

**The Whispering of the Framing Square**

**By**

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fulfillment of the requirements for the degree of**

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**In**

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## **The Whispering of the Framing Square**

I began to hear the whispers of the square by way of my cottage, built by my hands and the hands of my family. We began working on this enormous project two weeks before I started architecture school in the fall of 2006. We started by demolishing the old cottage by hand piece by piece and during the process of taking it apart we began to appreciate the individual elements of the old cabin. It was built originally in the 1800s and had rough sawn lumber of a grand scale which was salvaged for the new cottage. Similar to the 'taiko' beam of traditional Japanese timber framing, we reused this material. Stripping it of its exterior layers of worn wood, we brought out the beautiful wood below - peppered with old nail holes - revealing the "presence" of workers past. These salvaged pieces were placed for all to see as casing and mouldings.



**Figure 1 My family cottage**



**Figure 2 A place to contemplate**



**Figure 3 A work in progress**



**Figure 4 Wood peppered with old nail holes**

I felt the overwhelming sensation of the worker as we began the task of rebuilding. I realized that things that I thought I knew, I didn't or I knew very little about them. Even as I learned more about the tools and techniques I came to the conclusion that there was still far more to learn that would only come through time and experience. This was a kind of secret knowledge, a knowledge only whispered to you as you worked, a knowledge not spoken aloud but learned through the senses. As we worked, I would often ask how to do a particular task. After a frustrating bit of conversation my father would finally say, "It's like this" and demonstrate using the tool and the material in question. Even after his demonstration, I had to work with the tool for a while to train my hands to think as his did. There were secrets that only the tool could teach me. Umberto Eco

argues that “Secret knowledge is deep knowledge. Thus truth becomes identified with what is not said or what is said obscurely and must be understood beyond or beneath the surface [...]. [...] Truth is something we have been living with from the beginning of time, except that we have forgotten it.”<sup>1</sup> The tools, though in front of me, were useless as I had not learned what was beneath their surface, what tasks I could achieve with such simple objects. Only the faith in my father as a craftsman could guide me — no amount of reading or drawing could have prepared me for the task that lay ahead.

**I:**

### **Craft**

If we are to understand architecture as a regulator of craft, we must understand what defines “craft” as a whole. Broadly speaking, craft is a method of production most closely associated with the pre-industrial era. Craft as described by David Pye is “[...]workmanship using any kind of technique or apparatus,[applied to a material either directly or indirectly,] in which the quality of the result is not predetermined, but depends on the judgement, dexterity and care which the maker exercises as he works.”<sup>2</sup> An example of craft applied directly to a material would be the joiner carpenter laying out a mortise joint on a timber post; similarly, an example of indirect workmanship would be an architect drawing that same mortise joint on paper to later be transcribed by the joiner carpenter to the timber.

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<sup>1</sup>Eco, Umberto, Interpretation and History. “Interpretation and Overinterpretation.” (Cambridge UK: Cambridge UP, 1992) 150.

<sup>2</sup> Pye, David, The Nature and Art of Workmanship (Bethel: Cabium Press, 1995) 20.



Figure 5 A half dovetail mortise I drew out on a timber post

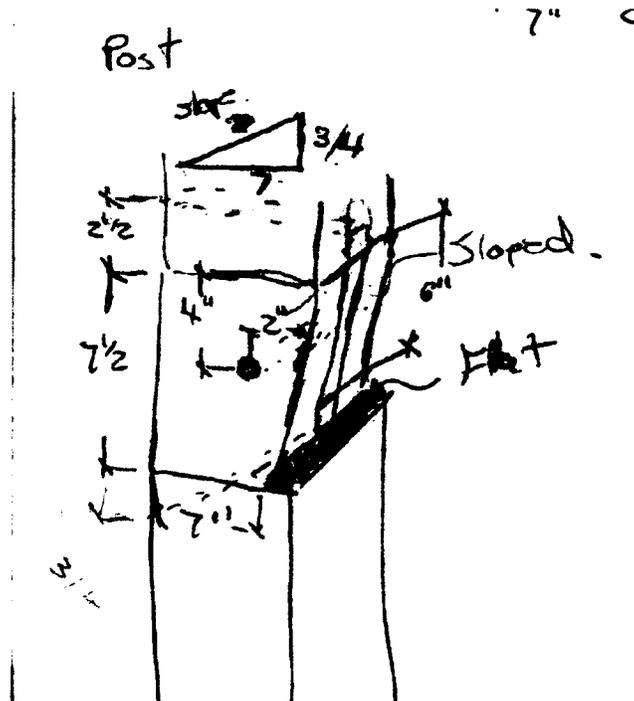


Figure 6 My sketch of a half dovetail mortise drawn out on paper

Richard Sennett describes craft as focusing on the particular and “[...] applied to depth of understanding,” in contrast with the contemporary IQ test which “[...] represents a more superficial management of many problems.”<sup>3</sup> Following Aristotle Sennett explains “— [w]e consider that the architects in every profession are more estimable and know more than the artisans, because they know the reasons of the things which are done. —”<sup>4</sup> Aristotle refers to architects in this way as a master craftsman.

In the medieval understanding of Aristotle, craft was tied together in guilds representing particular trades. These guilds were further broken down into workshops which consisted of masters, journeymen and apprentices. As apprentices, these craftsmen had to prove that they could imitate the master’s work. Upon proving that they were capable, they would become journeyman. In order to become a master, however, the journeymen had to prove that they possessed “[...]the larger understanding of how to use what one knows.”<sup>5</sup>

Marco Frascari, in discussing the origins of architecture notes that: “Architecture is a name which derives from Greek and is composed of two parts. The first means principal or chief, and the second part fabricator or artisan. [...] However, Plato says that the architect does not go in for any craft, but he supervises the craftsmen [Plato, Pol.259e-260a]. Therefore, we can say that the architect is not a smith, a carpenter, a mason, he is not a distinguished and particular artisan, but a chief supervisor and

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<sup>3</sup> Sennett, Richard, The Craftsman ( New Haven : Yale University Press, 2008) 284.

<sup>4</sup> Sennett 23.

<sup>5</sup> Sennett 58.

regulator of all the artisans, such as one who attained a high rank pursuing several branches of knowledge.”<sup>6</sup>

Building upon Frascari’s interpretation of Plato, that an architect be a chief supervisor and regulator of the artisans, the idea of the “collective craftsman”<sup>7</sup> comes into play. This term, coined by W. Edwards Deming, suggests that for the “[...] sake of ‘total quality control’ managers get their hands dirty on the shop floor and subordinates speak frankly to their superiors.”<sup>8</sup> What is important to note is that Deming states that managers must fully participate in the process of the creation of the product for society. It is clear that the manager cannot be on the ‘assembly line’ every minute of everyday however he must fully understand the process involved and must be able to put himself in the shoes of his subordinates. If this is not achieved by managers, like architects the concept of the collective craftsmen is nullified and cannot be used as an excuse for the lack of understanding on the managers part, his job is to understand. In other words, we as architects must come to the realization that, to be able to put ourselves in the shoes of the trades we must know and use the tools and techniques employed by the trades in order to think and design with them. As Marco Frascari has said, “The study of architecture is a marvellous training for everything but architecture. The frightening thought that what you draw may become a building makes for reasoned lines.”<sup>9</sup>

It is important to note that Deming is referring to industrial production and the assembly line rather than the traditional crafts, but one can argue that industry and craft are similar. Walter Gropius, the founder of the Bauhaus, did not choose between the

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<sup>6</sup> Frascari, Marco, “Maidens “Theory” and “Practice” at the Sides of Lady Architecture.” *Assemblage* 7. (1988) 24-26.

<sup>7</sup> Sennett 31.

<sup>8</sup> Sennett 31.

<sup>9</sup> Frascari 26.

terms craft and industry, as he “[...] believed that they expressed a kind of battle between two opposed abstractions.”<sup>10</sup> These two abstractions are of living conditions and methods but not of fundamental principles. The reasoning of Gropius is clear; craft and industry provide the same products to society, one uses the human hand the other the machines. In Richard Sennett’s view, “Machines only ever replicate human activity.”<sup>11</sup> The “craftsman” in this case is the person or group of people controlling the machine.

In Sennett’s reading of Plato, craft also requires a standard of excellence where, “[...] implicit in any act: the aspiration for quality will drive a craftsman to improve, to get better rather than get by.”<sup>12</sup> In the medieval workshops this would have been to an extent the example put forward by the master but more importantly the use of tools and techniques that helped him achieve and perfect his task informed by the standard. Without the tools and the knowledge passed down by the masters on the use of those tools the apprentice would not be able to verify his work and challenge the very idea of perfection. This suggests that the craftsman needs to have the tools and the hard won ability to use them in order to strive for perfection.

**II:**

### **Tacit Knowledge**

The final concept we must understand in discussing craft is that of tacit knowledge, also referred to as embodied knowledge. Tacit knowledge is the feeling of doing something instinctively, without seemingly thinking. For Sennett, there is a “[...]”

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<sup>10</sup> De Fusco, Renato, Le Corbusier, Designer: Furniture, 1929 (Woodbury: Barron's, 1977) 13.

<sup>11</sup> Sennett 84.

<sup>12</sup> Sennett 24.

constant interplay between tacit knowledge and self-conscious awareness, the tacit knowledge serving as an anchor, the explicit awareness serving as critique and corrective.”<sup>13</sup> The craftsman innovates by using tacit knowledge and, to avoid boredom, pushing his technique to a higher level. This, in turn, increases his tacit knowledge. Innovation is achieved by focusing on the particular and identifying those things that can be made better.

Tacit knowledge is a knowledge that is only gained through experience and through the use of tools and technique. This form of thinking, as Sennett describes it, comes from the craftsman’s “[...] intimate connection between hand and head,”<sup>14</sup> as “[...]all skills, even the most abstract, begin as bodily practices[...].”<sup>15</sup>

For Juhani Pallasmaa, the craftsman has a different understanding of the world in which, “[t]he senses not only mediate information for the judgement of the intellect; they are also a means of igniting the imagination and of articulating sensory thought.”<sup>16</sup> This understanding is based on the idea that, “[a]ll the senses, including vision, are extensions of the tactile sense [...]”<sup>17</sup>. The craftsman uses touch as “[...] invasive, “unbounded” data,” whereas he/she realizes that, “the eye supplies images that are contained in a frame.”<sup>18</sup> The craftsman realizes that if he moves around looking at the joint from different angles and with different lighting conditions he sees differences. He touches the joint because his hand does not confuse him in the same way as his eye. It tells the truth

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<sup>13</sup> Sennett 50.

<sup>14</sup> Sennett 9.

<sup>15</sup> Sennett 10.

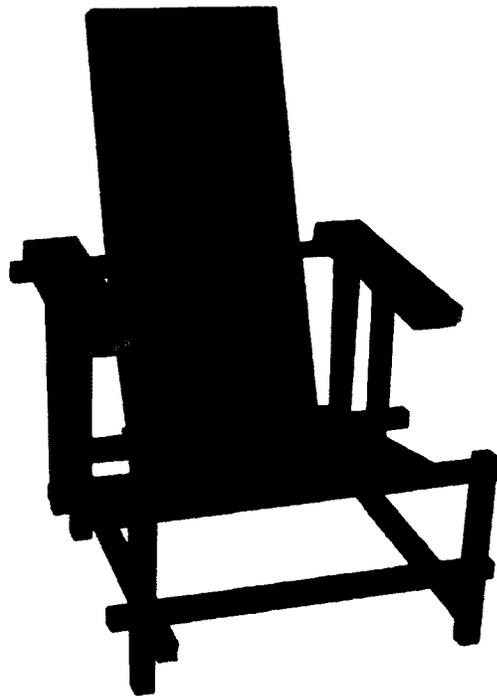
<sup>16</sup> Pallasmaa, Juhani, The Eyes of the Skin: Architecture and the Senses (Chichester Hoboken: Wiley-Academy, 2005) 45.

<sup>17</sup> Pallasmaa 10.

<sup>18</sup> Sennett 152.

in providing “unbounded data”. This “frame” is the knowledge already understood by the craftsman’s hands, “[...] what the touch already knows.”<sup>19</sup>

A seemingly obvious statement is to say that craftsmen learn by doing. This is important because, as Sennett describes: “[c]raftwork establishes a realm of skill and knowledge perhaps beyond human verbal capacities to explain [...]”<sup>20</sup> This has been understood by some architects as they built and designed furniture as a means of gaining such knowledge. For instance Gerrit Rietveld, furniture designer and architect, talking about the Red Blue Chair before he died said: “When I made it I did not realize that it would have such an enormous significance for me and also for others, nor did I imagine that its effect would be so overwhelming even in architecture.”<sup>21</sup>



**Figure 7 Rietveld's Red Blue Chair**

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<sup>19</sup> Pallasmaa 42.

<sup>20</sup> Sennett 95.

<sup>21</sup> Rietveld, Gerrit Thomas, Rietveld Furniture and the Schröder House (London: South Bank Centre, 1990) 16.

Errors can be interpreted as a loss of control in the craftsman's work that in turn lead to innovation. Quoting John Ruskin, Sennett reminds us that: "discoveries stumble on happy accidents."<sup>22</sup> These "happy accidents,"<sup>23</sup> are the result of the willingness of the craftsman to experiment through error and in some cases the craftsman "does more than encounter mess; he or she creates it as a means of understanding [...]."<sup>24</sup>

In addition to experimenting through error, the craftsman must see where the difficulties lie. This means that a good craftsman must not only solve problems efficiently, but find problems efficiently as well: "The open relation between problem solving and problem finding, [...], builds and expands skills, [...]."<sup>25</sup> For Sennett, problem finding is just as important as problem solving. One of the means for the craftsman to solve these problems is to identify the most "forgiving element in a difficult situation."<sup>26</sup> These problems can be referred to as resistance and can be found or made "[...] in the first something blocks us, in the second we make our own difficulties."<sup>27</sup> Without resistance the craftsman is stagnant unless of course his "[...] work is connected to the freedom to experiment [...]"<sup>28</sup> in which the craftsman can create his own resistance in order to push his skills further.

The difference in knowledge between the master and the apprentice when dealing with resistance is that the apprentice will "[...] aggressively conduct war against it [...]" while the master will strive "to understand the resistances."<sup>29</sup> In other words the

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<sup>22</sup> Sennett 113.

<sup>23</sup> Sennett 116.

<sup>24</sup> Sennett 161.

<sup>25</sup> Sennett 38.

<sup>26</sup> Sennett 221.

<sup>27</sup> Sennett 215.

<sup>28</sup> Sennett 27.

<sup>29</sup> Sennett 226.

apprentice will strive to eliminate risk while the master will accept its presence and strive to manage the risk- but not eliminate it entirely.

To illustrate this further the example of a carpenter, George W. Snow who invented balloon framing “[...] in Chicago in 1832 [a system] that used light framing members connected with machine-produced nails.”<sup>30</sup> George W. Snow sought that timber framing was a highly effective system in areas where the trees for building could be found on or around the site but was not effective at being shipped all over the world to places that did not have such resources, as was done at the time. Snow sought out a system, an innovation, which would take from his experience, his tacit knowledge and the tools of timber framing building technique. In particular Snow would draw much of his inspiration from square ruled timber framing and its template jig, the framing square, which provided him with the constraint needed to focus his thoughts onto the particular and by doing so balloon framing drastically reduced the costs associated with shipping. It was so successful that balloon framing virtually wiped out the craft of timber framing at least in the North American context, until the 1970s.

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<sup>30</sup> Sobon, Jack, Build a Classic: Timber-Framed House (North Adams: Storey Publishing, 1994) 9.

