at the same time. To accomplish the goal of making multi-function product and bring some new elements into traditional furniture, we studied the traditional furniture pieces including chair, bed, cabinet, and table. To make the form more simplified, we were following the concept of contemporary design, and took out the side panels from the structure, so the piece would not have a defined back and can be placed in any sort of space, either in the center or aside. The analysis of the user experience and the culture of using public furniture in our country did not lead to solution for furniture without backing. Experience shows an extremely low culture of using public furniture and even worse use and maintenance hygiene, so we thought that simple wooden benches without a backrest would not be possible.

This research and working process opens an opportunity and new skills to create objects that supports green design. Within the support of all kinds of software and progressive techniques, the design of outdoor bench would follow the principles of space and environment improvements. The final product should contain the basic traditional culture characteristics, ergonomic function and eco-design concept. For next step, we would like to make a full-scaled product with the correct material and add proper joints to attain the goal of assembling and disassembling. We believe that in future the multi-function outdoor furniture and product would greatly improve the quality of people's life (Fig.1-12).

4. CONCLUSIONS

Furniture and product design has been our research focus in this paper. There is a need to learn and understood how they can be widely used to support human's basic living and their time spent outside, especially when it comes to outdoor furniture. We found that today's designers of furniture and industrial products aim to create a better artistic living environment together with the well-considered function, so they directly influence people's lifestyle and living quality.

With rapid changes of time, the concern about society and environment is an issue that urgently needs to be taken into consideration in the design process. The shortage of natural resources and their high price is another issue that people need to take into account. Limited availability of wood, iron, steel and many other raw materials has become a growing concern these days. Those materials are widely used for manufacturing furniture. Different materials and new technologies have been experimentally practiced and used for production, yet it still costs a lot to pay for the advanced technology and rare materials. In our highly diversified society, the users of furniture and products have a lot of different requirements. They want products and furniture that are usable in all various types of environment, or can be easily transformed into a variety of functions. The multi-function method and space sustainability should be considered when people do furniture and product design. This furniture should fit into a limited space and perform all kinds of duties at the same time.



