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A Joint of Many Worlds: Entangled Stories in Battaile en Ibens's 78+ Construction System in Timber

Eric Crevels

This paper explores the distinct networks of technical and embodied knowledge present in the development of the 78+ construction system in timber, designed in the 1970-80s by Flemish design office Battaile Ibens. It develops the history of the knooppunt, a joint of a particular material and technical complexity that structures the system's wooden beams and cross-shaped columns, and argues for the understanding of architecture and construction as complex constellations of different crafts and skills, including but not limited to architectural design and engineering. Design and technical decisions are traced in parallel to economic and marketing strategies, weaving together social and material phenomena that shaped the system's history. From the initial designs and prototyping, through publicity decisions and appearances in international expositions, until its idealization in the office's approach, the history of the knooppunt exemplifies the interplay between different stakeholders and knowledge orbiting the technological development of construction systems.

Introduction

Amongst the dozens of models in the archive of the Vlaams Architectuurnstituut (VAi) in Antwerp, one finds what is expected in an architectural collection, from private houses to new urban developments. Sitting in a high shelf, however, a large wooden model contrasts with the landscape 1 . (Fig. 1) Four sets of mitred butt-joints surround a cross-shaped axle – their edges sitting in the recesses and their ends extruding outwards in a larger, doubled-lined shape resembling a military medal or heraldic symbol. The inner corners are filled by triangular blocks, which gives the assemble a robust, solid appearance. The central axle protrudes outwards on one side, and the ends of large rods are visible on the faces of the corner pieces, fastened with washers and nuts. It is clear that the model represents no building.

Figure 1 – Wooden model of the 78+ knooppunt at VAi. circa 1980. Source: Eric Crevels

The piece is a true-scale model of the Knooppunt ("joint" or "node", in Dutch), a joint that connects the beams and columns of the 78+ construction system developed by Claire Bataille and Paul Ibens's design office (B&I), working with International Design Constructions (IDC). Named after the year of its instalment, the 78+ is designed as a modular system, intended to be an "original, flexible, and above all economical prefabricated system" 2. The cross-shaped axle on the model, sitting horizontally at the VAi's shelf, represents in reality the column of the system, while the eight long profiles, conjoined in four mitred butt-joints, are the beams. The entire piece is traversed diagonally by two large perpendicular threaded rods, running slightly off centre not to collide in the middle. The rods act as tethers and, with the help of the corner blocks, lock everything in place.

A microhistory of design development

The knooppunt appears almost fully developed in the VAi's archives, already presenting its main components and general form in the earliest documents. Given the complexity of the assembly, however, it is likely the result of an exploration with many earlier versions, through careful consideration and iterative processes, as common in design 3. Unfortunately, there are no sketches showing this initial progress, but despite the lack of recorded changes, traces of the design's development can still be recovered from the archived documents. Specifically, by comparing the existing technical drawings, photographic material and the model, some partial conclusions about the knooppunt's design and the knowledge behind its production can be drawn.
The intention behind the model's construction seems to be experimental, meant to test the joint assembly rather than being used for exposition. The model was shown only once in later media articles, in October 1980, and it was not included in the IDC's catalogue (Fig. 2) or presented in the De Wereld van het

Design exhibition in the same year 4. This absence is rather significant, given that the knooppunt is almost always featured, be it in exploded views or through the prototype building's pictures, and it appears to have become the main publicity element of the 78+.

Figure 2 – Advertising material of the 78+ Construction System in timber. Source: VAi