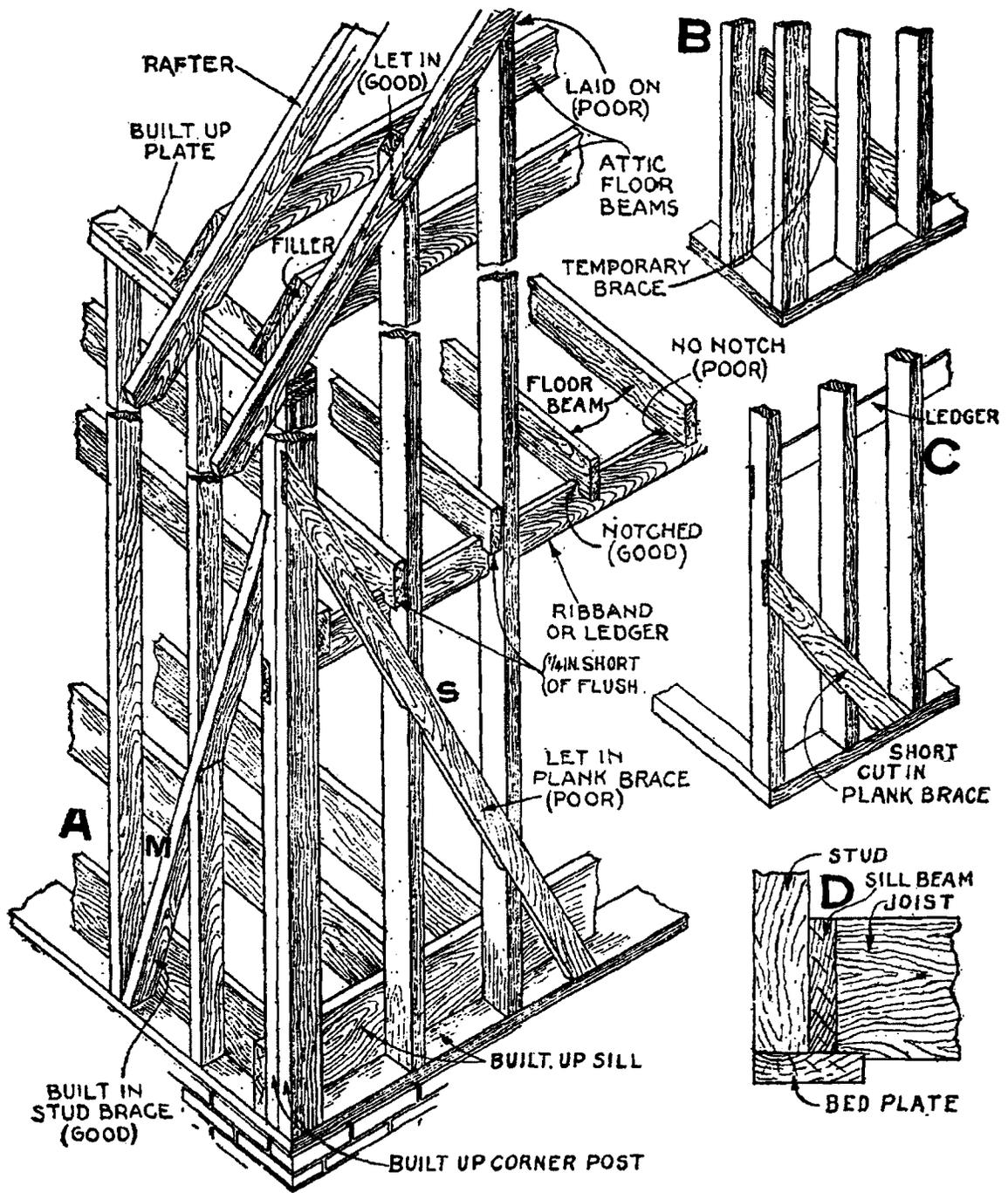


Figure 8 Early Balloon framing drawing still with clear connection to wood joinery

### III:

#### **Honest Material**

Richard Sennett describes “[...] in the eighteenth century [...] “honest” brick evoke[d] a building surface in which the brickwork is exposed rather than covered over: no cosmetics [...].”<sup>31</sup> This concept of “honest” material is not just a phenomenon of the eighteenth century. In my opinion the search for “honest” brick can be observed in the theories of Louis Kahn. This search is evident in his most often coined phrase: “You say to brick, “what do you want brick?” And the brick says to you, “I like an arch” [...].”<sup>32</sup> Sennett would also argue that Alvar Aalto also reveals the “honesty” of his brick in the Baker House by building curved walls that reveal the “presence” of the craftsman to conjure up the knowledge of its making; “[...]at intervals each course of brickwork includes an overburned, twisted brick [...]. We are thus disposed to think about what brick is...”<sup>33</sup> and how it is made. This search for honesty is clearly found in the way the material is worked as a brick is in itself a manipulated natural element.

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<sup>31</sup> Sennett 138.

<sup>32</sup> Cadwell 150-151.

<sup>33</sup> Sennett 143.



**Figure 9 Khans brick arches at the Indian Institute of Management Ahmedabad**



**Figure 10 The Baker House**

I believe that among all of the various theories of truth, honesty and purity, there can be found a link to mathematics and the concept of mathematical beauty. But in order to truly digest what an honest material is we should ask the simplest of questions: what is honesty? According to the Oxford Dictionary, honest refers to something that is “free of deceit; truthful, simple and unpretentious.”<sup>34</sup> And what of pure? It is something “not mixed or adulterated with any other substance or material, or something without any extraneous and unnecessary elements”<sup>35</sup>. In summary for a material to be honest, it must be truthful, simple and without any extraneous and unnecessary elements, in other words only the necessary. These ideas of honesty lead me to the link that exists to mathematics, as a mathematical equation does not tell a lie. In particular this link can be read in the theories in mathematics of Bertrand Russel a philosopher and mathematician. Bertrand Russel described mathematical beauty as “[...] possess[ing] not only truth[s], but supreme beauty — a beauty cold and austere, like that of sculpture, without appeal to any part of our weaker nature, without the gorgeous trappings of painting or music, yet sublimely pure, and capable of a stern perfection such as only the greatest art can show.”<sup>36</sup> Mathematicians sometime refer to this beauty as the expression of elegant methods and this is what I believe to be the only truly truthful, honest or pure gesture as every material is worked or molded in order for it to become architecture. But this begs the question, what is elegance? Elegance can be defined as, “the quality of being pleasingly ingenious and simple; neatness.”<sup>37</sup> An elegant solution may use “[...] a non-obvious method to produce a solution which is highly effective and simple [...] [and]

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<sup>34</sup> "Honest," Oxford Dictionary of English. 2010.

<sup>35</sup> "Pure" Oxford Dictionary of English. 2010.

<sup>36</sup> Russell, Bertrand (1919), "The Study of Mathematics," Mysticism and Logic: And Other Essays. Longman. 60.

<sup>37</sup> "Elegance" New Oxford American Dictionary. 2010.

may solve multiple problems at once, especially problems not thought to be inter-related”<sup>38</sup> The simplest and most elegant solution solving many problems at once in my opinion is that of the template jig as well as the equations that can be found beyond its surface.

#### IV:

#### Tools

What of Pallasmaa’s reading of Heidegger, the belief that the act of building is to dwell. “Primitive man used his own body as the dimensioning and proportioning system of his constructions.”<sup>39</sup> This is still the case today when we refer to the imperial system of measurement as it was originally based on the body parts of royalty. As Pallasmaa has stated in some traditional cultures “[c]onstruction [...] is guided by the body in the same way that a bird shapes its nest by movements of its body.”<sup>40</sup> This provides architecture with a touch of humanity which, in Pallasmaa’s words, “[...] connects us with time and tradition: through impressions of touch we shake the hands of countless generations”<sup>41</sup> and therefore, “[t]he authenticity of architectural experience is grounded in the tectonic language of building and the comprehensibility of the act of construction to the senses.”<sup>42</sup> If, as Craftsmen and Architects, we are to ground architectural experience in “the tectonic

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<sup>38</sup> Zeldes, Nathan. "Ingenious simplicity." Web log post. [Nathan's Possibly Interesting Web Site](http://www.nzeldes.com/Miscellany/Elegance.htm). 11 Oct. 2011 <<http://www.nzeldes.com/Miscellany/Elegance.htm>>.

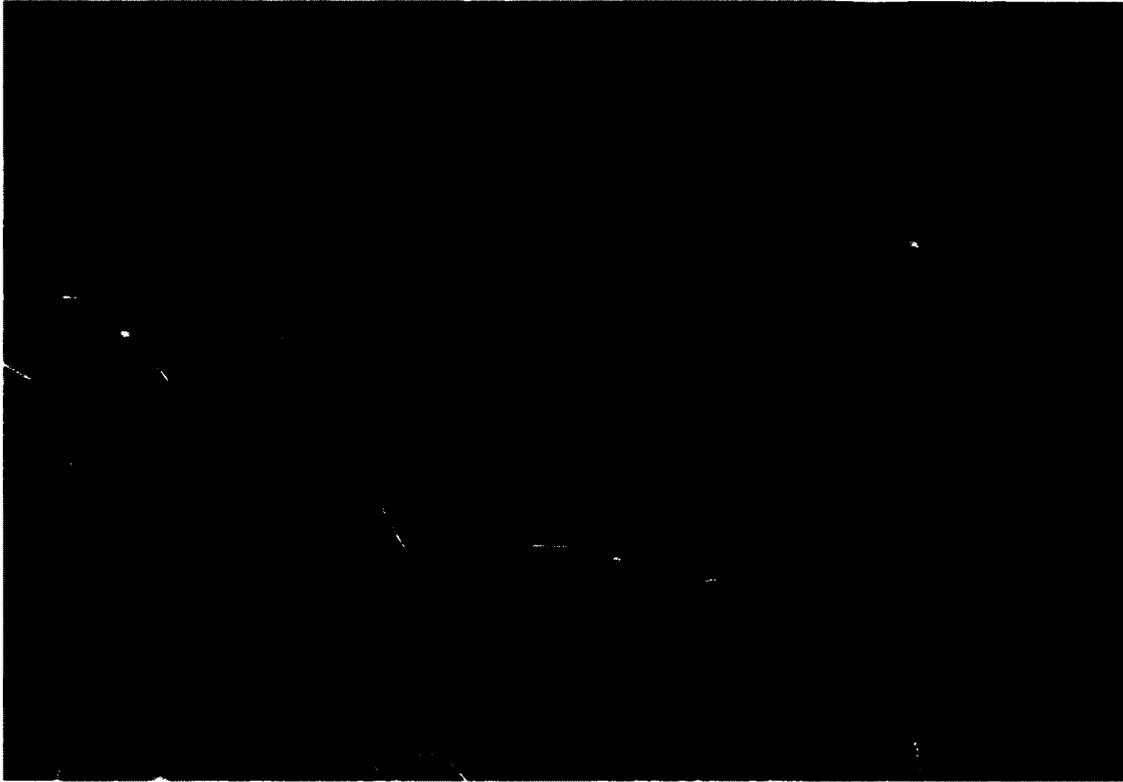
<sup>39</sup> Pallasmaa 60.

<sup>40</sup> Pallasmaa 26.

<sup>41</sup> Pallasmaa 56.

<sup>42</sup> Pallasmaa 64.

language of building”<sup>43</sup>, we must understand the process of building and therefore technique itself.



**Figure 11 A bird shaping his nest with his body**

Tools could be described simply as “[...] an external object as a functional extension of the body, [used] in attaining an immediate goal”<sup>44</sup>, while not being consumed in the process. However, a closer analysis of tools reveals two general categories; simple tools and fit-for-purpose tools. As George Kubler writes “[...] the simpler tools record very large durations [...] more complicated tools record brief episodes of special needs and inventions.”<sup>45</sup> Further, the simpler the tool, the more prevalent and trans-disciplinary its use will be. “Early solutions (promorphic) are

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<sup>43</sup> Pallasmaa 64.

<sup>44</sup> “Tool using” A Dictionary of Animal Behaviour. 2006.

<sup>45</sup> Kubler, George, The Shape of Time: Remarks On The History of Things (New Haven: Yale University Press, 1962) 38.

technically simple, energetically inexpensive, expressively clear. [...] Early solutions are integral in relation to the problem they resolve.”<sup>46</sup>

As Sennett describes, “[s]imple tools often raise this problem; the possibilities of using simple tools in many ways increase the puzzle of how they are best employed in a particular application. A modern analogy lies in the contrast between the Phillips head screwdriver and the flat-edge screwdriver.”<sup>47</sup> Even with the invention of the Phillips screwdriver the flat-edge screwdriver remains in almost every tradesman’s tools box, as it can be used to pry off old tiles, puncturing holes in the edges of a can of paint, as well as perform its main task of screwing a screw. It is important to note that simple tools “[...] can perform complex work only because we have, as adults learned to play with their possibilities rather than treat each tool as fit-for-purpose.”<sup>48</sup> In other words one must develop the tacit knowledge to understand them and their many uses.

The Phillips head screw driver is what Sennett would call a fit-for-purpose tool. While it does an extremely good job of screwing a screw, it can only be used for the task it was designed for and nothing more. “Late solutions (neomorphic) are costly, difficult, intricate, recondite, and animated. [...] Late ones are partial in being addressed more to the details of function or expression than to the totality of the same problem.”<sup>49</sup>

If we are to further analyse tools we come to realise that “[...] (1) in the course of an irreversible finite series [in the evolution of tools] the use of any position reduces the number of remaining positions; (2) each position in a series affords only a limited number of possibilities of action; (3) the choice of an action commits the corresponding position; (4) taking a position both defines and reduces the range of possibilities in the succeeding

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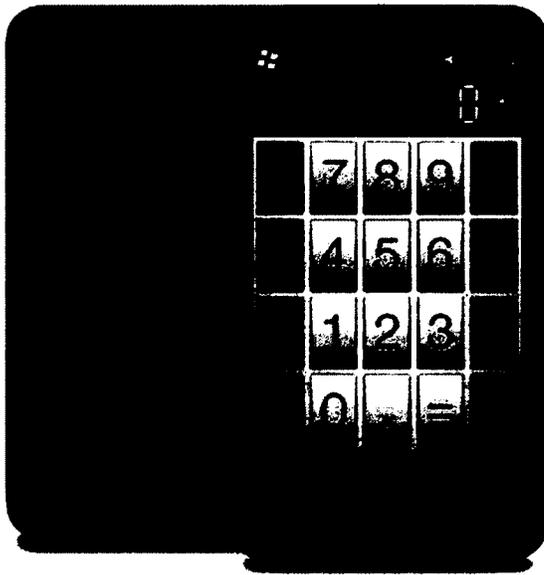
<sup>46</sup> Kubler 55-56.

<sup>47</sup> Sennett 198.

<sup>48</sup> Sennett 273.

<sup>49</sup> Kubler 55-56.

position.”<sup>50</sup> In addition, I would add a fifth category to Kubler’s analysis: establishing adjacency: multiple series may be combined in order to provide further definition to the task as well as more possibilities while at the same instance reducing their ability to only further take positions through establishing more adjacencies, this is primarily the case in digital technologies what is typically called adding functionalities.



**Figure 12 Cell phone with added calculator functions**

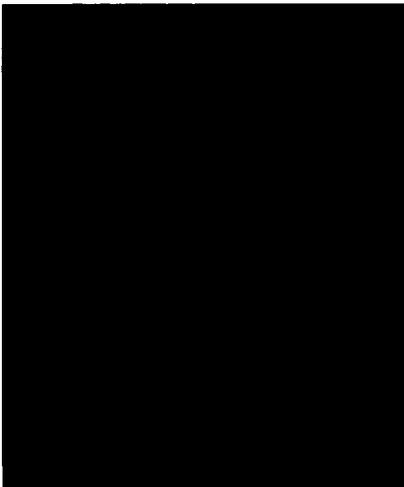
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<sup>50</sup> Kubler 54.

V:

## **Templates and Jigs**

To further understand tools and architecture we must understand the concepts of templates and jigs. As David Pye has said, “[a]ll workmen [or all craftsmen][...] are constantly devising ways to limit the risk by using such things as jigs and templates”<sup>51</sup> A template is a method to limit risk that can be described as a “a shaped piece of rigid material used as a pattern for processes [...] [it is] something that serves as a model for others to copy”<sup>52</sup>. In this way, I would argue that, for an architect, drawings serve as a kind of template. A template can be at the same scale or at differing scales to what is being represented. A template is a guide and provides instructions to the person cutting, moulding or shaping the material being worked. A template requires translation. It cannot be directly used to verify the work directly, as it requires the use of another tool or instrument in order to verify work.



**Figure 13 Template made of rigid material**



**Figure 14 A jig guiding a hand drill**

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<sup>51</sup> Pye 21.

<sup>52</sup> "Template" Oxford Dictionary of English. 2010.

But what is a jig? The Oxford dictionary describes a jig as “a device that holds a piece of work and guides the tool operating on it [...]”<sup>53</sup>. In addition, it is meant to provide repeatability, accuracy and interchange. Like a template, a jig is a guide. But unlike a template, it physically controls the tool or tools that shape the material. A jig allows for a certain sequence of movements or actions to occur to an object and will not allow others. A Jig can only be understood by an analysis of its fixture tool, what its used for, and if we are to gain the “[...]comprehensibility of the act of construction to the senses”<sup>54</sup> then we must understand its template as well. An understanding of the template can only be achieved with the use of a template jig or in other words an instrument. Instruments are “a tool or implement used especially for delicate or scientific work that is used in performing an action or measuring”<sup>55</sup>. The word instrument derives from the Latin *instrumentum* which means to instruct, direct, command, inform or even to teach.<sup>56</sup> This has great implications for the architect as the instrument can provide a frame or restraint in which instructions can be provided more clearly and succinctly to the worker. This implies however the architect must design using a method called instrumentation, that meaning “the arrangement or composition of a piece [...] for [a] particular instrument.”<sup>57</sup> A template jig or instrument is a physical or digital embodiment of what is to be produced and can be used to mark directly or indirectly a material with the task needed. It is in physical form a simple tool like that of a compass. It is a measuring device or instrument with a certain physical memory. In the digital world it is the algorithms of a parametric model. A major issue with the digital template jig is there is

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<sup>53</sup> "Jig" Oxford Dictionary of English. 2010.

<sup>54</sup> Pallasmaa 64.

<sup>55</sup> "Instrument" The Canadian Oxford Dictionary. 2004.

<sup>56</sup> "Instruct" The Canadian Oxford Dictionary. 2004.

<sup>57</sup> "Instrumentation" Oxford Dictionary of English. 2010.