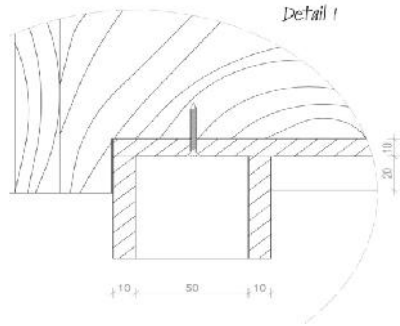


Figure 1- 4. three seat bench - basis, dissection, detail, perspective view

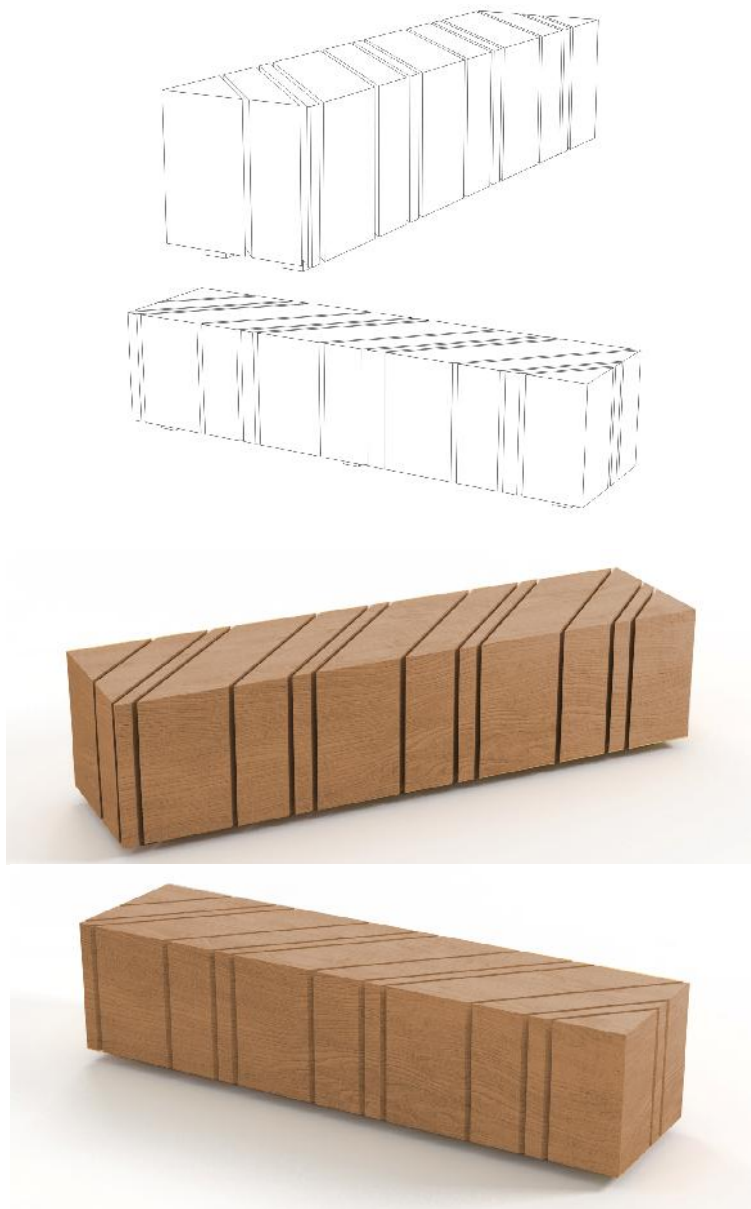


Figure 5. Three seat bench - 3D

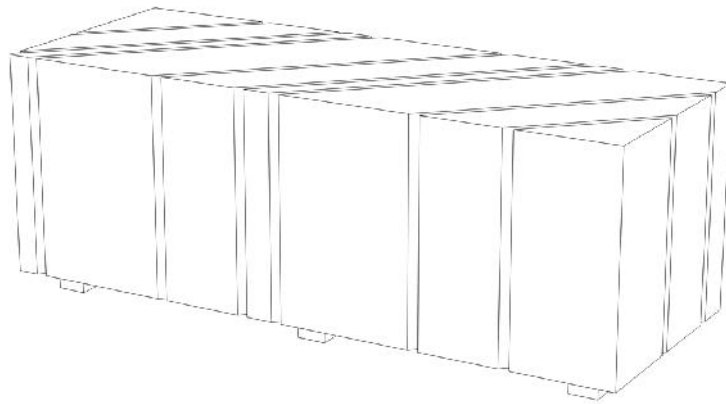
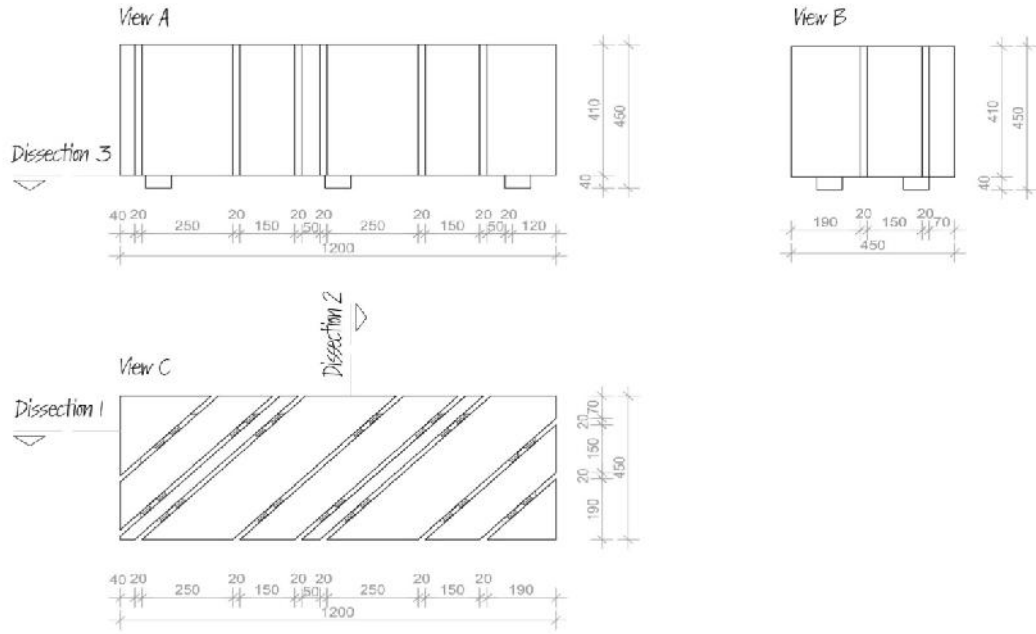