As a crafted artifact, the model is rather unimpressive. Its pieces are loosely bound, the mitred joints are not flush and do not match exactly the angle of the cross-shaped column. The pieces are not square, as a carpenter would say. Several gaps can be seen, in sizes not expectable from its age. From a craft point of view, it was not particularly well made. This low quality matches what is expected of a test model, built without the utmost care for precise fitting, but maintaining key aspects of its composition. The existence of two different configurations of the corner blocks in the model attests to this interpretation. In one solution, the corner blocks possess a square angled chamfer and sit in a recession carved in the beam, matching its geometry. This configuration would prevent the piece from moving backwards, which is a common feature in many carpentry and woodworking joints. Yet, its application in the knooppunt is misplaced. The bolt crossing and tethering the pieces acts pulling the corner block towards the joint, not away from it. Accordingly, the alternative configuration is far simpler, with the corner block siting flush on the surface of the beams, without any recess or other complications. The use of both versions in the model suggests that the matter was not resolved at the point of its development. (Fig 3a) Indeed, this detail can offer some clues on where temporally it sits in the whole story. The patent files of the 78+, submitted in June 1980 (Fig 3c), also show the two solutions 5. Whereas one illustration in the file shows the flush version, another depicts the carved one, accompanied by a description that translates to "Figure 3 shows a solution in which the blocks 9 are incorporated into the beams 8", presenting an "execution variant" 6. Moreover, in an exploded view with the carved solution, dated June 1978, it is possible to see a small ink marking made over the original drawing, (Fig 3e) hinting at the possible use of a flush configuration 7. In the later (September 1980) and much more complex exploded view, the flush version is the only one employed, notably with the addition of two pegs between the corner blocks and the beams, this time acting in accordance to the forces at play. From these documents, it is possible that the alternative, flush method, was suggested in 1978, but only tested at around the same time as the patenting process, via the wooden model – most probably, in preparation for the construction of the prototype pavilion around 1980 (discussed below).

Figure 3 – Variation in the solutions for the corner block. Source: VAi

While not ueful in the 78+ specific case, the proposal of the carved solution requires some knowledge of carpentry techniques and it suggests that the craft's savoir-faire had already made its way into the project. Minute as they may seem, such tales of technical development present traces of practical knowledge regarding the properties of wood and the techniques of its employment, when confronted with the specific requirements and contingencies involving the development of a new way of building. This story sketches a picture of iterative development, indicating little nudges from craft knowledge that steward the design towards a more applicable and practical form, a story of epistemic interference between different fields. B&I, together with IDC, were threading a path that connected industry, craft and architecture, balancing the many aspects surrounding its development. The knooppunt model is part of the process. As an experimental tool, it connects the conceptual and constructive sides of architectural productions by materializing ideas in the complex contingencies of physical reality. This phenomenon is akin to what is described by Gibson as Material Inheritance, a concept that refers to the traces of craft knowledge and rationality that make their way into and influence the ways of making and thinking of a particular industry, without being formally recognized or easily brought to surface 8. However, an examination of the 78+ construction system through the knooppunt model, while significant in terms of understanding the tectonic values of the system's design, fails to put in evidence the complete picture behind the system's material inheritance. The representational character of technical drawings, sketches, and models present in architectural archives can often be misleading to

understand the practical, hands-on dimension that governs craft knowledge and skill. Additionally, despite the material and technical entanglements exposed so far, the logics behind the design of the 78+ and the particular form of the knooppunt remain rather unclear. According to Brazilian scholar Sérgio Ferro, mysteries in architecture are often related to a logic that is specific to the construction site 9. Therefore, in order to fully understand the knowledge at play in the development of 78+ system, it is necessary to investigate its chaîne opératoire 10.

The concept of chaîne opératoire is particularly significant for studies of technology because it tells a story detached from its products and particular characteristics – technical or aesthetic – and focuses instead on the conditions and processes inside the production of artifacts. In the case of the 78+ and the knooppunt, these operations have an even greater importance. The design of modular systems follow a discourse that advocates for rationality in construction, thriving on industrial maxims of efficiency, mass production and affordability 11. In the system's description provided by the architects, there was a great focus on making the system adequate for numerous applications (from residences to industrial villages) and different sites (including "thirdworld villages") 12. This flexibility would require, evidently, a similarly versatile mode of construction.