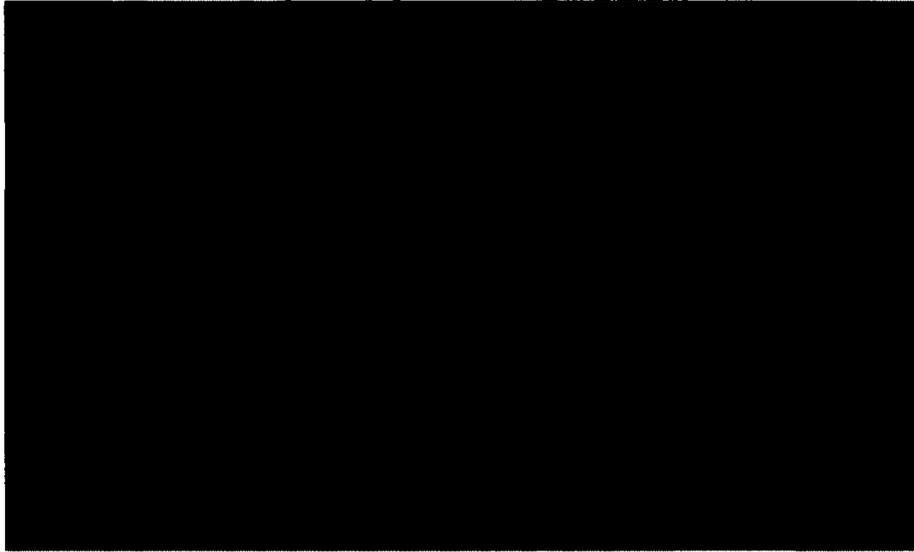
nothing to provide you with restraint; the machine can produce almost anything imaginable with unlimited amounts of variation which can make it non comprehensible to the senses. One must always be able to represent the template jig in a physical object; every operation performed should be purified to its mathematical equivalent in equations and adjusted for the “musical range” of the physical instrument. It is particularly important to retain the physical template jig as work is almost always assembled by a worker. A good template jig should be able to guide the hand of the worker while at the same time provide guidance to the thoughts and designs of the architect. By imposing upon ourselves restrictions brought on by such a template jig, we are showing contingency and restraint and allowing the process of the collective craftsmen to take place. The imposition of a physical template jig is not a limiting transgression but rather a freeing one by allowing our minds to focus on what is important. It can allow for an amount of self regulation rarely seen in modern times; the architect, the worker, the client any passer by can verify the work being done as long as he has acquired the tacit knowledge to use the template jig.

**VI:**

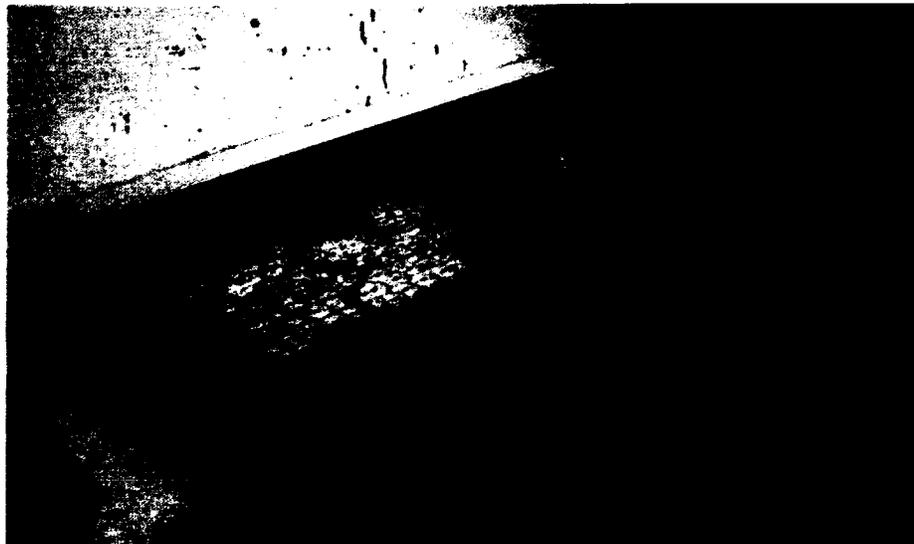
### **Crafting Architecture**

We as architects must come to terms with the fact that there will always be interpretation, but we can attempt to limit it. We must always draw with a certain amount

of geometry but must understand that what we draw is the “‘prima materia’ of Plato”<sup>58</sup> and a return to what Marco Frascari would call “geomatter” is what is needed, — an idea prevalent in the Master builder’s way of thinking.



**Figure 15 First Site Model based on Cartesian ideal form**



**Figure 16 Second site model based on geomatter and the Japanese carpenters square**

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<sup>58</sup> Pérez-Gomez, Alberto, Hermeneutics as Discourse in Design. Design Issues 15.2 (1999) 73.

The contrasting ideas can be seen within these two site models. The first in which the ideal form (template or drawing) is taken put on a Cartesian grid that refers to the absolute origin and every point refers back to that origin. This model does not take into account the method of making the model and attempts at recreating in three dimensions the ideal form or drawing, even though the ideal form is not the exact copy of what it is representing. The second model is attempting to take into account the material of the model its making and a template jig to guide its making. This shift in thinking would reduce the gap between ‘design intent’ and that of actual building by way of thinking through designs using a template jig and with actual materials. Each line would not be referring to itself but to an actual material one that we can touch from this earth as well as to a template jig. As architects we must remember that “[n]othing has ever been square because nothing has ever been straight, nor has anything been flat, nor spherical, cylindrical, cubical.”<sup>59</sup> These are geometric concepts that are necessary for us to be able to communicate our design intentions but are never true. In David Pye’s words; “in a designer’s drawing all joints fit perfectly”<sup>60</sup>, but if an architect is indeed thinking of geomatter rather than geometry, then he will design a joint with play, that can be regulated and verified using a template jig, a joint that can be truly realized in construction reality. Architects and the design team are to construction as the conductor/composer is to the orchestra where as David Pye has said “each player (workman) – is interpreting – (working to) – the same score – (design) – and is called on to play the instrument – [apply the template jig]”<sup>61</sup>

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<sup>59</sup> Pye 30.

<sup>60</sup> Pye 31.

<sup>61</sup> Pye 54.

Just as the template jig the architectural drawing guides the hand of the worker. In both cases a worker's product is still "[...] not predetermined, but depends on the judgement, dexterity and care which the maker exercises as he works."<sup>62</sup> The main difference between the two is that a template jig allows for more regulated work to be applied directly to a material (a jig), where as the architectural drawing is an indirect way in which to provide regulation for the work being done (a template). David Pye defines regulated workmanship as "[...] workmanship where the achievement appears to correspond exactly with the idea; things meant to repeat appear to repeat exactly, things meant to be square look exactly square, and so on."<sup>63</sup>

Given that an architectural drawing is an indirect method of regulation, a deep understanding of technique and therefore the evolution and use of tools is required. "Technique is the knowledge of how to make devices and other things out of raw materials. Technique is the knowledge which informs the activity of workmanship. It is what can be written about the methods of workmanship."<sup>64</sup> The architect of craft must become the worker as he designs, envisioning himself inside the construct ,building it piece by piece inside his minds eye as he draws. As Kahn said "[...] to draw as we build[...]."<sup>65</sup> This would imply architects don't just make representations of buildings, but rather an architect is fully involved in the making of a building. Drawing an architectural drawing can be similar to the spell check function of word processors; it can give a false sense of security by not providing resistance to your actions as you draw.

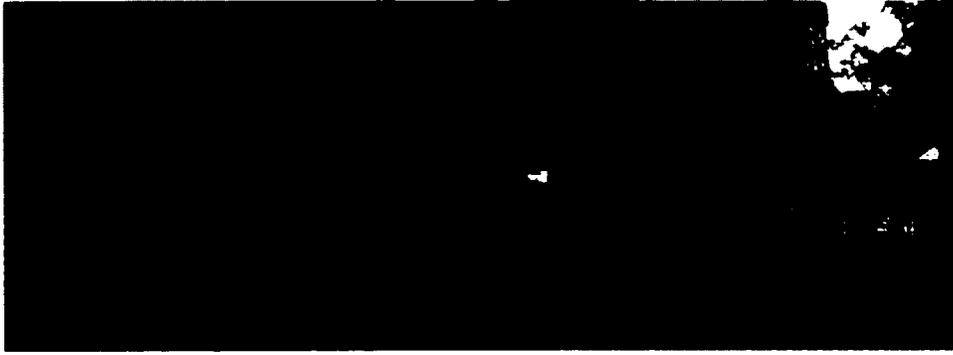
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<sup>62</sup> Pye 20.

<sup>63</sup> Pye 52-53.

<sup>64</sup> Pye 51.

<sup>65</sup> Cadwell 153.



**Figure 17 MEC on Richmond road Ottawa, timber braces built on center**

This false sense of security can be observed in, for instance, the front of the Mountain Equipment Co-Op on Richmond road in Ottawa. The architects of the building decided to put traditional timber joints on the centre of the timber posts. This was not an innovation but rather an aesthetic decision. They displayed in this joint that they understood to a degree the method the joints are cut but also displayed a lack of understanding of how the worker regulated his work within the joint. On centre measurements come from steel construction as they only require to cut through small sections of consistently dense material at a time. Timber, on the other hand, never was nor should be designed with on centre measures, as it severely limits the ability of the worker to regulate, and therefore puts at risk the ability of the worker to produce good work. If they understood the framing square or even the scribe tool, both traditional template jigs used in timber framing, before drawing they would have never designed with on center measurements, but rather using reference faces, in other words from edge to edge. A worker establishes the center line by measuring from one edge to another and using his eyes approximates its distance from the first edge, calculates the center mathematically and with his eyes approximates this mark as well, therefore what we know for certain is a distance from one face and that any on center measurement is an

approximation. This reference face can even be seen with the modern CNC machine as it assumes its cutting table is flat. The use of on center measurements goes against what the architectural drawing should do, that is to help regulate work indirectly by an understanding of tools and technique.



**Figure 18 Measuring from a reference face using a Japanese carpenters square**

What is integral to the creation of a template is an understanding of both the tools being used to cut and to verify as well as what they are being applied to. If there is no understanding of these basic elements the template jig will fail to achieve its task of regulation and be utterly useless to the worker. A stark example of this can be seen in the use of a modern tool, a three axes drill computer numerical control machine (a CNC machine), in which the worker is virtually eliminated. The architect or designer must understand the limitations of the tool in order to create a digital template jig. He must

understand that the CNC machine can only cut on 3 axes and that the tool is not capable of creating inside square corners. Even if he understands these basic concepts and incorporates them into his template jig, it is still useless if on cutting day he decides to place a block of concrete on the table to be cut by the CNC machine. As David Pye has written “[...] [Craftsmanship] is what for practical purposes the designer cannot give effective instructions about by drawings or words, although he can envisage it perfectly well.”<sup>66</sup> And envision it, he must.

A musician through the technique of instrumentation begins composing a piece of music knowing the instruments he was to play it on. Similarly an architect must know the tools that can be used to cut materials as well as know the template jig he will use to regulate the work being done. An architect must design knowing the “instrumental range” of the template jig he chooses to employ in his design. What can the tool do, what can it do well, what can’t it do, what does it do poorly, the architect must find ways of exploiting the template jigs full range as well as extending its range by way of modification and jigs. This same concept can be seen in both square rule timber framing and balloon framing where the framing square was fundamental and its instrumental range exploited. For instance in balloon framing the common spacing of joist are sixteen and twenty four inches, the same length of the two blades of the framing square, not only that the blade width of two inches is the same as a rough sawn piece of construction lumber and the other blade width of one and a half inches is the same as a finished piece of construction lumber, this is no coincidence.

This brings to light the view of authorial architect as artist; however it is not the true nature of architecture, architecture is not an art but a craft as “[t]he line between craft

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<sup>66</sup> Pye 51.

and art may seem to separate technique and expression.”<sup>67</sup> An architect who considers appropriateness in context is not the inward turned artist only concerned with expressing his ideas, but the outward looking craftsman trying to better his community.<sup>68</sup> The artist is a claim to me and mine but what architects produce is for us and all. As architects, we never work alone. Even in an architecture firm, multiple people collaborate on the same project. A principle architect may have the last say, but he is not asked to make every decision, nor can he; what he needs is a template jig to help guide the team.

As architects of craft we must come to understand tools, techniques and in particular template jigs as an extended mind that meaning objects within the environment that functions as a part of the mind.<sup>69</sup> Andy Clark and David J. Chalmers state “[...] the human organism is linked with an external entity in a two-way interaction, creating a *coupled system* that can be seen as a cognitive system in its own right. All the components in the system play an active causal role, and they jointly govern behaviour in the same sort of way that cognition usually does. If we remove the external component the system's behavioural competence will drop, just as it would if we removed part of its brain.[...]”<sup>70</sup> One mind that unlike the one in our heads can be shared with the worker and should be shared. The notion of the incompetent worker denounced by the simple statement of “he should have looked at the drawings” speaks more of the misunderstanding of the architect than the incompetence of the worker. “[...] [T]he relevant external features are *active*, playing a crucial role in the here-and-now.”<sup>71</sup> The

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<sup>67</sup> Sennett 65.

<sup>68</sup> Sennett 65.

<sup>69</sup> Clark, Andy, and David J. Chalmers. "The Extended Mind." The Extended Mind. Washington University. 25 Nov. 2011 <<http://consc.net/papers/extended.html>>.

<sup>70</sup> Clark, Chalmers.

<sup>71</sup> Clark, Chalmers.

architectural drawing cannot be referenced before every task is done but what can be referenced are the tools the worker carries with him and the materials he is working with.

An architect must be particularly careful when it comes to digital fabrication .If done incorrectly it will eliminate the ability of the worker to regulate their work and thus the worker can only assume that everything fits together perfectly and the way it was intended. This is a frightening thought as even with pre-manufactured elements the worker still has found ways of correcting imperfections in the “perfect”. The craftsman has also needed to modify pre-manufactured parts for them to function in the way they were designed to. This modification occurs mostly because the architects or designer do not understand how buildings are assembled.

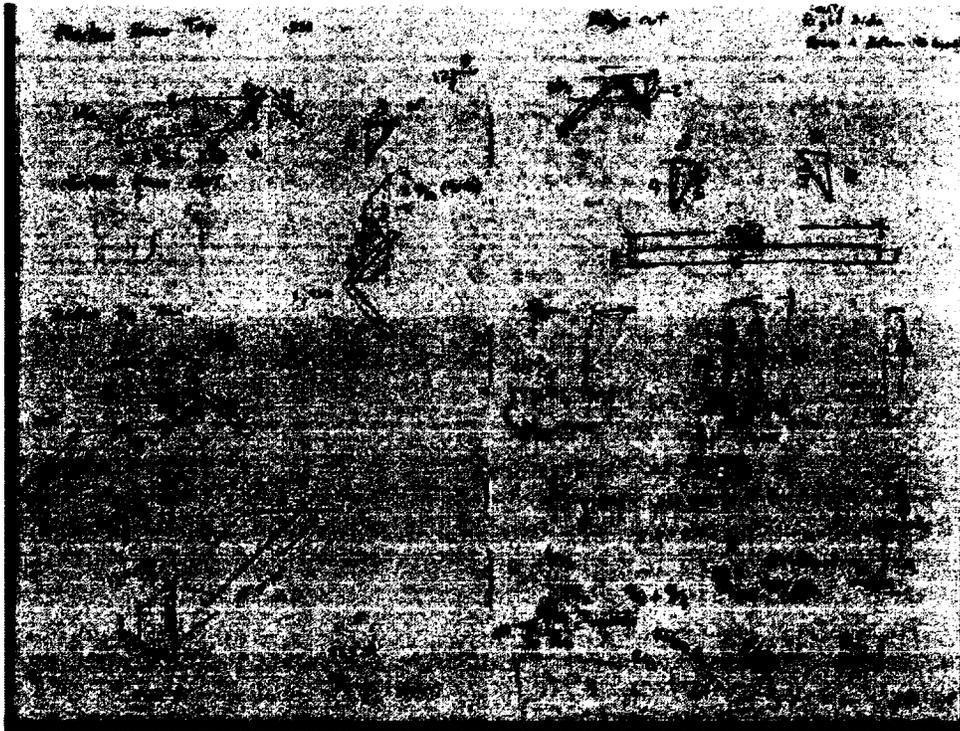
One must never forget that architecture is made by way of workmanship and what is suppose to be level appears level but is not perfectly level. An architect must realize that workmanship attempts to achieve “trueness” not “perfection”. The concept of “true” meaning that over the entire distance of the element measured for level is level but over that same distance the element varies in levelness. The worker must always retain his ability to regulate the work being done in order to ensure that the work being done remains “true”.

In order to truly understand craft architecture we must start our design from the scale of the worker, that of the construction detail, using real material, like the worker, using a template jig to guide us, as the worker and each detail referencing the last, like the worker. This must be done by hand to increase our tacit knowledge and if we are truly to hone our skills as architects, it must be done in a functional object that is at a scale that enables us to think using a template jig like the crafts.