Figure 6-9. Two seat bench - basis, perspective view, 3D.

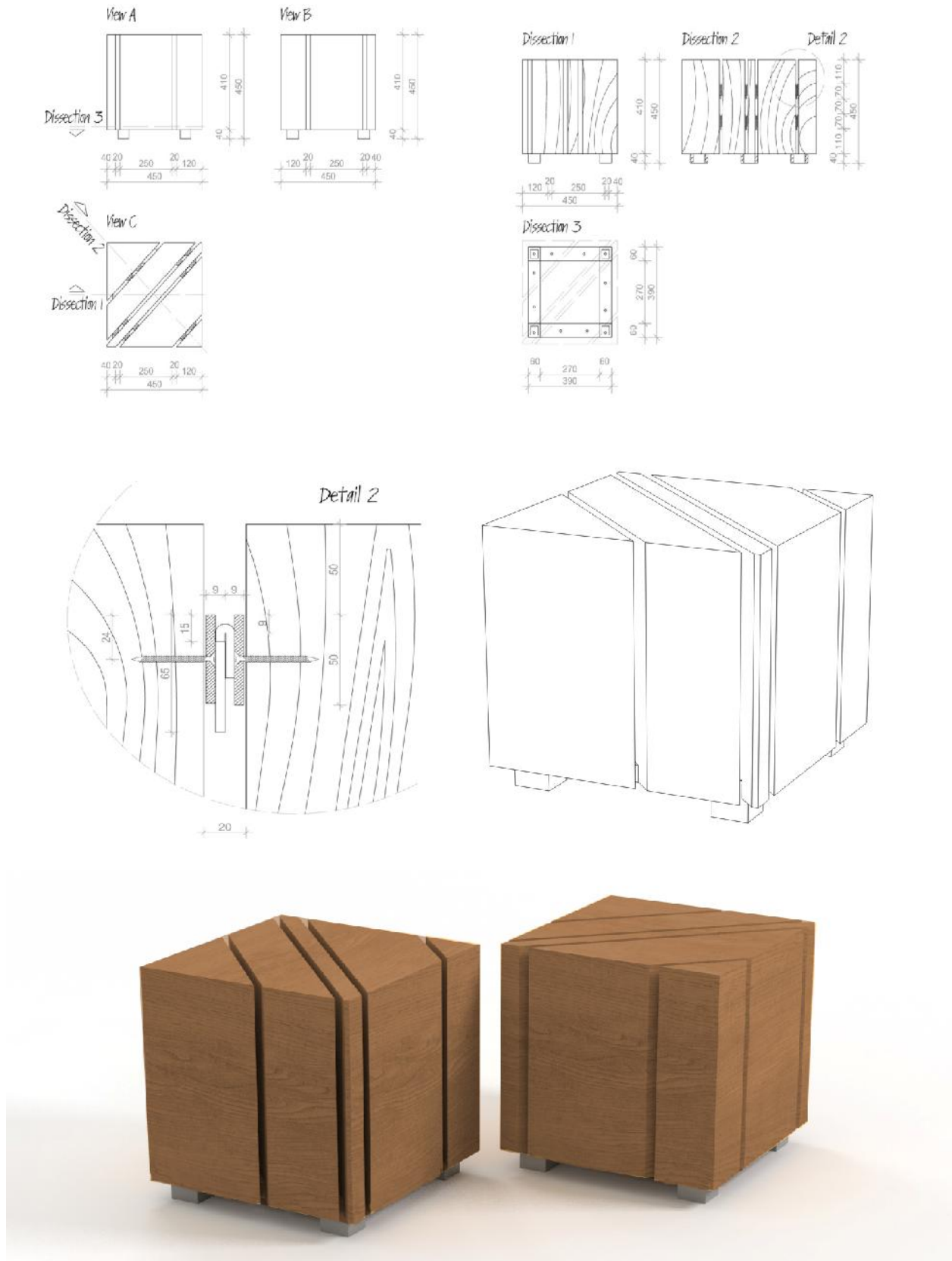


Figure 10-14. One seat (outdoor chair)- basis, dissection, detail, perspective view, 3D.