One could argue that this was precisely the knooppunt's raison d'être, but that is not the entire story. There is, in the 78+, another particular arrangement that works in favour of these premises, and a single written source provides some explanation on this matter. In a text provided by the architects to the Wereld van het Design exhibition, it is stated that the 78+ is "based on cross sectioned vertical columns that are joined by horizontal square frames that form the floor and roof supports." 13 This description is accompanied by a step-by-step erection procedure instructing that "the horizontal frames are installed" after the columns, and directing builders to see "the model joint" 14. In stark contrast to the technical drawings, the instructions do not mention the knooppunt, but the columns and these 'horizontal frames', never mentioned elsewhere. Notably, in a photographic series depicting the system's assembly, where a model of the 78+ is constructed in steps, the square modules are missing 15. (Fig. 4)

Figure 4 – Montage model depicting the 78+ assembly. Source: VAi

Fortunately, some clues of this arrangement come from the photographs depicting its use. The archives of the VAi include a photographic collection showing the assembly of a prototype building using the 78+ system, built under the clientele of J. Ibens, Paul's brother 16. (Fig. 5) The prototype consists in a pavilion of approximately 70 m2, whose designs are dated from November 1979. The plan was developed over a four-square grid conformed by nine of the 78+ cross-shaped columns. An isometric perspective of the design can be found in the patent documents, but the pictures (themselves undated) appear in other printed materials only in May 1981, meaning that its construction probably occurred around the same time as the patenting process – from the vegetation and clothing seen in the pictures, sometime in the warmer months of 1980.

Figure 5 – Pictures of the prototype's building process. Source: VAi

As can be seen from these photographs, the beams are previously joined together along with the corner blocks in a square shaped module. The module is then raised and fastened to the previously positioned columns. From the perspective of the construction site, the employment of the square modules with the knooppunt locking mechanism has significant advantages. Being the corner piece glued to the beams in a frame, the ensemble is easy to position and secure in place. Rather than dealing at once with several pieces that must converge in a single point, with their leveraged ends hanging on the back, the builders would deal with only one piece. Additionally, the cross shape section of the columns houses the square modules, keeping them in place and guiding them along the vertical axis.

Figure 6 – The finished prototype. Source: VAi

This small, almost unseen detail of the system's assembly affords an important consideration regarding the relationship between the knooppunt, the square module, and the 78+ system. Instead of understanding the knooppunt as the main element supporting the system, both structurally and in terms of design logic, perhaps the definition of the square module has a similar importance. Indeed, the 78+ system only works as it does because of the square module and the joint, and they can be seen as complementary negatives of each other [17]. It is possible to envision a scenario in which both were developed simultaneously, each element participating in the other's formation, as symbiotic counterparts that work together constructing the design, both in terms of production process and of final product.

Phase Shifts – the other sides of technical developments

The mutual interference between the knooppunt and the modular square frames imbues the 78+ systems with a superimposed, dialogic modularity that merges the rationalities of the design office and the construction site. In other words, it represents a combination of intellectual and operative ways of thinking, and different communities of practice – namely, design, engineering and carpentry [18]. Unfortunately, as can be attested from the archival collection on the 78+ system and the literature around it, this dialogic modularity remains unspoken of. While the knooppunt is represented not only in model, but in several other media and in different formats (particularly with exploded isometrics), the assembly logic of the square frames is never portrayed visually in any technical drawing, in the IDC's 78+ catalogue, or in the media articles. Taking into consideration its constructive rationality and possible importance for the very constitution of the knooppunt, the lack of representation of the square module in most of the 78+ documents is intriguing, as it goes against the system's advocacy for the DIY and simplicity [19].

The shift makes sense from a marketing perspective, however; a realm in which the 78+ system was particularly successful. It was featured in a number of exhibitions organized by the Design Centre: the De Wereld van het Design exhibition, in late 1980, after which the 78+ was awarded the Sigle d'Or prize; the Design and Export exhibition in the spring of the following year; and the Belgica Hoy, in November 1982, in Barcelona. The system was featured in the Biënnale Interieur in Kortrijk, also in 1982, with the construction of a barn-red two-stories pavilion. (Fig. 7) Following the exhibitions and prize, it appeared in several press articles [20], including the cover of neuf magazine [21].