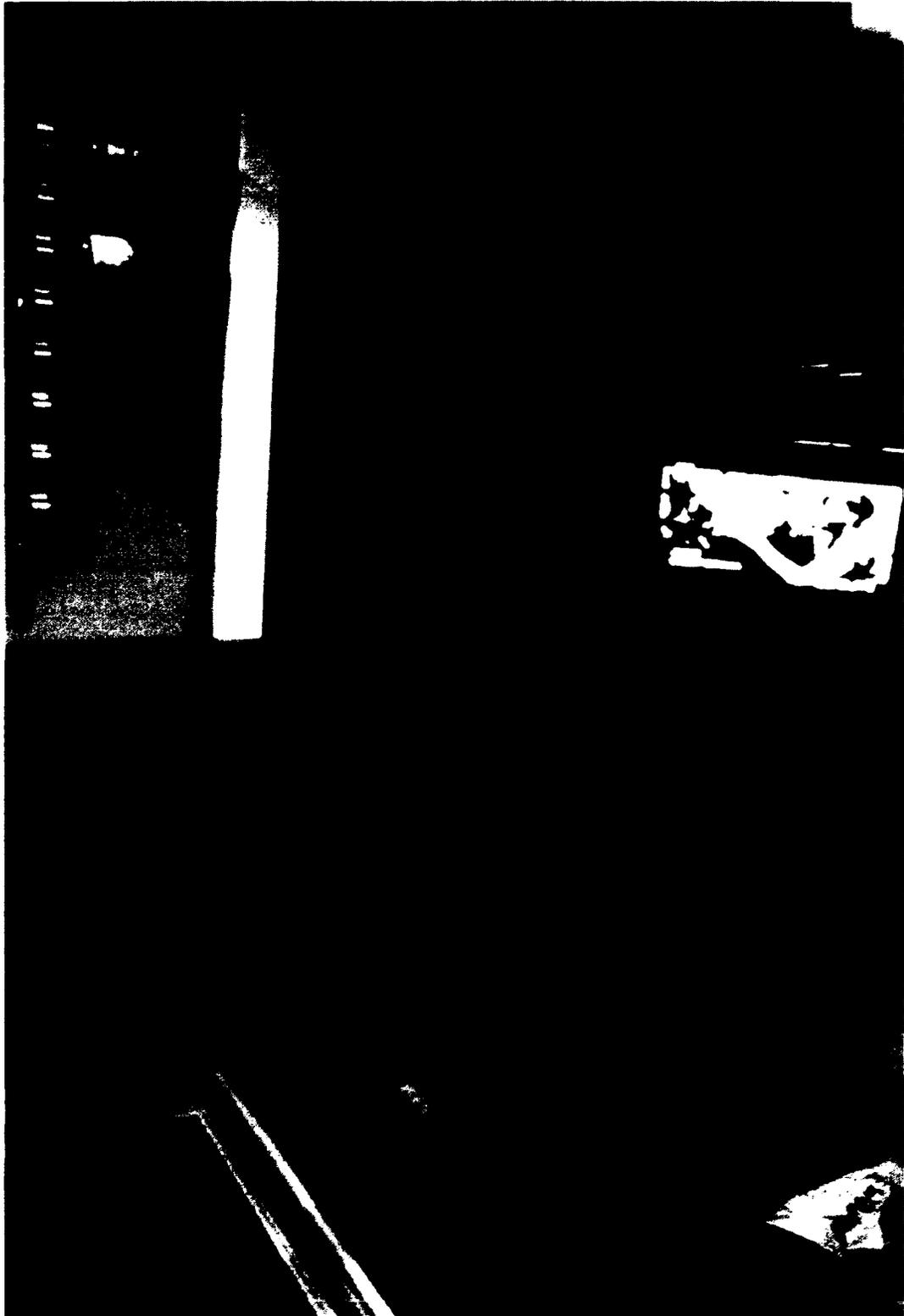
## VII:

### The Framing Square

The free space of furniture design and construction was the process in which my project began. I chose in my architectural project to exploit the Template Jig of the framing square, in other words the North American carpenters square and to aid in exploring its possibilities through furniture design and construction the squares smaller cousin, the Japanese carpenters square. The chapter that follows is an analysis of research as well as what was learnt in the process about the framing square and its many uses.



**Figure 19 Drawings of my breakfast bar, my the first exploration**



**Figure 20 Photo of completed breakfast bar**

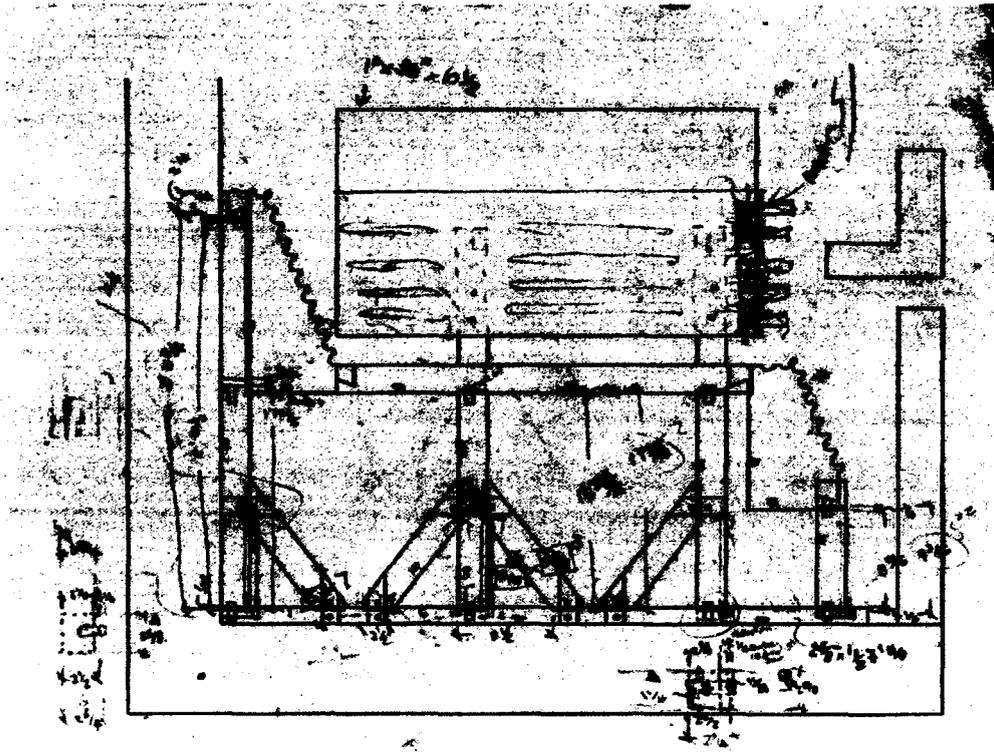


Figure 21 Elevation/ section of my bench, my second exploration

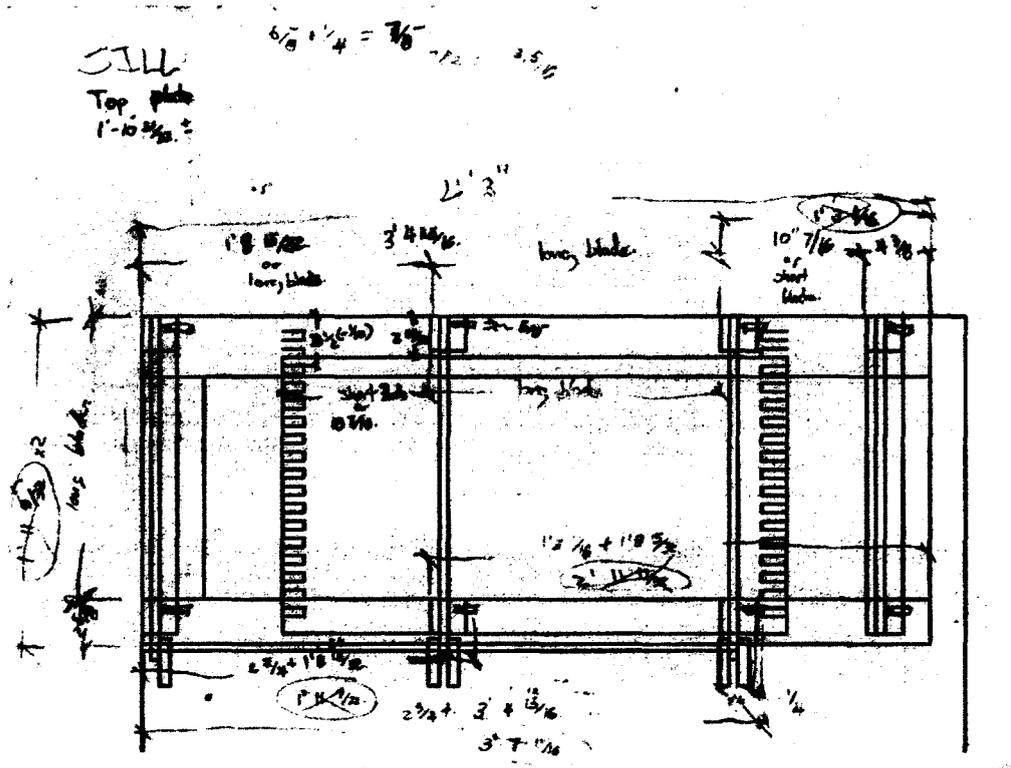


Figure 22 Plan/ section of my bench, my second exploration



**Figure 23 Photograph of bench completed**

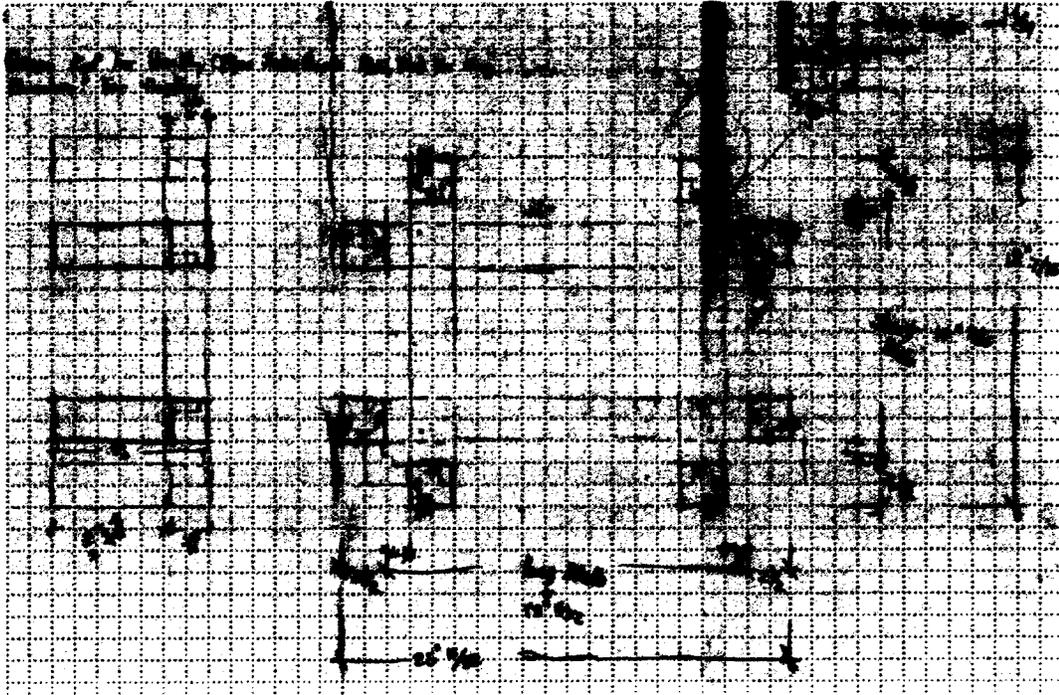


Figure 24 Plan/ elevation/ detail of my planter, my third exploration

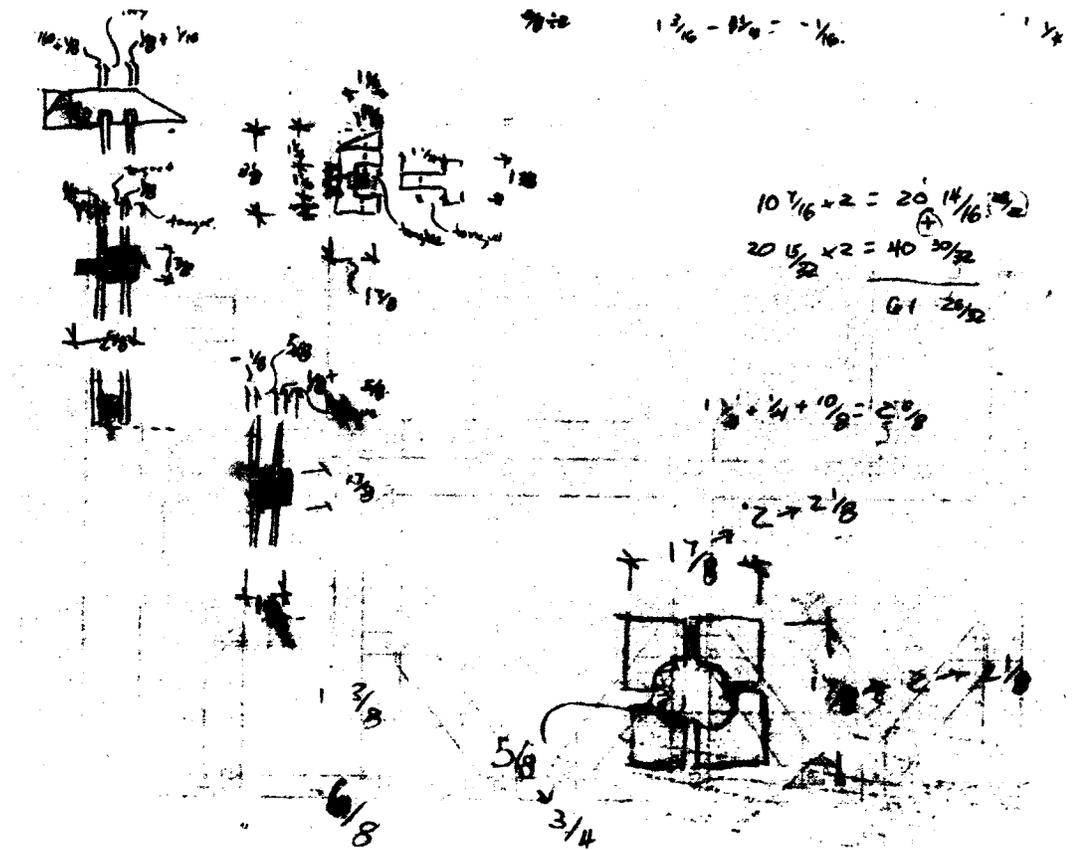
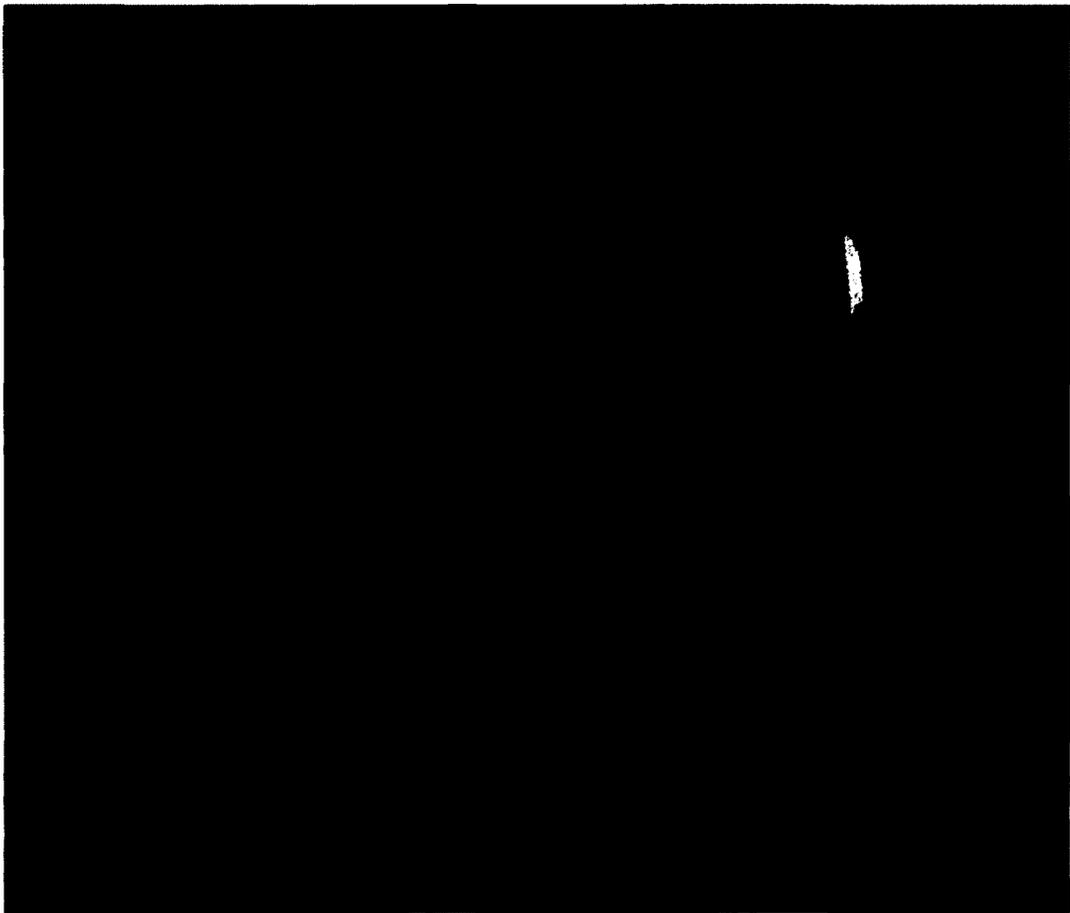