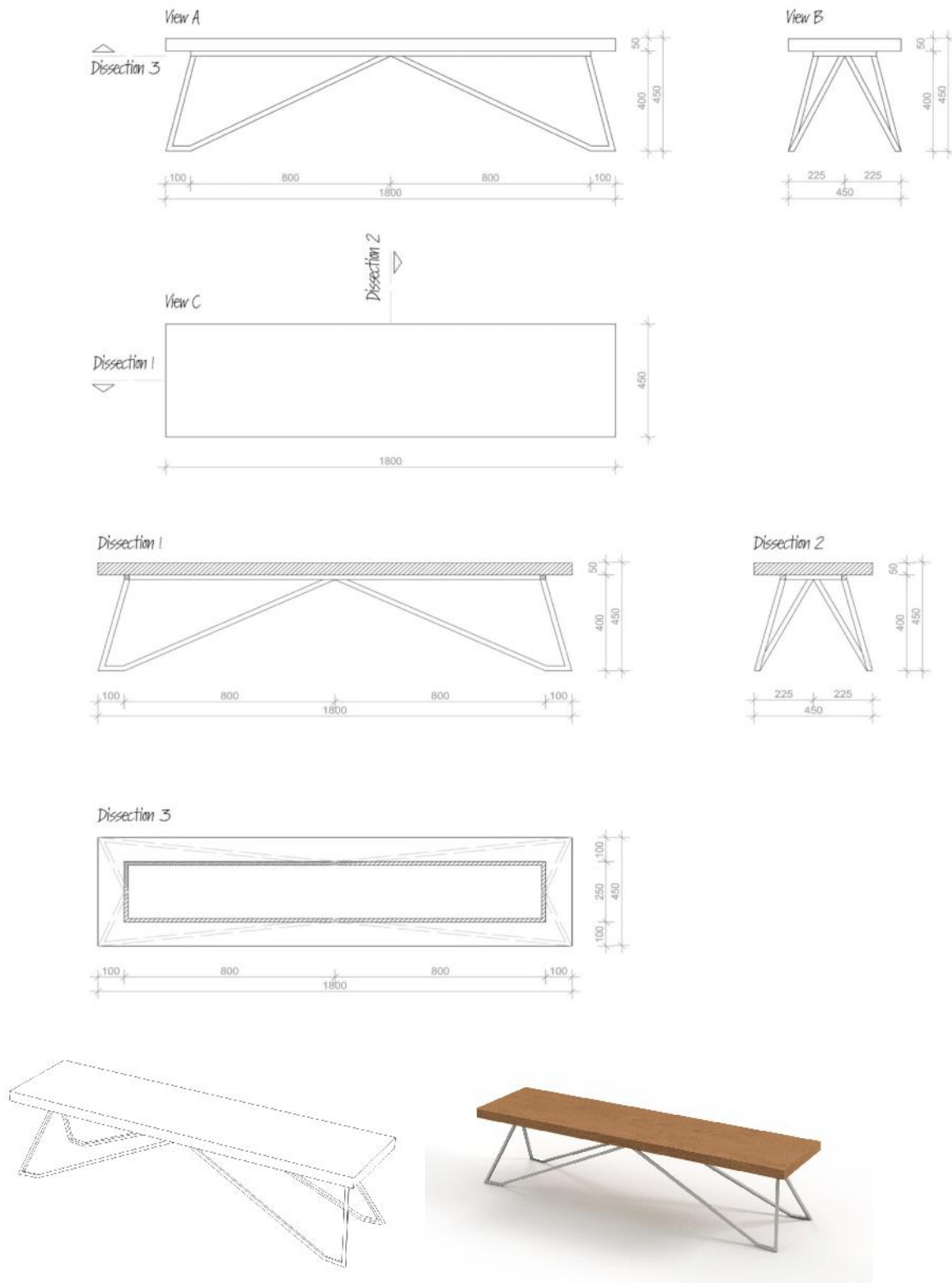
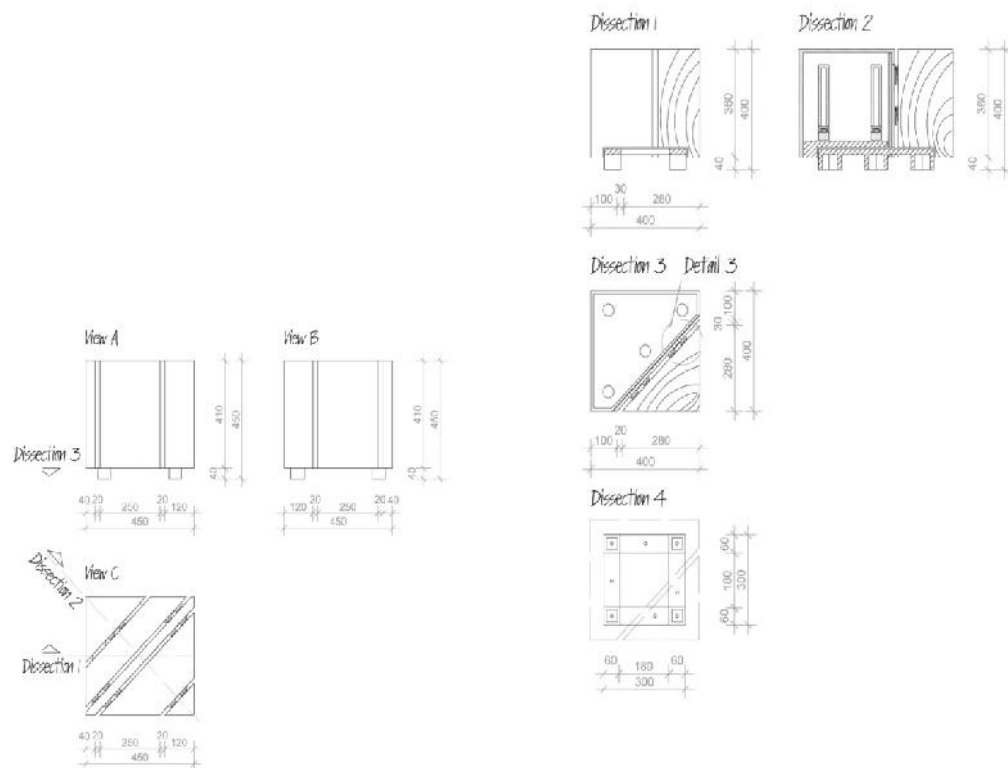


Figure 15-19. Two seat bench - basis, dissection, detail, perspective view.