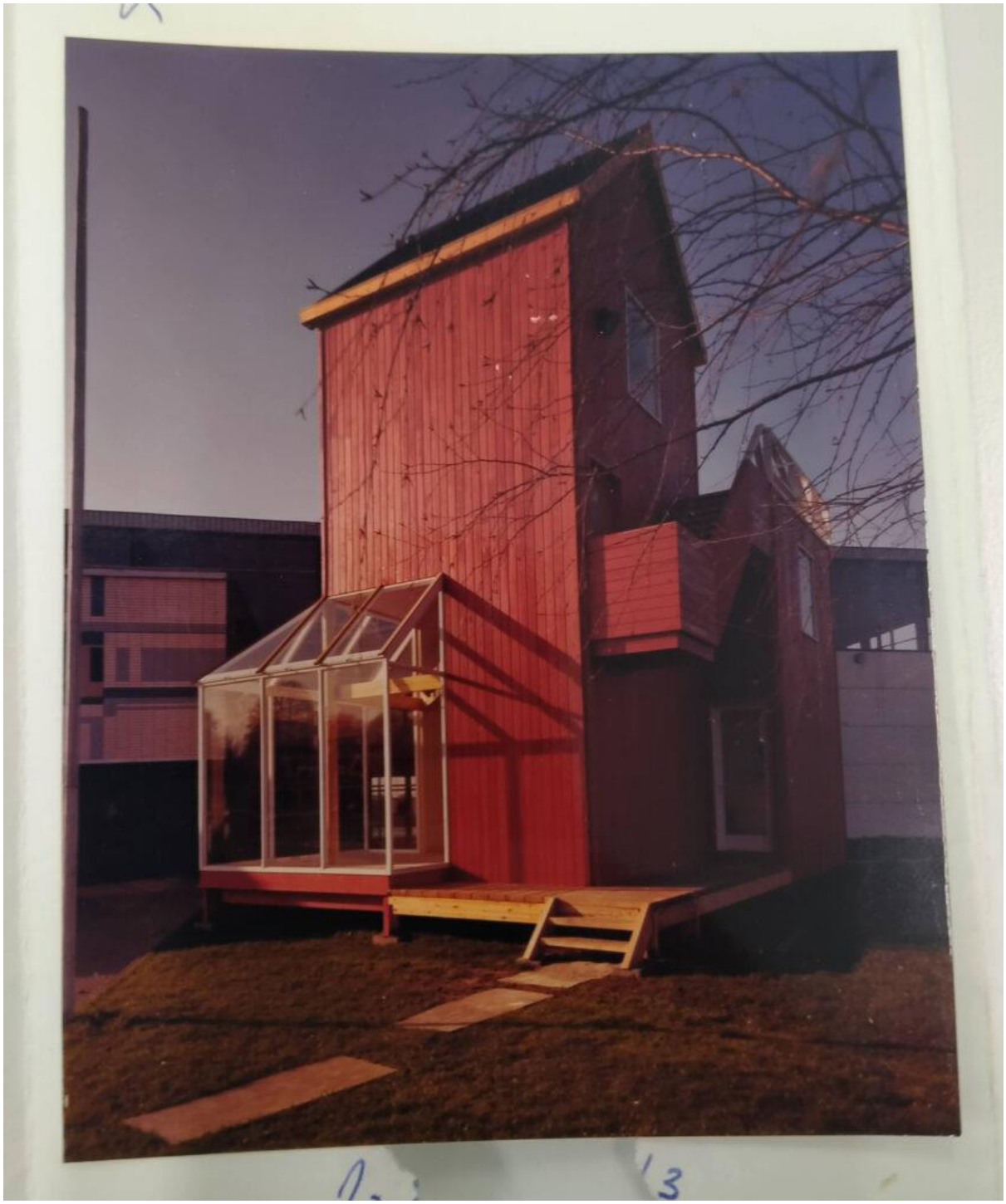

Figure 7 – The 78+ pavilion of the 1982 Biennale Interrieur Kortrijk. Source: Eric Crevels

Besides the cultural attention, the designers worked on projects of urban development in the Belgian cities of Vielsalm, Virton, and Manderfeld, in addition to many private commissions. Furthermore, in late June 1980, Clarie Bataille and Paul Ibens formed the Preewood Construction Company in the United States, in partnership with Robert Huckins and Walter Van Elven, meant to "carry the trade or business of General Contractor" 22 . Not long after, they were engaged in projects for neighbourhoods in Ruidoso, New Mexico, and in Rifle, Colorado, designing several different residential types, in many shapes and sizes.