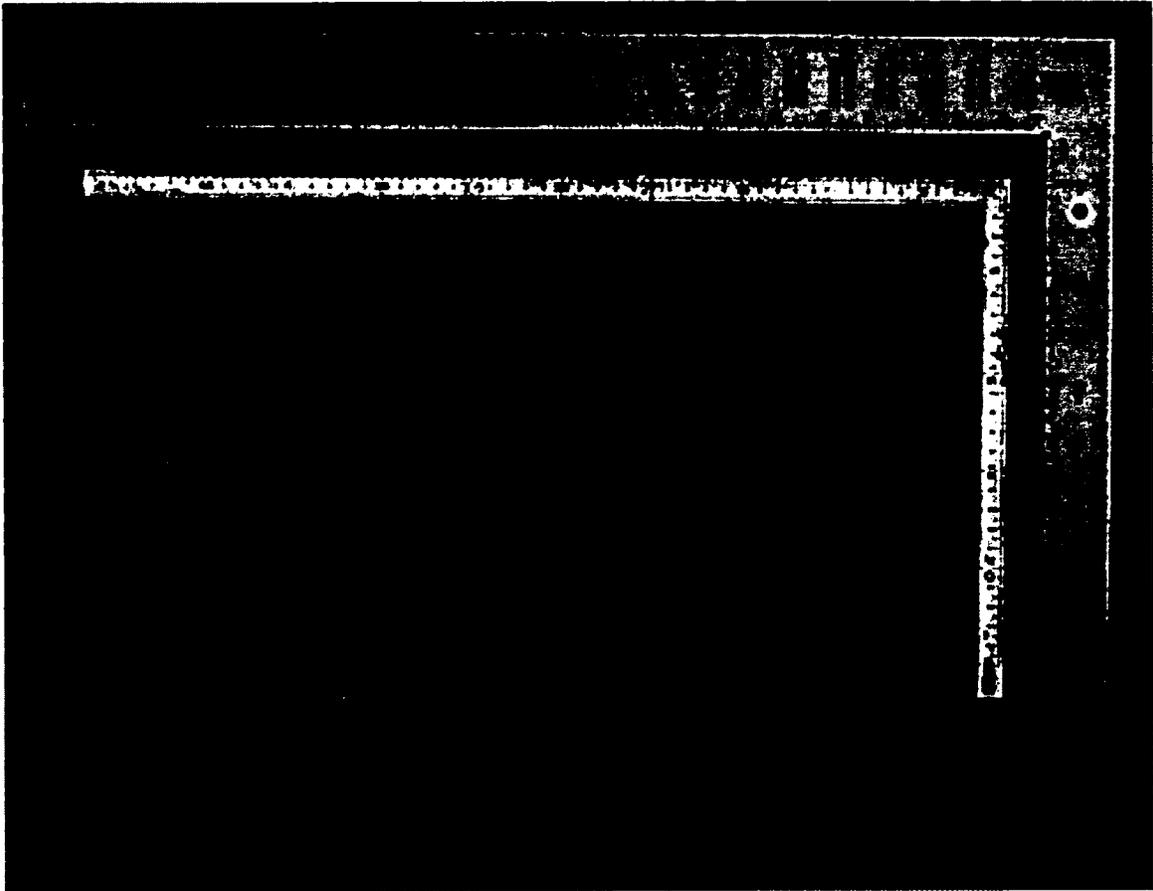
Figure 25 Details sketches of glazing and corner bracket for my planter



**Figure 26 Sketches thinking through copper and glass for planter**



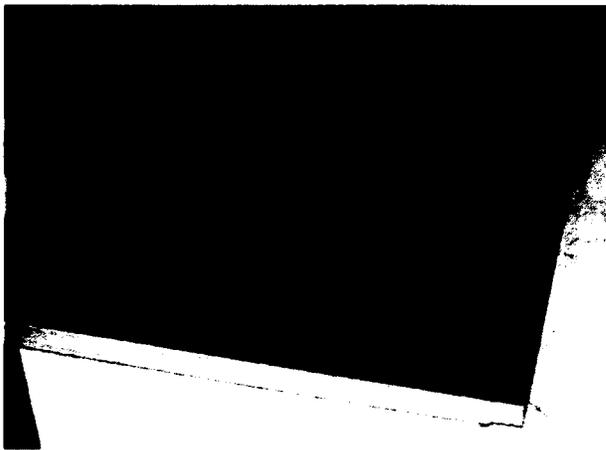
**Figure 27 Photograph of planter completed**



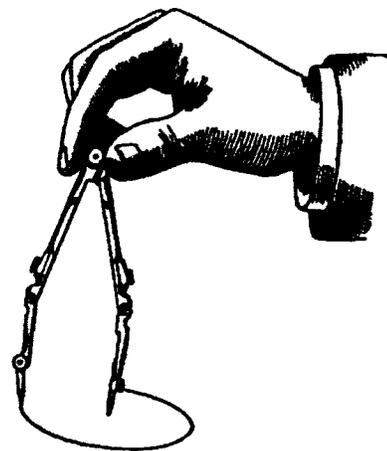
**Figure 28 The framing square with its Japanese cousin**

It became clear to me that in order to understand the framing square and its many uses it is important to understand its evolution; this reveals how best to employ the template jig and helps discover new uses. The evolution of a simple tool, the string, helps to illustrate how increasing specialization introduces constraints on the versatility of that tool while later establishing adjacencies increases its uses. The string starts to become useful as a tool when one end is fixed. Once this occurs, one can use it to establish a level line, to measure a distance or to trace a sphere in 360 degrees, this relating to the mathematical equation of  $x^2 + y^2 + z^2 = r^2$ . The string allows you to do almost anything and is only limited by the length of the string itself. The string gave birth to the compass

which allowed, with a fixed point, to measure, a distance considerably shorter than that of the string but more accurately, as well as trace a circle in 360 degrees, this relating to the mathematical equation of  $x^2 + y^2 = r^2$ , not a sphere. Not only does the compass severely limit the capabilities of measuring and tracing a sphere of the string but it nearly completely eliminates the ability to determine the level line. The limitations of the compass originate in its conception as a tool for the use in two dimensional representation and measurements.



**Figure 29 Using a string to draw a circle**



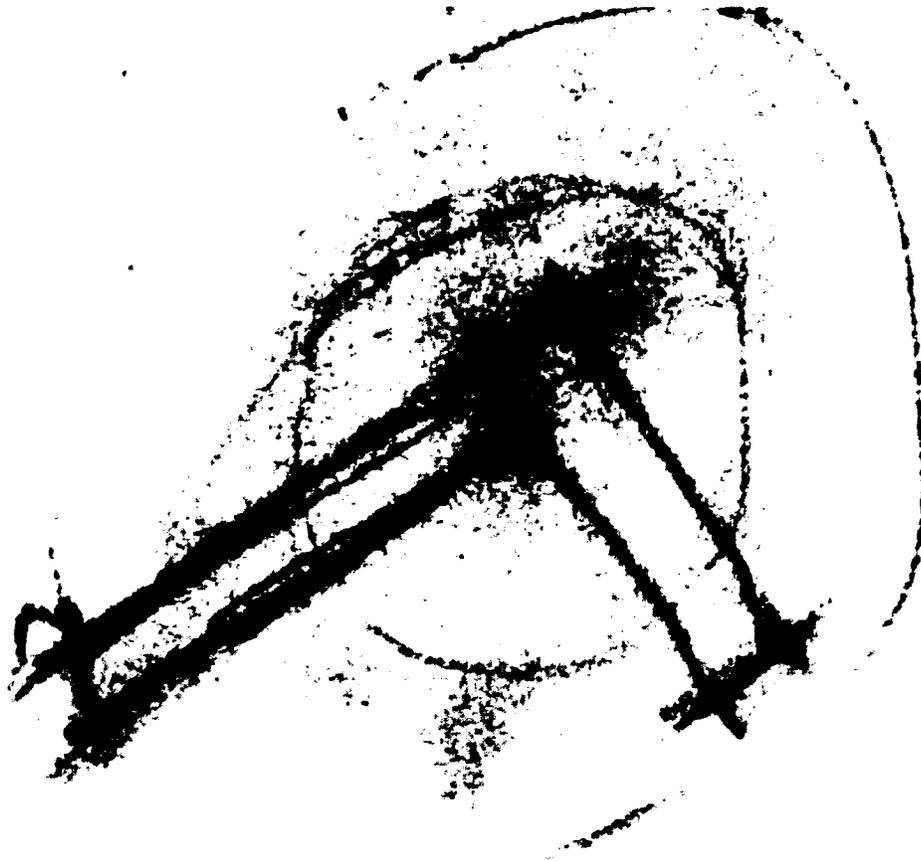
**Figure 30 Using a compass to draw a circle**

The next step in the evolution of the tool was that of the framing square; it again further limits ones abilities to do work but further defines the work being done. The framing square is capable of doing all that the compass does, albeit differently. It can measure making use of the imperial system and these measurements are limited by the length of the blades either sixteen or twenty four inches depending on the blade used. It is further limited by the fixed linear nature of the blades, as it cannot measure items in a tight situation unlike a compass. The framing square also cannot measure a distance between two objects with a protrusion between them, as it must sit flat on the objects

being measured; however, this same task can help the worker determine a surfaces shape rather than just determining two fixed points. The framing square is also capable of tracing a circle like a compass by providing a fixed point to spin upon, that point being the inner connecting angle of both blades. Once provided, however, the framing square is only practically capable of tracing circles with a radius of fourteen or twenty two and a half inches, the length of the inside of the blades.



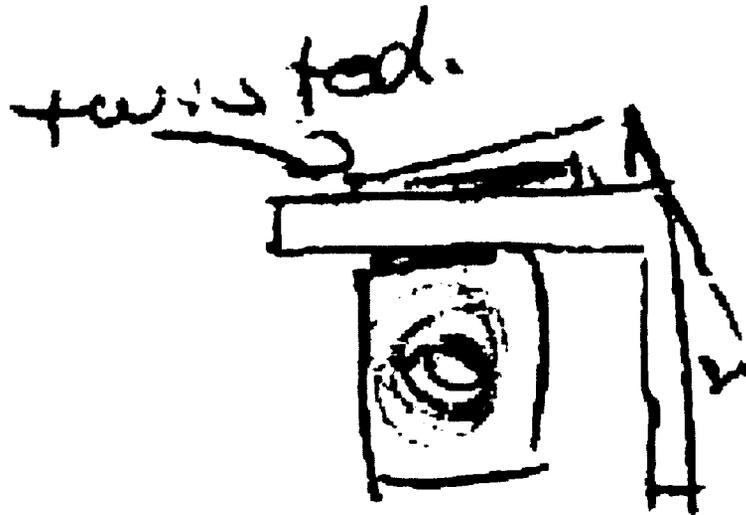
**Figure 31 A Japanese square used to verify a surface in a mortise joint**



**Figure 32 A square used to draw circles with one fixed point**

What is particularly interesting about the framing square is that it combines multiple simple tools into one tool. It establishes adjacencies, of the sequence of the string to form new possibilities those being, for example, the ideas originating from the string of level and square, which can be defined as a level string line in combination with a plumb line string (this would be named square and plumb), as well as the ruler, originating from the straight edge. The framing square provides the ability to determine if an object is square by placing the two blades against the object and observing if there are any gaps between the framing square and the object and if so then it is not square. It is also capable of determining if an object is level by placing one framing square at each

end of the object and sitting down the object if there are any twists or curves along the object you will observe the squares blades off angle from each other.

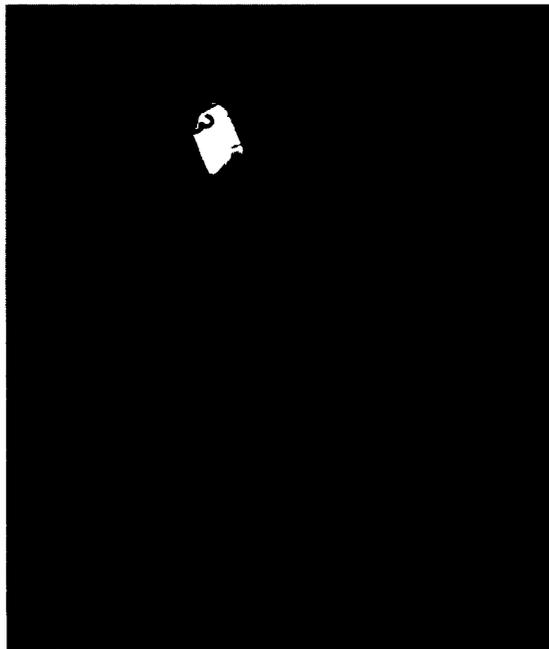


**Figure 33 Sketch of using two square to determine level ness**



**Figure 34 Japanese square used like a ruler to determine slope on half dovetail**

The framing square can also perform a task of quickly providing a slope like a ruler by the width of the blade and the length chosen, of course limited by the blades length. The framing square's two perpendicular rulers also allow for the tracing of slopes of various angles, by providing a rise and a run measurement, limited only by the length of the blades, a task that a single ruler can accomplish but in far more time and far less accuracy. The framing square also allows for a new and very accurate method of drawing a circle deriving from its origin as a tool meant to trace the largest square timber possible out of a tree round by providing two fixed points determining the diameter of the circle, and tracing the outer or inner tip of the joining blades, depending on the edge used on the reference points. This method of drawing a circle is limited by the length of the smallest blade and calculated by way of the Pythagorean Theorem ( $a^2 + b^2 = c^2$ ), the hypotenuse referring to the diameter of the circle. Therefore with the framing Square a full circle can be drawn with this method up to a diameter of twenty two inches and five eights.



**Figure 35 Japanese square used to verify a circle with two points**

In addition, to these established adjacencies, the framing square was conceived in its current form for the use of joiner carpenters in timber framing around 1800. The framing square made it possible to prefabricate interchangeable pieces that did not need to be preassembled, as was the case previously.<sup>72</sup> The way they achieved this with the framing square was by making use of the width of the two blades, one being two inches the other one and a half inches wide, these blades were to be a template jigs for the entire framing system known now as the square rule. The blade widths were used as the module for the placing, dimensions and verification of joints and pegs. For example, the verification of mortise joints was done by trying to put the blade into the mortise and if it could slide down through the entire joint the mortise was correct, the square in this case becomes an extension of the tactile sense of the worker as it feels both inside edges of the mortise. It should be noted that early framing squares had deeper blades as there were still large supplies of old growth forest for the use of timber framers. The tools passed on the knowledge of the appropriate sized joints by its blades width. This could be understood as a kind of collective memory pasts on through the tool itself from past generations of master carpenters. Square rule timber framing is an expression of how techniques or tools, and in particular the framing square is the origin that created it.

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<sup>72</sup> Sobon, Jack, and Roger Schroeder, Timber Frame Construction: All About Post-and-Beam Buildings (North Adams: Storey Publishing, 1984) 73.



**Figure 36 Square used as an extension of the tactile sense to verify mortise joint**

A mathematical analysis of the framing square and its most common relationships with timbers reveals a clear link between the square's dimensions and two basic rules of thumb used by countless generations of carpenters and architects, those being the golden ratio and the three, four, five rule. Its blade dimensions, if put into a relationship, make for sixteen by twenty four. If simplified, this makes for two thirds; therefore, twenty four is one third more than sixteen making an exact link to the golden ratio. When the multiples of the square are put into relationship with the possible multiples of the three, four, five rule along with a relationship with the most common timber sizes of nominal eight by eight and eight by sixteen inches, the brace length and joint relationship to the overall is exactly one third, two thirds as well. These links are clear and make not only

the joints verifiable using the square as in square rule timber framing, but the length of the braces as well.



**Figure 37 Sketches showing mathematical analysis of square and relations to timber sizes and braces**

## VIII:

### Site Considerations

With an understanding of the “musical range’ of the template jig one must begin to analyze the site in which the architectural project will take place. The site shall be the old Ottawa Workshops Building at Seven (7) Bayview Road in Ottawa, Ontario. The site is located between the neighbourhoods of Hintonburg, Mechanicsville and the Lebreton Flats and is found in the old industrial heart of the city of Ottawa, which was a huge driver for the local economy even before the arrival of the federal government.



**Figure 38 Looking North towards the Ottawa Workshops Building along Bayview rd.**



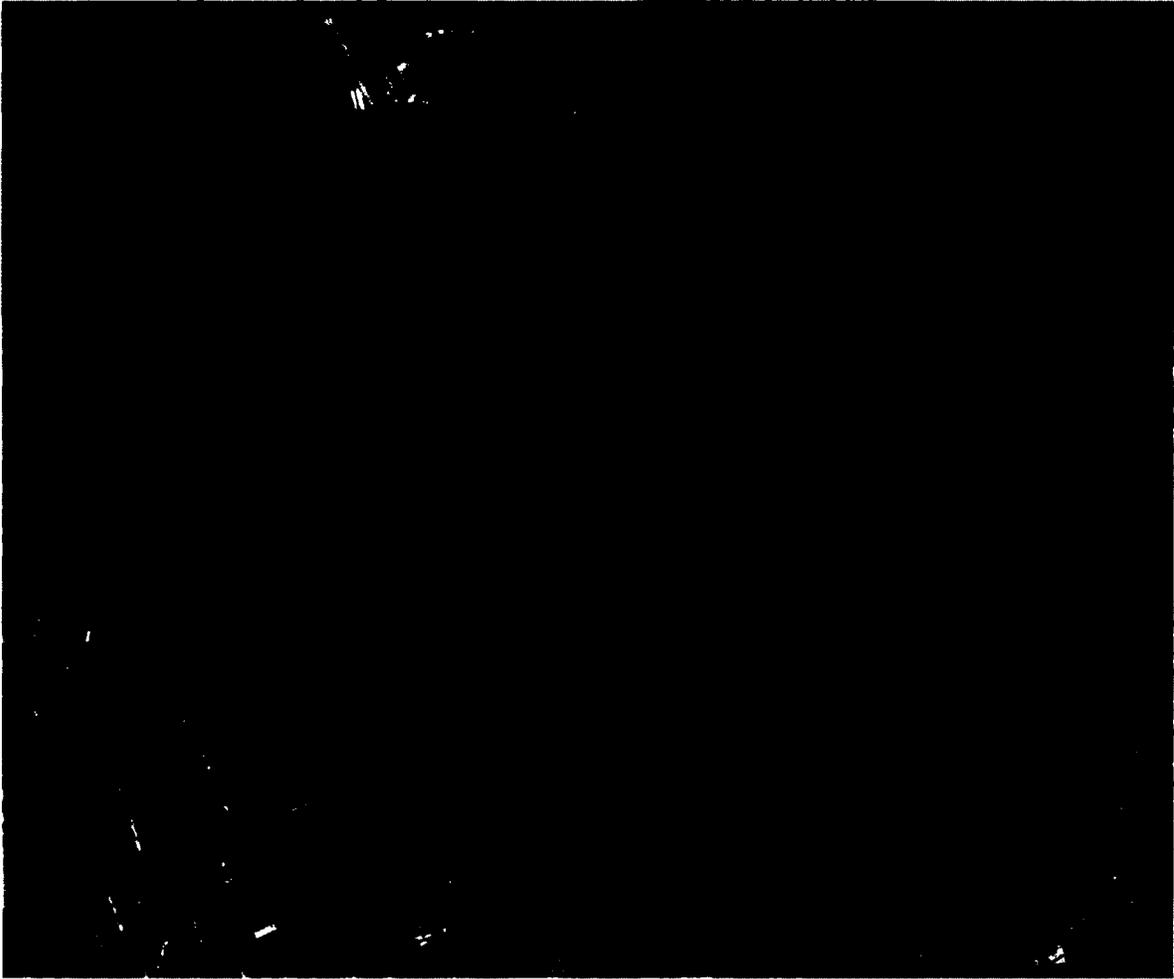
**Figure 39 Looking East towards the Ottawa Workshops Building along Burnside ave.**



**Figure 40 Site in relation to the neighbourhoods around it**

Around the site there were lumber mills to the North East at the Chaudière falls, as well as directly to the South East along Mill Street. The railway to the south, now the transit way, to the north, now the Ottawa River Parkway, and the East, now used for the O-train. A brick yard once lay on and around the site, and portions of it still functions to this day (in a sense) as Merkley. Just South and East once stood the public stables for the City of Ottawa, where carriages would have been kept and maintained. In addition, to the

South West, Mechanicsville and Hintonburg, have been historically the locations for car dealerships and mechanic shops in the Nation's Capital. Even to this day, there are many small car dealerships and mechanics shops scattered through out its streets. Far North on Lemieux Island sits the water treatment plant for the city and immediately to the North lies the Ottawa River Parkway, a testament to the Federal Government's dominance over industry in Ottawa, as they bought and demolished many industrial buildings for its construction. The Parkway also exhibits the dominance of the automobile over planning in the Nations Capital after the Greber Plan of the 1950s. It is considered to be one of the National Capital Commission's processional boulevards to Parliament Hill. The site has a long history connecting it to the craft industries and the auto industry, a site where things have been and continue to be made to this day. The tradition of the auto industry seems an appropriate use of the building given the site and building's long history connecting to such uses. This use will also allow for the majority of the building to be reused without the need for major changes. The site lends itself to an auto dealership showroom addition to the North, visible from the Ottawa River parkway and the river, while allowing the existing building facades to remain the dominant feature along Bayview Road and Slidell Street.