Figure 20. 3D view of whole set of urban furniture



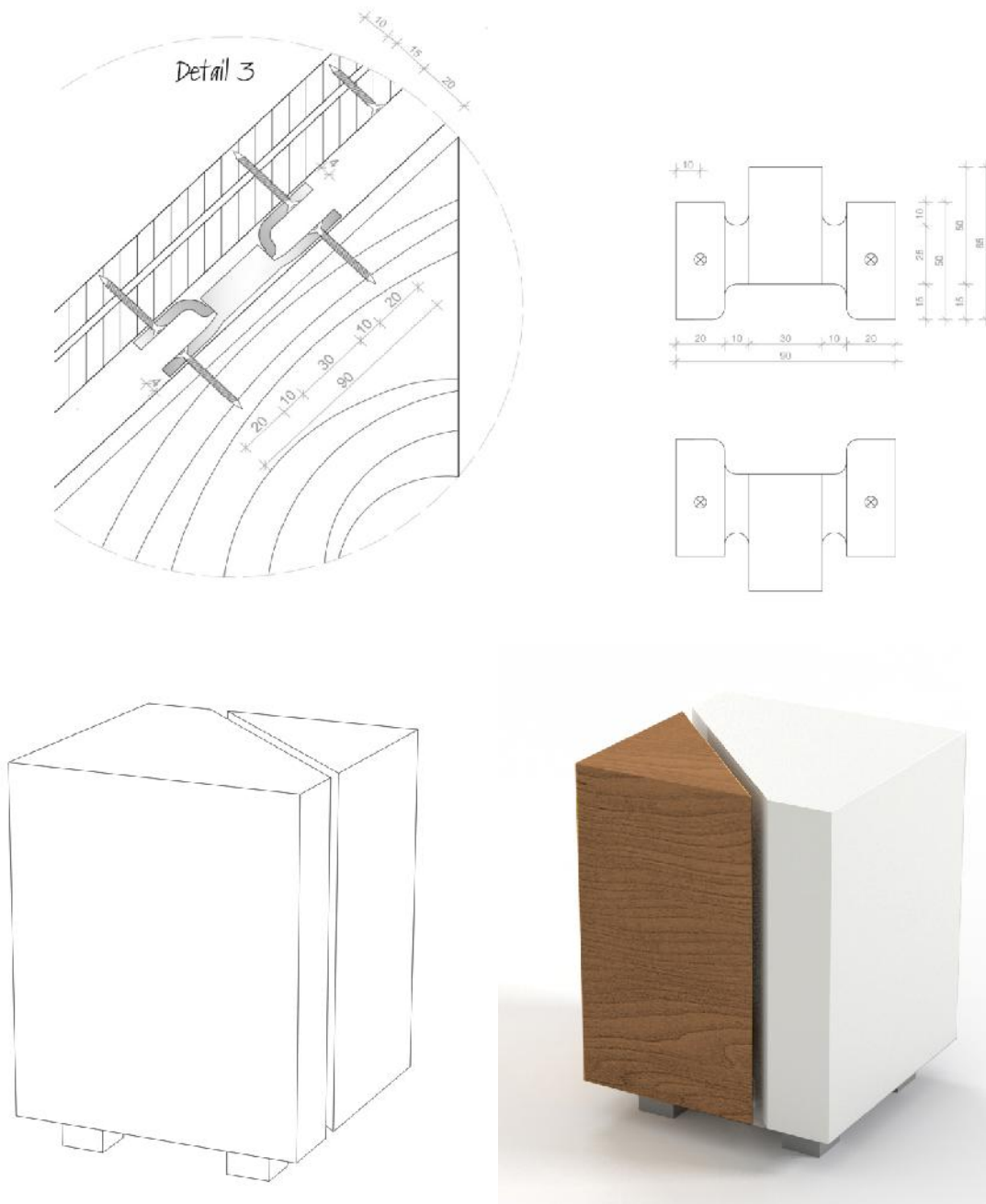


Figure 21-24. Outdoor urban light - basis, dissection, detail, perspective view, 3D.