Along with so much development and growth comes the associated demands. As such, it would be reasonable for the designers to choose a method of representation most familiar to their practice. It is

no secret that the work of architects involves the production of advertising material for both their own marketing and their client's. Architecture and construction are economic practices that sell specific products, which, in the specific case of the 78+, converge into one. In this scenario, the marketing promotion of the system corresponded directly to the promotion of the design.

Figure 8 – Design for a neighborhood in Viesalm. Source: VAi

When starting the design of the 78+ system, B&I existed for about 10 years, and had designed many different things – an impressive collection ranging from furniture, with many tables, stools, chairs, couches, dressoirs, canapés, commodes and so on, to cutlery, glasses, dinnerware, doorknobs and even some sinks 23. Claire Bataille and Paul Ibens did not hold architecture diplomas, but were trained as interieurarchitecten at the Hoger Instituut voor Bouwkunst en Stedenbouw, in Antwerp, and embraced crossdisciplinarity, reflected in their chosen name "Studiebureau Bataille-ibens Designers" 24. This multi-faceted aspect of the office's origin and work meant that B&I, intentionally or not, carried into their architectural work the modes of representation and practices from other fields of knowledge, effectively blurring the divide "between architecture and design, between garden and interior, between the ideal plan and the compromise of living, between art and craft" 25.

The representation choices for the 78+ system were surely connected to the office's involvement with interior and furniture design. As seen from B&I's other projects, the isometric and exploded view used to depict the knooppunt are common in their representative repertoire 26. These are methods of drawing frequently used to detail the assemblage of furniture, particularly customary in woodworking manuals. Favoured by makers because of their capacity to depict tridimensionality while maintaining the true dimension of lines, they requiring little knowledge of drawing technique, in contrast to perspectival drawing, and are easily understood by laymen.

Therefore, it is reasonable to believe that the focus on the knooppunt as a representative element of the system is an emergent condition. While the joint's design seem to derive not from marketing or visual quality's sake, its form greatly resonates with the modes of representation commonly employed in B&I's professional environment. In the exploded view, the tectonic intricacy of the joint's assembly is shown on a symmetric, ordered composition – from the empty edges inwards, the elements progressively appear, orbiting the column, and their angled lines converge at the drawing's centre, culminating in the knooppunt. It is a powerful picture, able to maintain the ideal of technical prowess in a language of design and aesthetical quality. (Fig. 9)