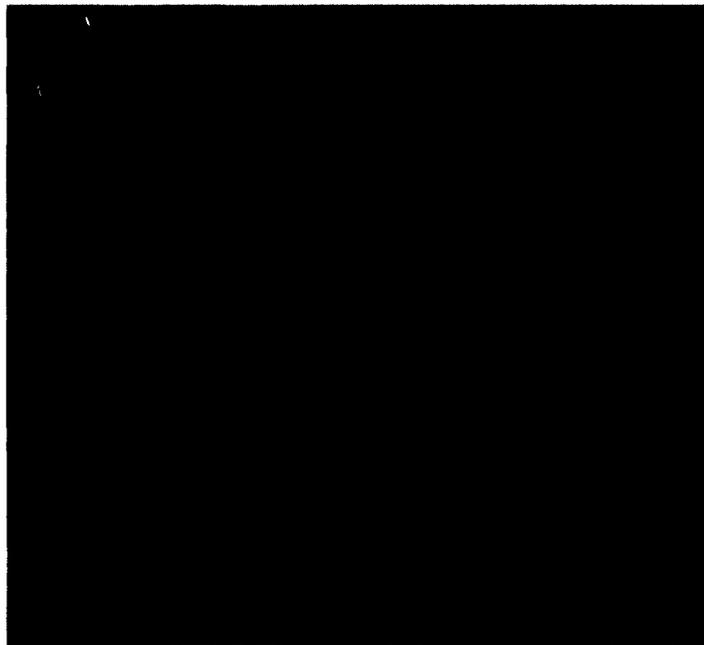
**Figure 41 Site Plan showing surrounding area**

**IX:**

**Materiality**

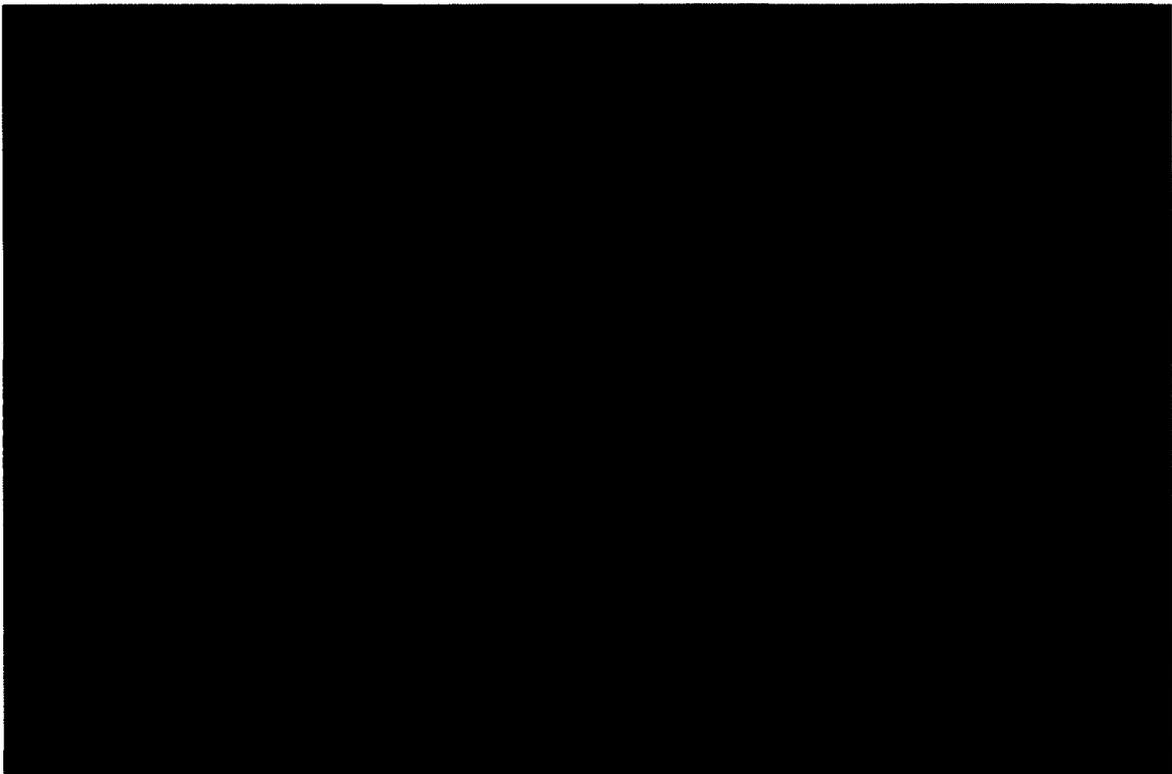
On the site itself an existing building, the Ottawa Workshops Building sits in disrepair and disuse, used primarily for storage and maintenance of the works department's vehicles. Just as the crafts were not developed from scratch, this architectural project shall, wherever possible, build upon what is already there and make improvements where necessary. The car having its origin in the wooden carriages that

occupied this site a century ago along with the concrete structure of the Ottawa Workshops Building having begun its life as a timber structure, the use of wood construction seems most appropriate. The framing square, the site, and its surroundings have a long standing connection to the lumber industry. Timber's relative ease of onsite workability makes it an appropriate choice for the primary material of the building. The primary timbers used shall be salvaged from the bottom of the Ottawa River the wood originating from the hay-day of the Ottawa lumber industry. In order to differentiate the new from the old, the new additions and changes to the building shall all be made of timber. We begin the process of designing just as the timber framer would with his timbers: establishing the two squarest edges for use as our reference faces. These reference faces will continue throughout the building and, with the aid of the framing square, be the generator of the design as well as the details within it.



**Figure 42 Site plan showing reference faces of site**

The timber shall be used wherever possible and joined by mortise and tenon with pegs, metal used only sparingly just as the carriages once did. Each joint shall display its assembly and use to the inhabitants; for this purpose as well as to bring the timber back to a human scale, the timbers shall be broken down into smaller sections and spliced together. Just as the carpenters of old, the large sill plates will be made of cedar in order to resist rot as well as to protect the end grain of the posts from wicking up water found in the foundation walls.



**Figure 43 Cedar sill plate half lap jointed corner mortise**

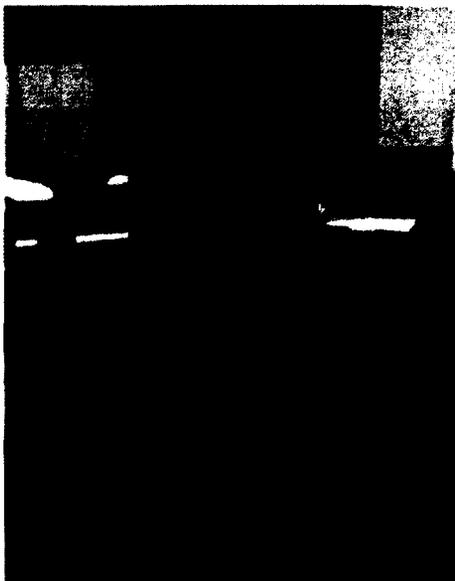
The posts are to be made of rough sawn centre of heart timbers; centre of heart timbers chosen in order to provide a means of controlling the checking (meaning cracking) as well as distortions that occur within the drying process. Similar to a technique used by Japanese timber framers, a relief or control joint will be cut into all the

timbers along their entire length and a piece of burnt maple placed within the void. Burnt maple is a wood that comes from a very particular process in which, like most milled lumber, is placed within a kiln to bring its moisture content down, but the difference is that it is left in the kiln much longer in order to change its properties. Through the process the maple becomes a dark brown almost burnt colour. The groove is to be placed on a non-reference side and be the same thickness as the square, that being one eighth of an inch (which is as well the same width as a circular saw blade) and a depth of one and a half inches. The inlay is to be two inches deep in order to bring to light the nominal size of the timber and the variation within its actual size. The burnt maple inlay will bring to light the process of which the wood is prepared for its place within the building and bring a greater understanding of the process of building to the public. The braces, as was commonly done, are to be smaller dimensionally than the post and made not of softwood but hardwood, and in particular maple.

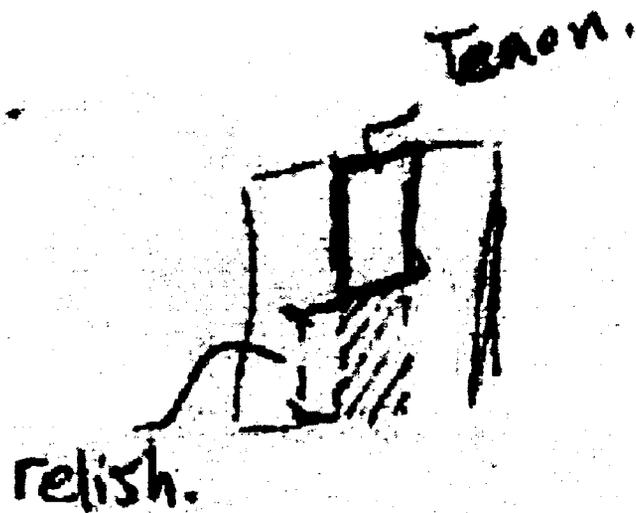


**Figure 44 Sketch plan of control joint in timber post**

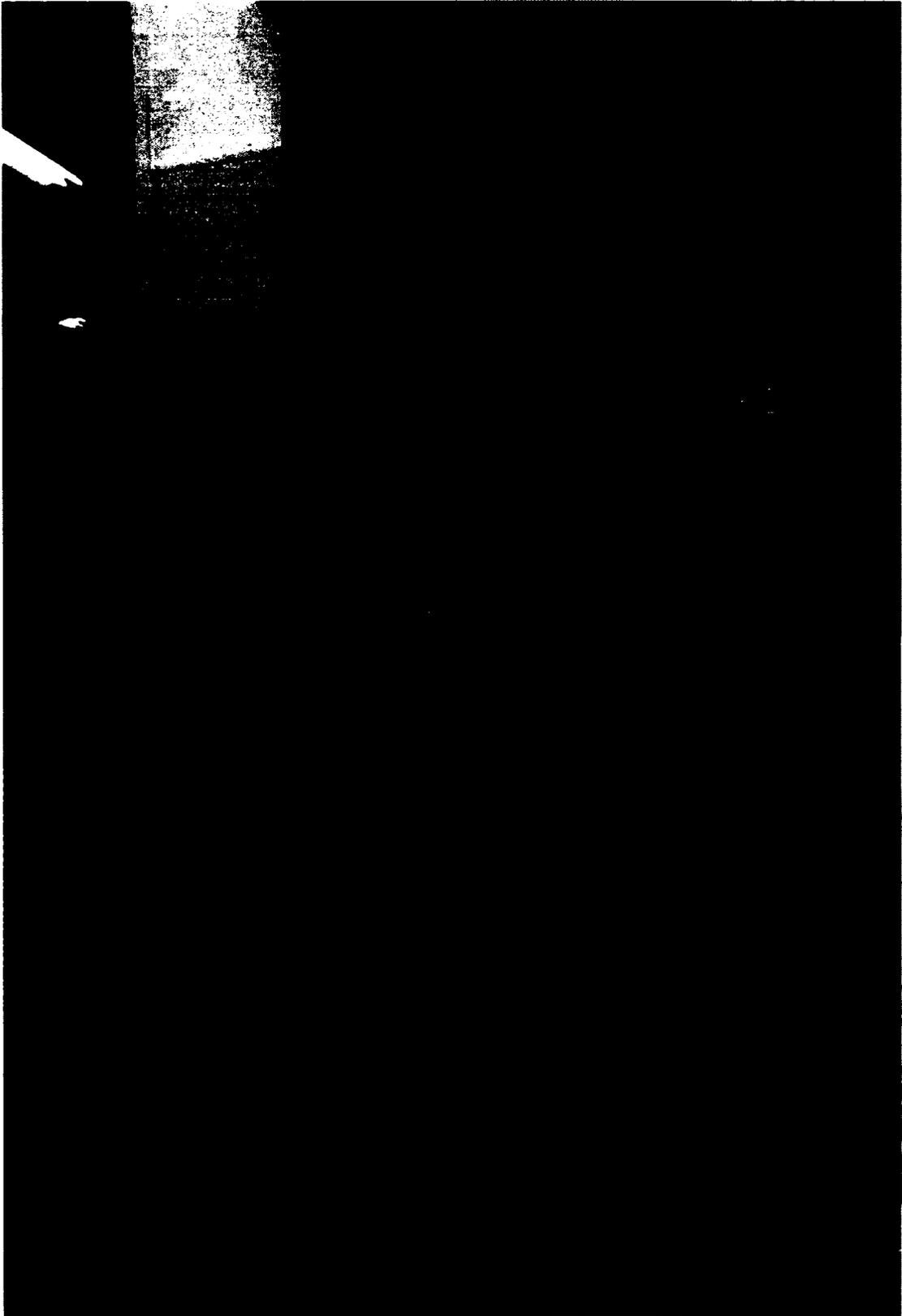
The splines throughout are to be made of walnut in order to contrast between the bearing elements and the tenons, giving an understanding of the joints to the inhabitants of the buildings. The spline will also have the affect of strengthening all the joints' capability to resist tensile forces by providing a stronger wood as the tenon piece and similar to a technique used by the Dutch timber framers that of an extended through tenon, in other words leaving more relish (meaning more wood) behind the peg. Finally the splines will also allow for an easier assembly process of the frame, as the frame will not need to be assembled in terms of bents and pushed up as was done in the past, but rather put together piece by piece in place more similarly to the process in which a steel frame is assembled today. This will also allow for a much easier repair process as the frame ages and damage occurs, it allows for a damaged piece to be removed independently of the rest of the frame and replaced, rather than completely disassembling the frame and reassembling it as is the case in traditional frames.



**Figure 45 Spline tenon post**



**Figure 46 Sketch displaying concept of relish**



**Figure 47 Photo displaying spline brace tenons with extra relish**

The glazing shall be broken up into sections of twenty four by sixteen inches and supported by mullions made of marine grade plywood rather than a traditional solid wood frame, and will be self supporting. The plywood will accommodate the use of modern building envelope design principles, as plywood is far more air and vapour tight than traditional solid woods. The glazing will be held tightly onto the frame by way of mullions designed with a method of pegging called draw-pinning, that meaning the hole for the peg within the tenon piece of the mullion will be one eighth of an inch closer to the shoulder of the joint than the mortise piece (or in this instance cap piece). The supporting vertical mullions are to be made up of two full length sheets of half inch plywood joined to the next element by way of two walnut splines of one and a half inches, one along the glazing edge and another the none glazing edge, pegged a minimum of two times to each supporting plywood member.