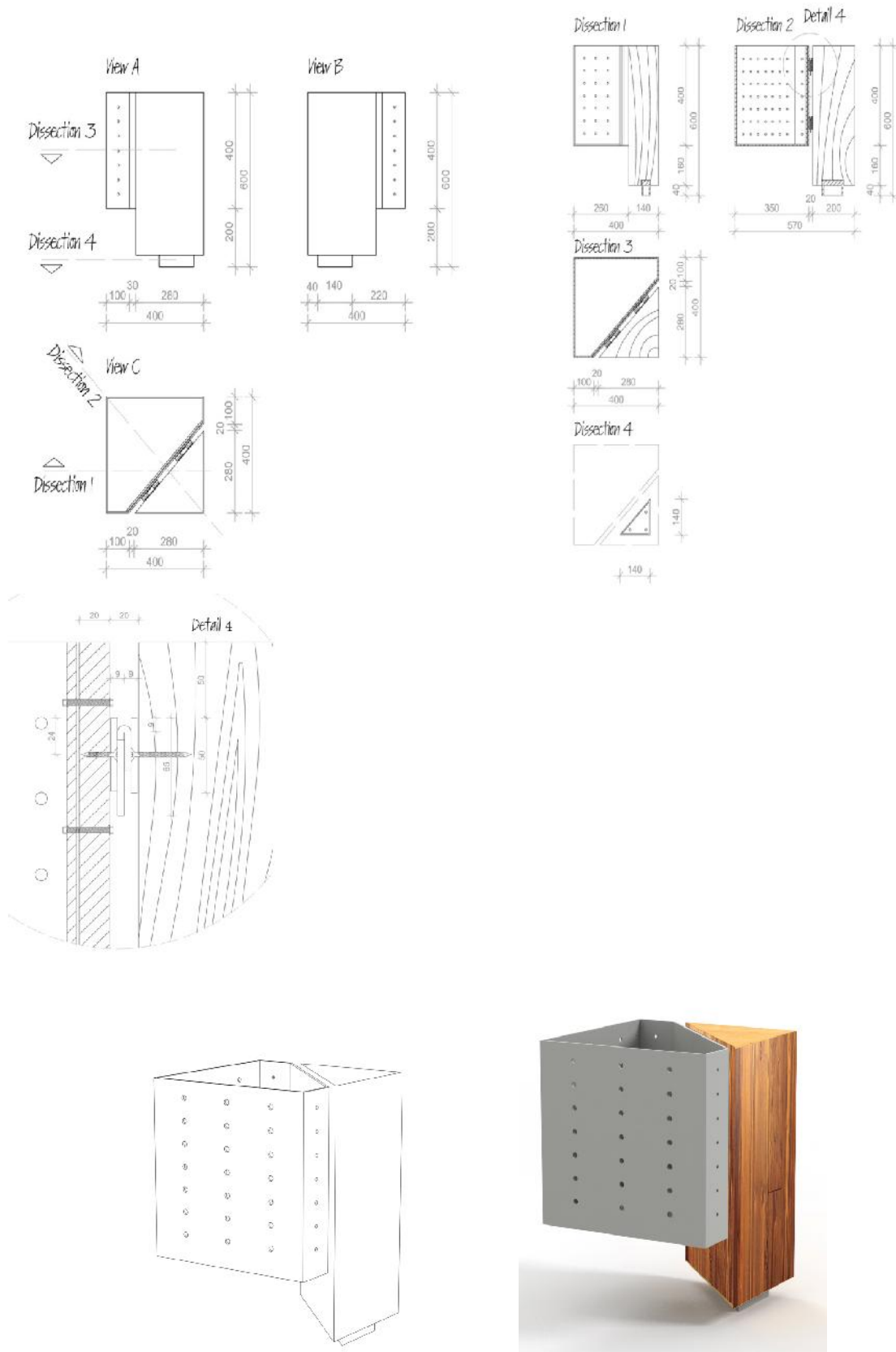


Figure 25-29. Outdoor urban light - basis, dissection, detail, perspective view, 3D.