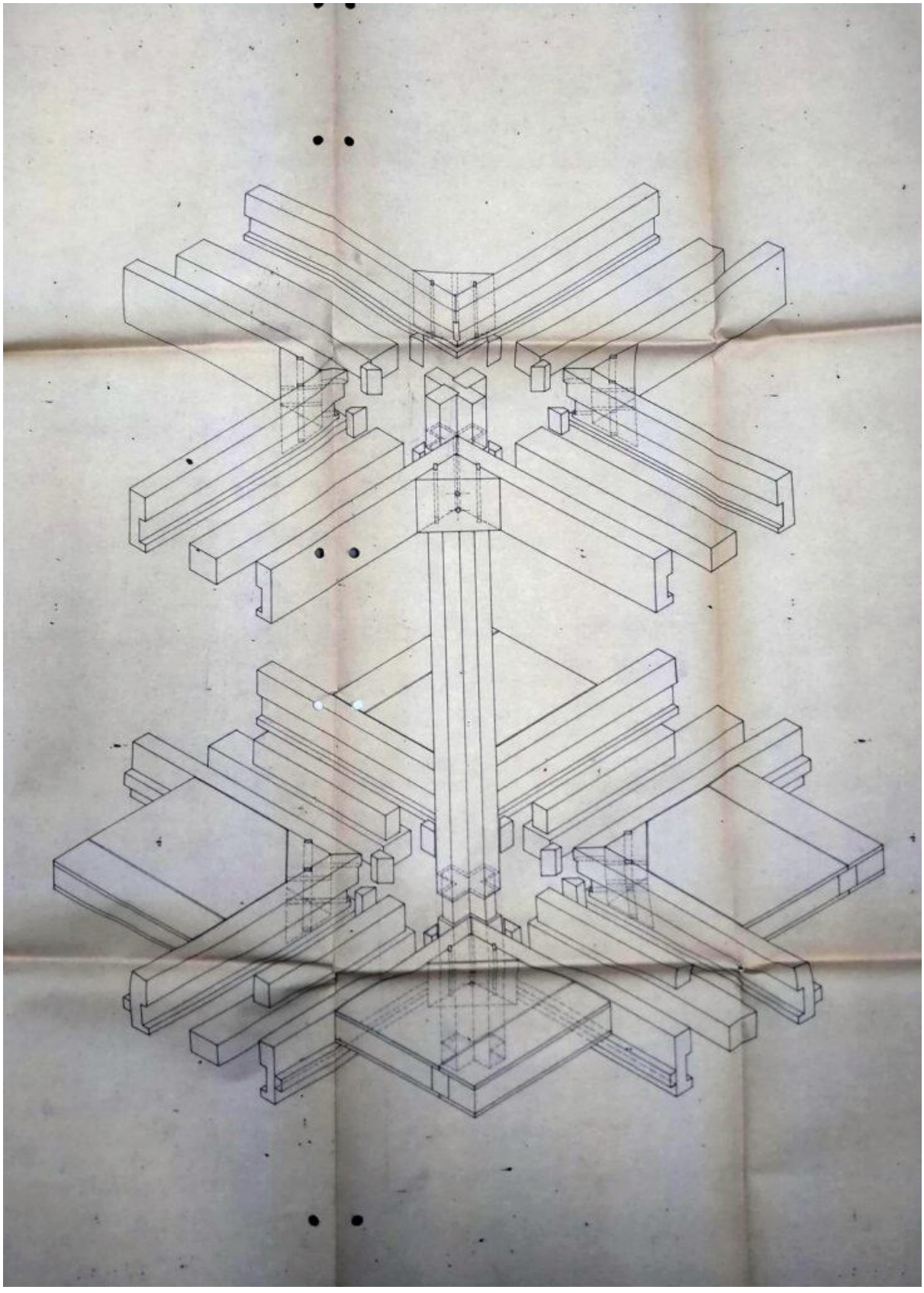

Figure 9 – Exploded isometric view of the knooppunt. Source: VAi.

When compared to the square module, the knooppunt is far more appealing from a commodity point of view. While both elements share much of the same technical rationality, they possess specific qualities

with opposite affordances in the dialectics of product and production. The knooppunt is easily portrayed as an independent object, while maintaining its complex appearance and technical appeal. The qualities of the square module, on the other hand, can only be seen in movement, while it is being installed. Thus, the two elements tend to operate, discursively, in different realms – and, again, for different publics. The logics behind the square modules is that of the construction site, particularly significant to builders and contractors, but the knooppunt better portrays the product offered by the 78+, ultimately what most concerns potential clients.

By focusing on the element that represents the final assemblage instead of the chaîne opératoire, B&I aligned the 78+ with a commodity oriented aesthetics. In this framework, the depictions of the knooppunt not only serve to inform but, and even more prominently, they deploy a particular discourse, with a specific lexicon and aiming at an intended target. Through this process, the knooppunt can be interpreted as akin to a dispositif, as Michel Foucault would put it 27. Echoing a movement from the medieval kodex to the theatre des machines 28, the focus on the knooppunt, especially through exploded isometric views, represents a progression towards a commercial logic of exposition, prioritizing elements that portray a technological product as a commodity. In other words, the knooppunt was elevated as the avatar of the 78+ because it represents the product of the assembly rather than it's process, a quality that resonates well with a market oriented environment.