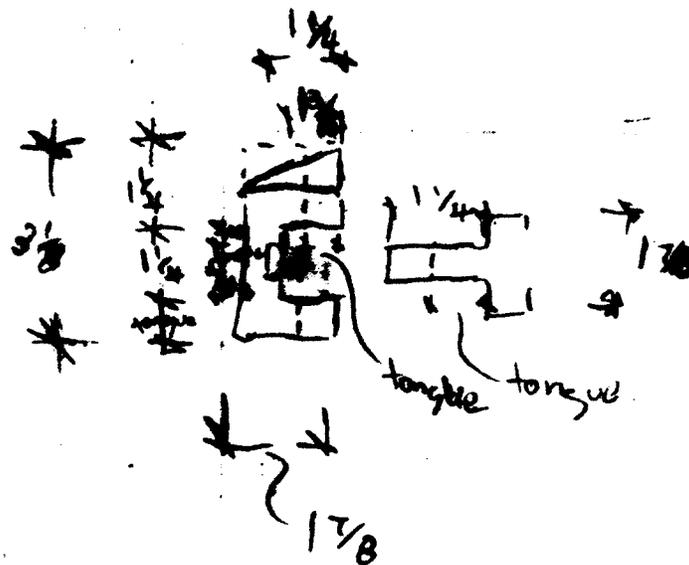
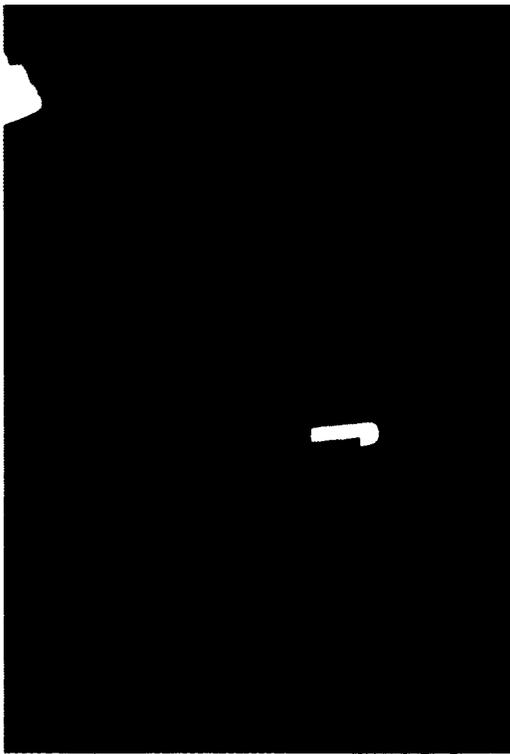
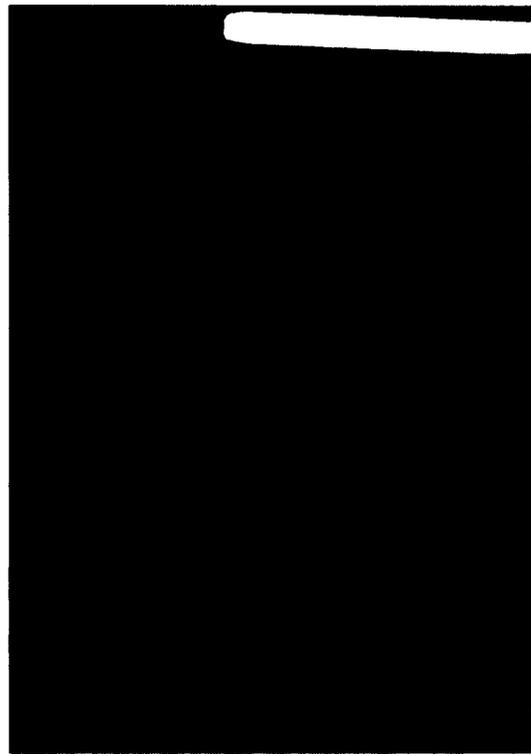


Figure 48 Sketch of draw pinned mullion cap designed for furniture

The floor of the car showroom is to be finished with rough sawn maple planks and in order to show cars; “freeform” pedestals are to be made up of solid maple connected by way of half dovetails to the plank floor, the forms seemingly rising out of the planks. The pedestals are created with an inversion of the way a timber framer creates his housing for a joint sloping it inward by an eighth of an inch. These pedestals are to be an expression of the framing square’s ‘musical range’ in creating circles, and is conceive by way of building up these circle with ellipses sloping up an eighth of an inch each time, the circles getting smaller as they rise out of the floor.



**Figure 49 ‘Freeform’ half dovetail connection**



**Figure 50 Form expresses the squares range**

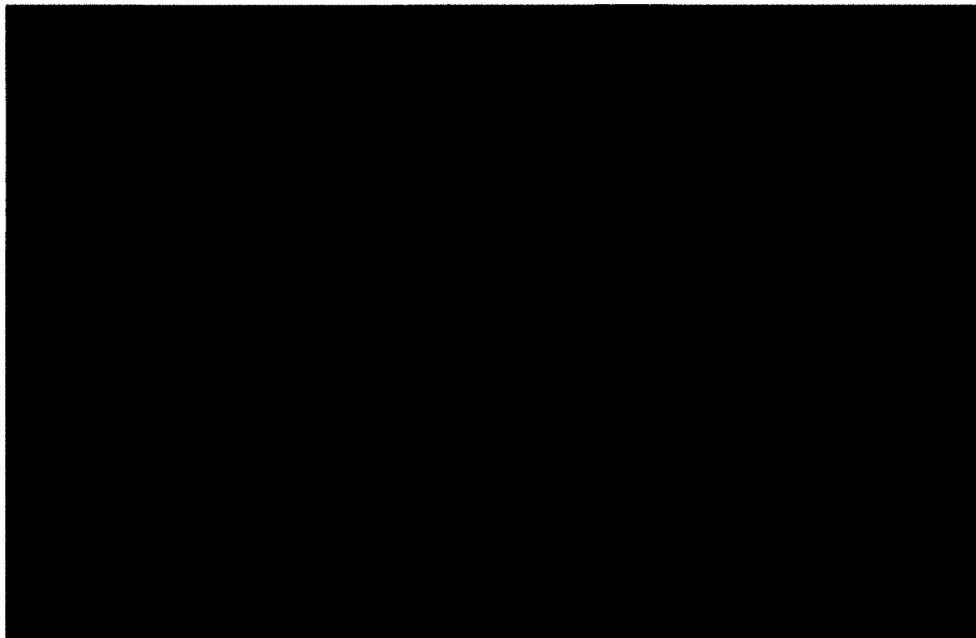
The new roof made of four inch nominal tong and groove recycled Ash. This recycled Ash would come from the Ottawa River Parkway and Parkland around it, cut

down by the city to combat the recent insect infestation in our local forests, a wood that is now brought to landfill.

**X:**

### **Reference Faces**

The footings and foundations shall communicate their reference faces and will be made in the method of the mortise joints in timber, by drilling consecutive holes down into the earth and creating a slice within it. This ditch shall be supported by cedar timber posts and tong and groove boards on the reference face but left unsupported on the non reference side leaving only the earth as a form, then filled with concrete. Once cured, the earth and boards are to be removed leaving the none reference side with a very rough and un-worked appearance, while the reference face shall display the groves left behind by the boarding revealing the side of the post in which boards can be placed.



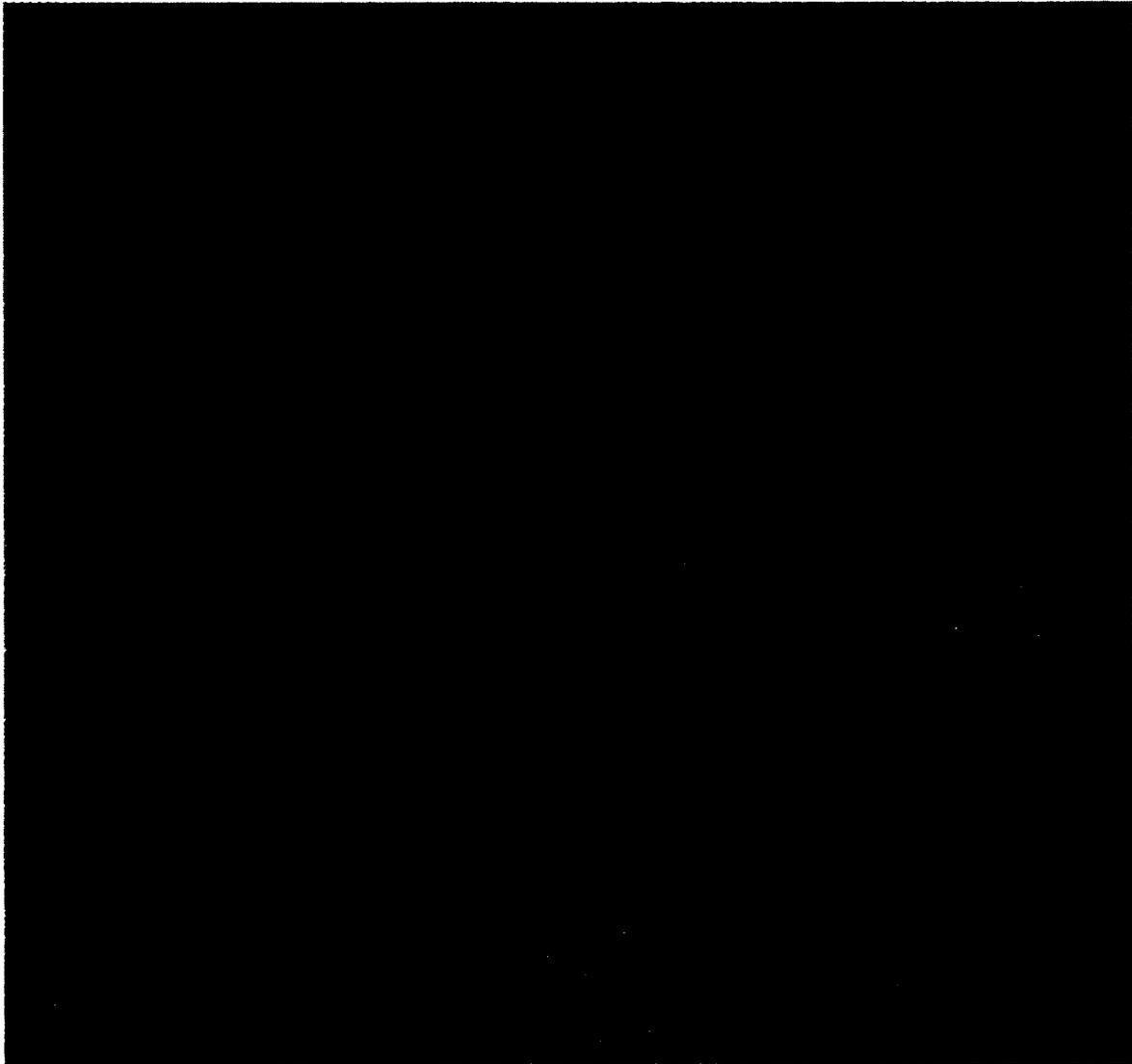
**Figure 51 Drilling out a mortise joint**



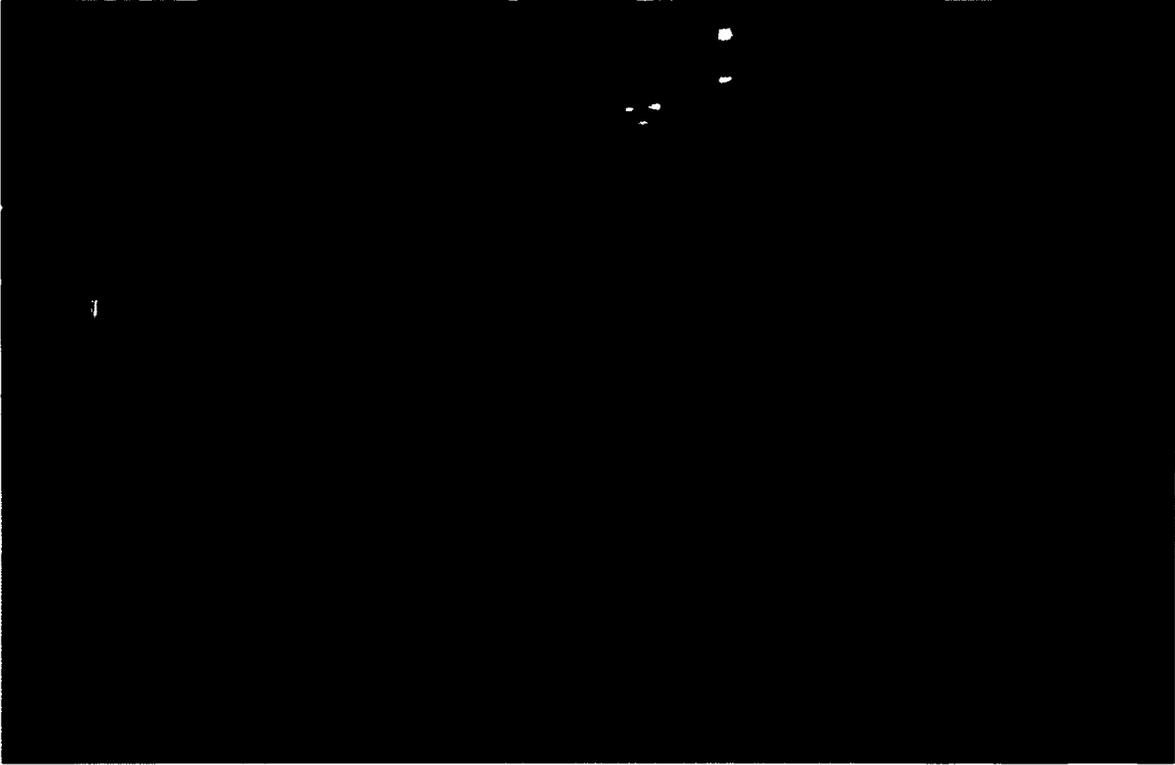
**Figure 52 Sketch of foundation detail**

The placement and understanding of the reference faces also allows us to deal with the existing building. The reference faces being placed on the south and east faces brings us to the realization that we do not know the exact location of the existing exterior walls, it moves in and out at different locations or is off square. This is not a problem with the use of reference faces if we treat the existing building as we would a timber joint. This meaning, if our reference face is not in the location of the connection we must either make a reduction, in other words working the existing material, in the existing building to allow for us to know its exact location or add onto the existing building a piece to which our connections can be made. Seeing as the existing building structure is that of concrete, a reduction is not easily achieved; as such, the additive method shall be used to connect the new structure with the existing. These connections shall be timber blocks to support the beam as well as the brace of the new timber structure connected to the concrete structure with steel bolts, allowing for minimal interference in the building's existing fabric. A combination of the additive and reduction methods shall also be used with the connection of the new roof to the existing building. The new roof will extend

above and beyond the existing inner courtyard walls of the workshops building, its timbers resting above the existing parapet wall with a bent steel plate as reinforcing to accept the beam as well as a clear story window between each timber beam. The entire top of the existing parapet walls are clearly outlined by way of light, further distinguishing the new from the old.



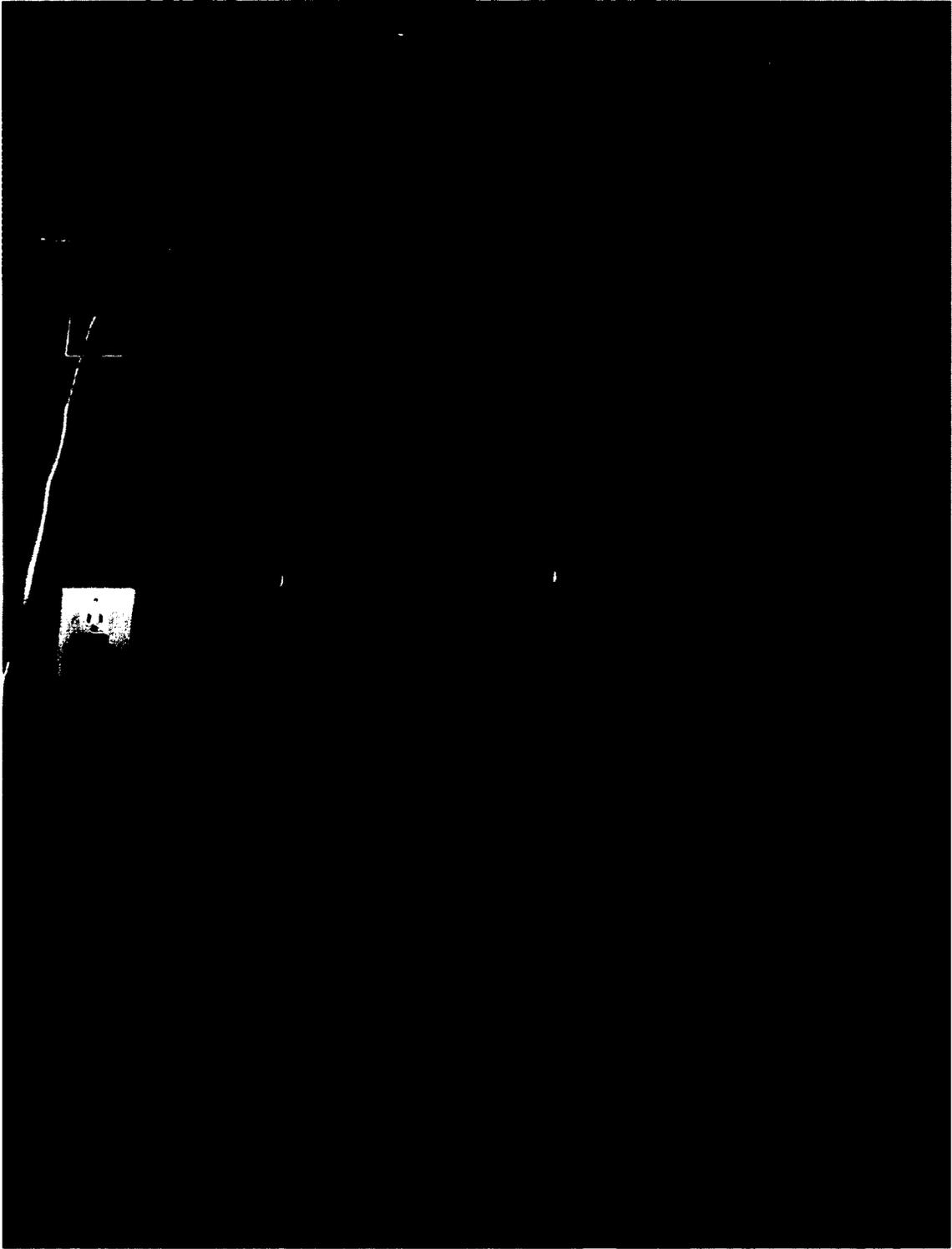
**Figure 53 Sketch showing roof detail over existing parapet wall**



**Figure 54 Breakfast bar framing resting on sill, similar to detail proposed for Roof**



**Figure 55 Close up of breakfast bar detail**



**Figure 56 Additive method using steel bolts to connect to the existing structure**

In order to communicate the idea of the reference faces the inversion of these faces that would normally occur at the exterior north western wall shall not occur. This will leave the reference faces the same through out the building. This wall face shall express it's none reference face by way of the supporting mullions of the glazed wall. The mullions shall be made in the profile of a car revealing the function of the building to the public driving on the parkway. These profiles shall be done by way of the framing square, leaving the reference points visible and expressed by a connecting brass pipe to join the individual mullions together, creating a truss system, and making the profiles even once assembled verifiable by the square.