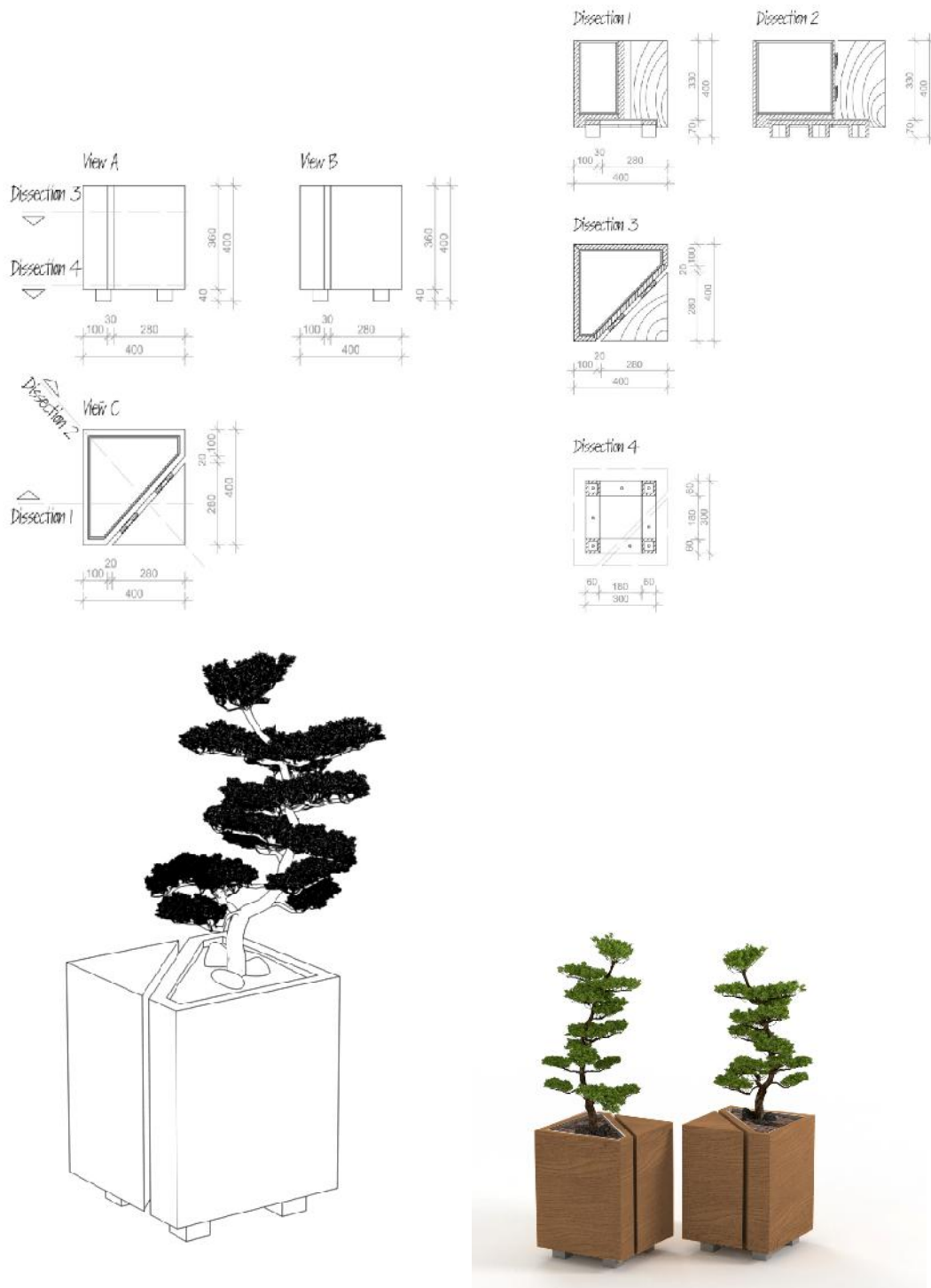


Figure 29-34. Outdoor urban bin - basis, dissection, detail, perspective view, 3D.

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