None of this means, however, that the knooppunt is inefficient from a constructive and processual point of view. If the elevation of the knooppunt as the avatar of the 78+ system perhaps finds a better explanation in is visual power, its form is still a result of a deep technical exploration. A great testimony to this double value can be found in the way the knooppunt was further explored in later projects by B&I. Developed for serial production under the Bulo brand, B&I's design for the H20 table makes use of cross-shaped elements as its legs 29. While not identical, the similarity with the 78+ is pointed out by many scholars 30. (Fig. 10) In architectural works, solutions resembling the knooppunt can be found in the metal structure of Brants-Voets house in Dwerp, and in an extension of a residence in Sint-Niklaas 31. Finally, the 78+ was itself further developed in the 98+ construction system 32. This revision presented a version of the system without the modular square frames, and replaced the corner blocks with aluminium L-shaped profiles. These modifications further simplified the assembly process and drastically reduced the amount of wood required for its construction.

Figure 10 – H20 table. Source: VAi

The recurrence of the knooppunt in many different designs accounts to its visual, technical, and conceptual appeal, but also to the joint's capacity to bridge together different domains. As seen from the stories in this paper, the knooppuntcarries knowledge from many communities of practice, including the savoir-faire of carpentry, construction site logistics, and market strategies. Behind this repetition, however, lies yet another phase of the knooppunt's history. As Christian Kieckens notes, the knooppunt reverberated with the designer's approach in a deeper level.

An important part of their oeuvre – not immediately visible and yet clearly present – deals with mastering this detail, with the materiality of the construction. It is part of their attitude that this mindset is transformed into a kind of wordless knowledge, a knowing 'how to deal with things'. 33

The slow, re-iterative coming back to the knooppunt can be perceived as a way the designers related to materiality. B&I found in it a tool that allowed them to navigate the many agencies involved in material productions, while maintaining their attentiveness to functionality and efficiency, and fostering their transdisciplinary stance 34. Abstracted into a design approach, the knooppunt became a concept underlying the office's work, a way in which the network of different epistemic regimes were accessed. Forged across many phase shifts – from experimental model to design concept – the knooppunt weaved threads of craft, market practices, and design processes and subverted the roles of creator and creation, blurring the expected boundaries of knowledge in architectural production. Moving between concrete and abstract dimensions, the joint carries forward the processes of its development, in a renewed material inheritance wedged in architectural history and the shelves of the VAi.

Conclusion

The investigation in this paper attempted to appraise the connections between the built environment and the processes involving its material constitution, using the 78+ construction system and its knooppunt as case study. Through the microhistories of the joint's design and its employment in the construction site it becomes clear that, as Glenn Adamson points out, technological development is never fully independent of craft skill 35 . As a constructive analogue to Joseph Kosuth's One and Three Chairs, the 78+ system is one but many at the same time. This multiplicity reflects the many fields involved in its formation and their specific directionality – some oriented towards the system's assembly in the construction site, while others focusing on the aesthetic appeal for marketing material. In the 78+, market, industry, design and craft come together in an enmeshed artifact. These are all different dimensions of what can be understood as a single phenomenon – each representing, nonetheless, a specific skillset and way of knowing, and the values inscribed in an episteme. Beyond modern discursive schisms between intellectual and operative, conceptual and constructive ways of thinking, the constellations of skill, knowledge and agency in the 78+ reveal a shared environment of material, practical and discursive horizons.

Metaphorically and literally, the knooppunt connects the many worlds surrounding the craft of architecture, forming and being formed by the different elements involved in its history. These entangled stories shape the way timber is employed and understood, being embedded into and giving rise to the particular way in which the material relates to society 36 – what, from a Foucauldian perspective, could be called a discursive materiality 37 .

Eric Crevels

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