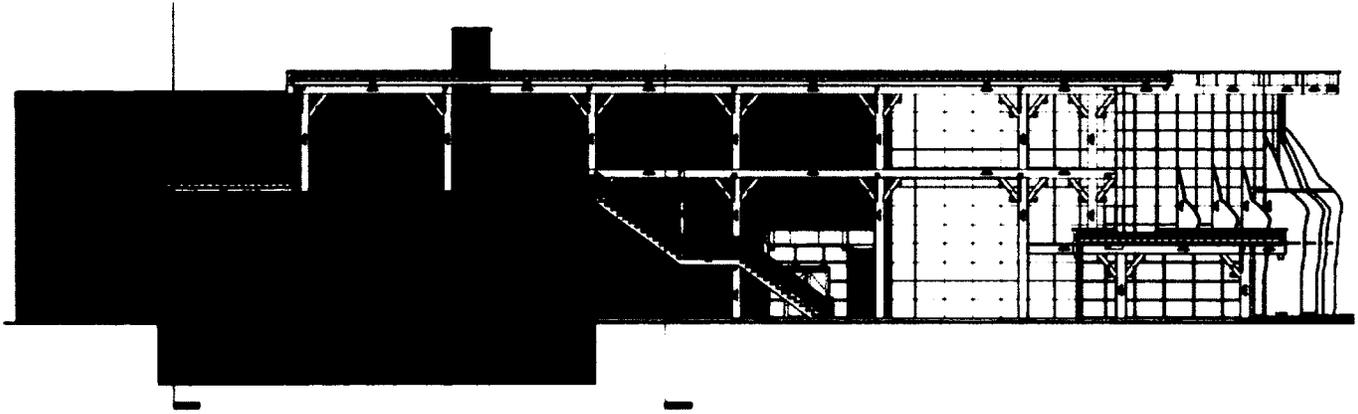


**Figure 57 Reference points for square expressed by brass rods**

In addition to this and to further bring forward the concept of the reference faces outside the building, the reference faces at the parapet wall will be completely inverted from their traditional placement of facing the exterior to face the interior revealing the structure and with the use of glazing as boarding, the roof assembly within. The drainage stone, to avoid excessive waste as well increase the capacity of the roof assembly to hold in moisture to support plant growth, would be made of the crushed clay brick from the building directly behind the workshops. Further, rather than draining the roof through roof drains invisible to the public, the outside corners of the roof assembly shall place a copper pipe with a quadrant cut out of it to serve as a kind of green roof scupper or downspout expressing the roof's drainage system to the public.



**Figure 58 Planter test case for glass parapet as well as green roof scuppers**



**Figure 59 Section through existing center block and proposed addition displaying some of the reference faces**

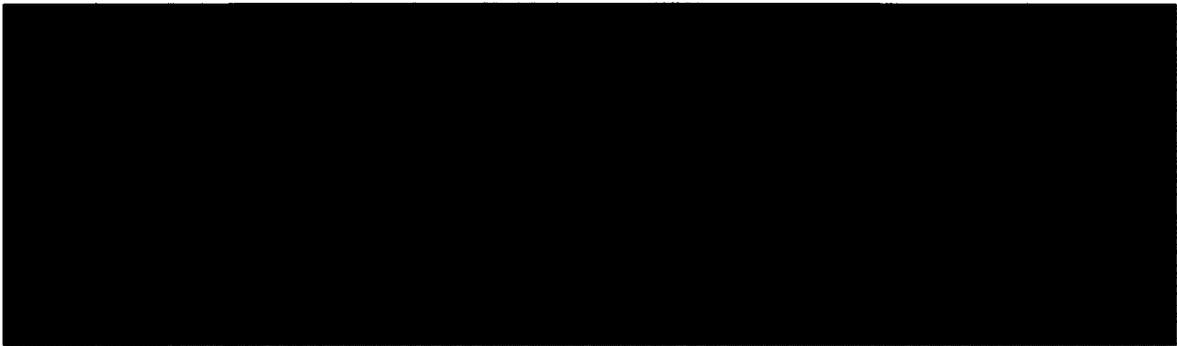
**XI:**

**Program**

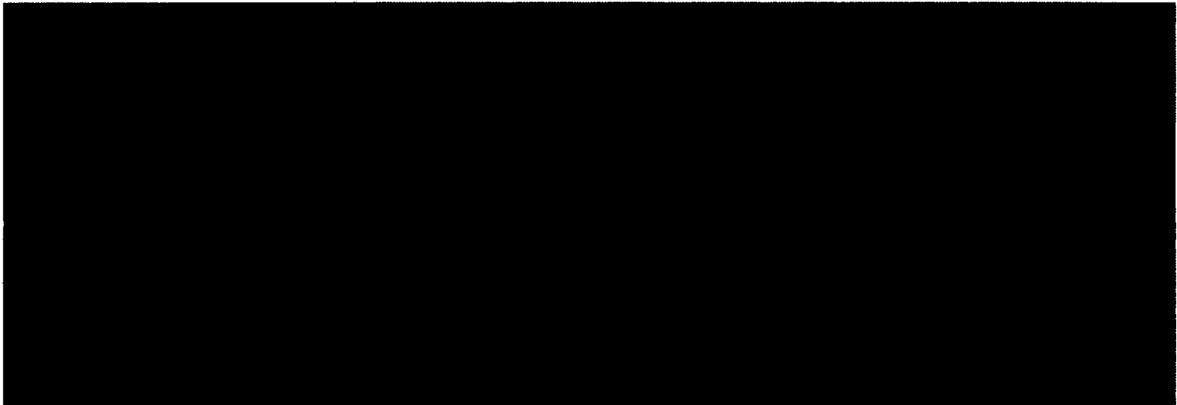
The functional requirements for the car dealership have been taken from my interpretation of the design guide book put out by Mercedes Benz Canada and as such the dealership is designed for the use of Mercedes and a subsidiary of Mercedes the Smart cars. The car dealership design could be broken down into four basic programmatic elements; the sales department, the parts department, the mechanical inspection department and the service department.



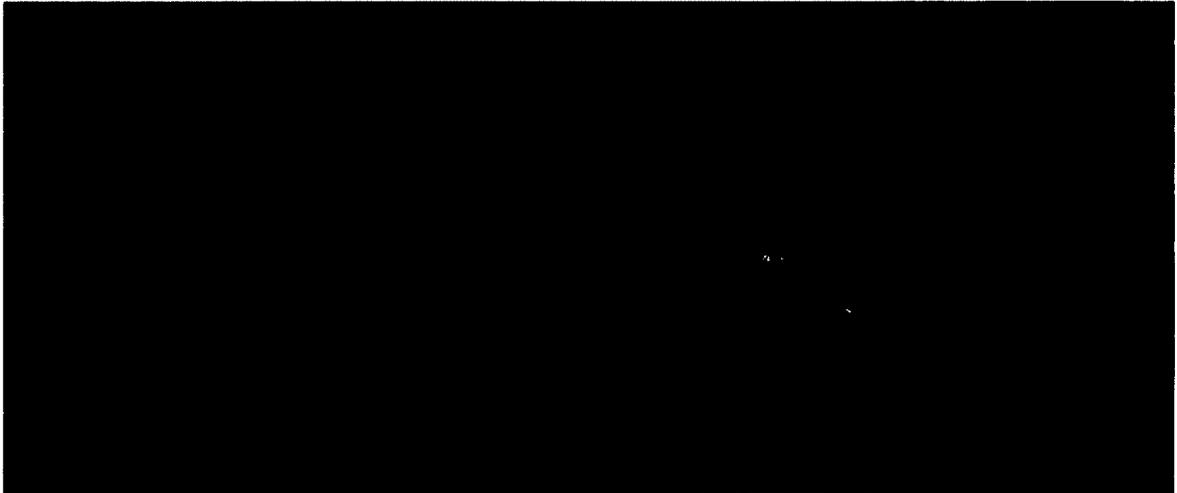
**Figure 60 View of proposed design from the traffic circle on the South West end of the site**



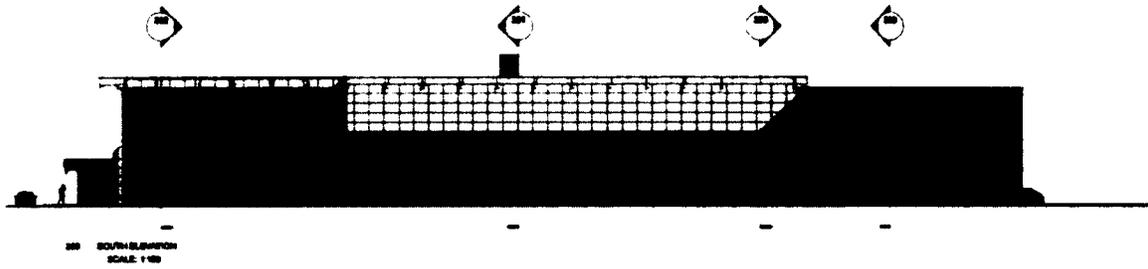
**Figure 61 View of proposed design from the Ottawa River Parkway**



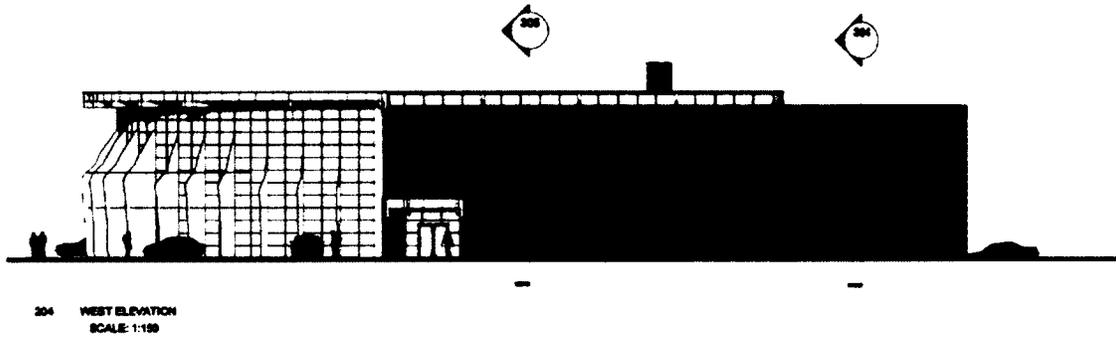
**Figure 62 View of proposed design from North East parking lot**



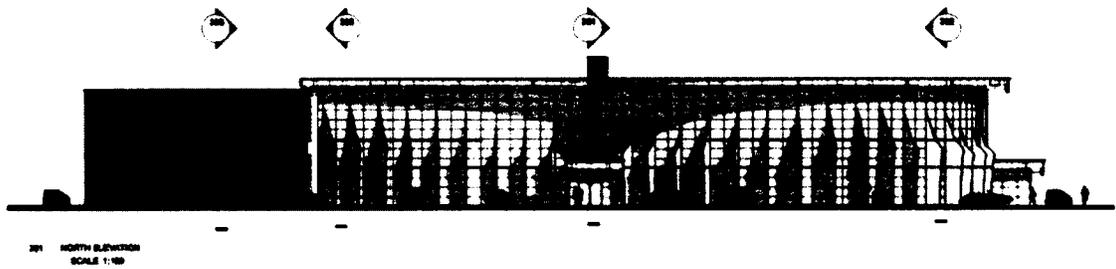
**Figure 63 View of proposed design walking North along Bayview**



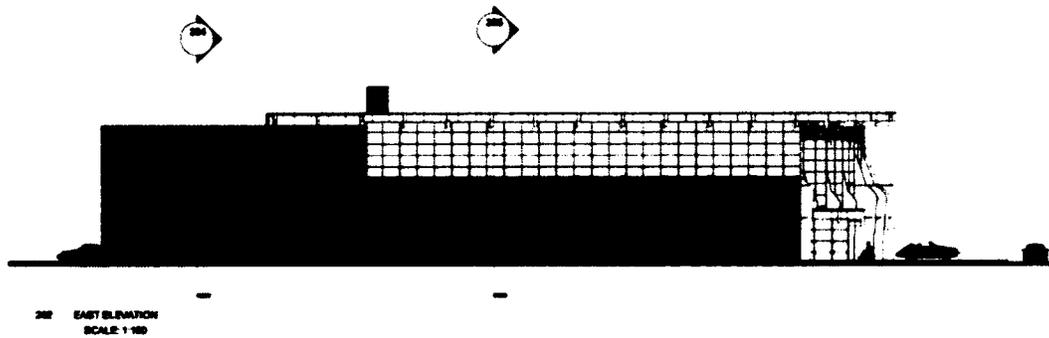
**Figure 64 South elevation**



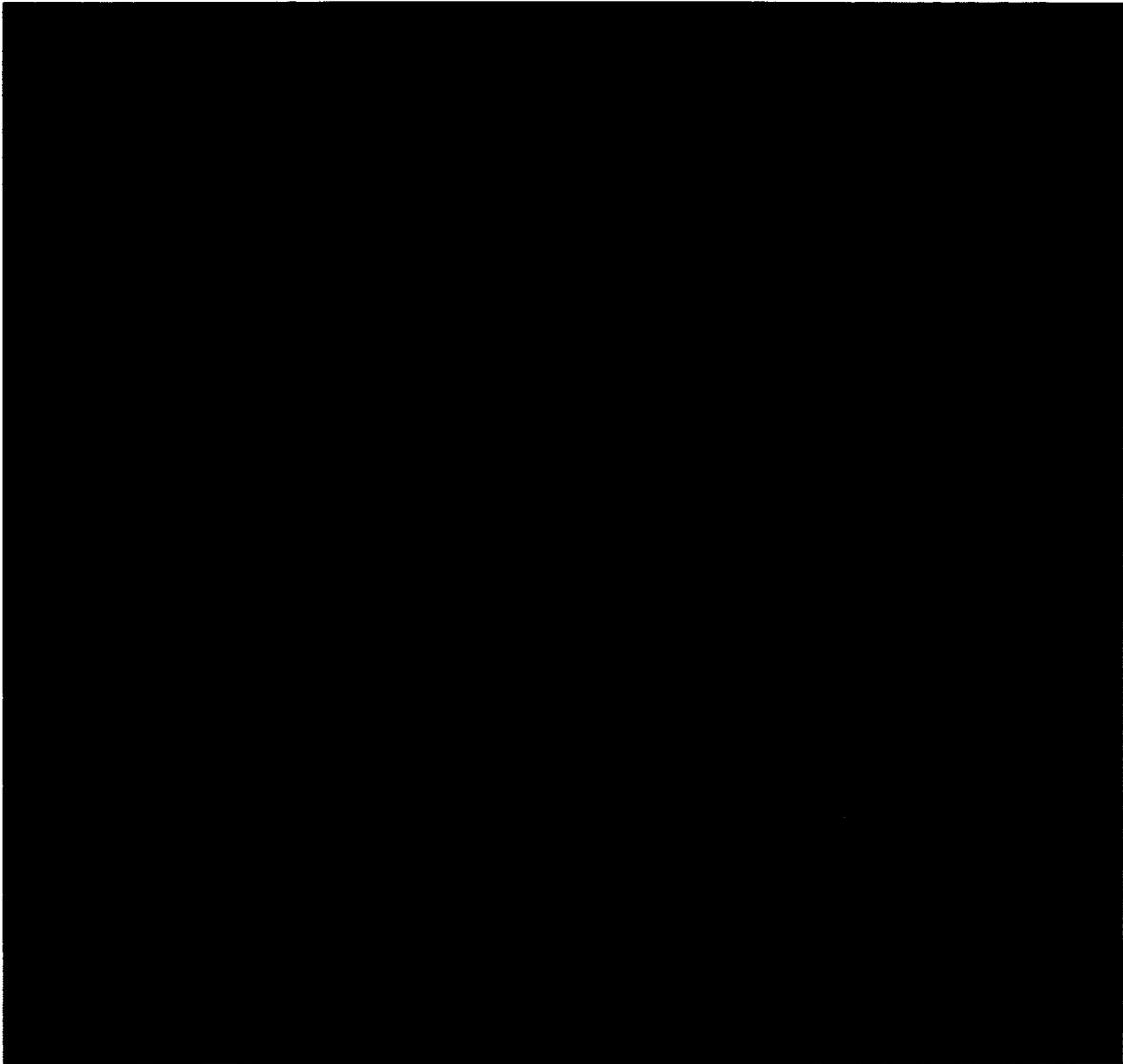
**Figure 65 West elevation**



**Figure 66 North elevation**



**Figure 67 East elevation**



**Figure 68 Site Plan**

The sales department is located on the north and west of the building. Sales can further be broken down into the Mercedes showroom located in the expansion to the north as well as a new showcase area of new car arrivals on the second floor above the existing one storey center block, the Smart showroom located in the existing first floor of the west block as well as a smart showcase area of new car arrivals bellow in a small existing basement space that can be viewed from above. The supporting spaces for the

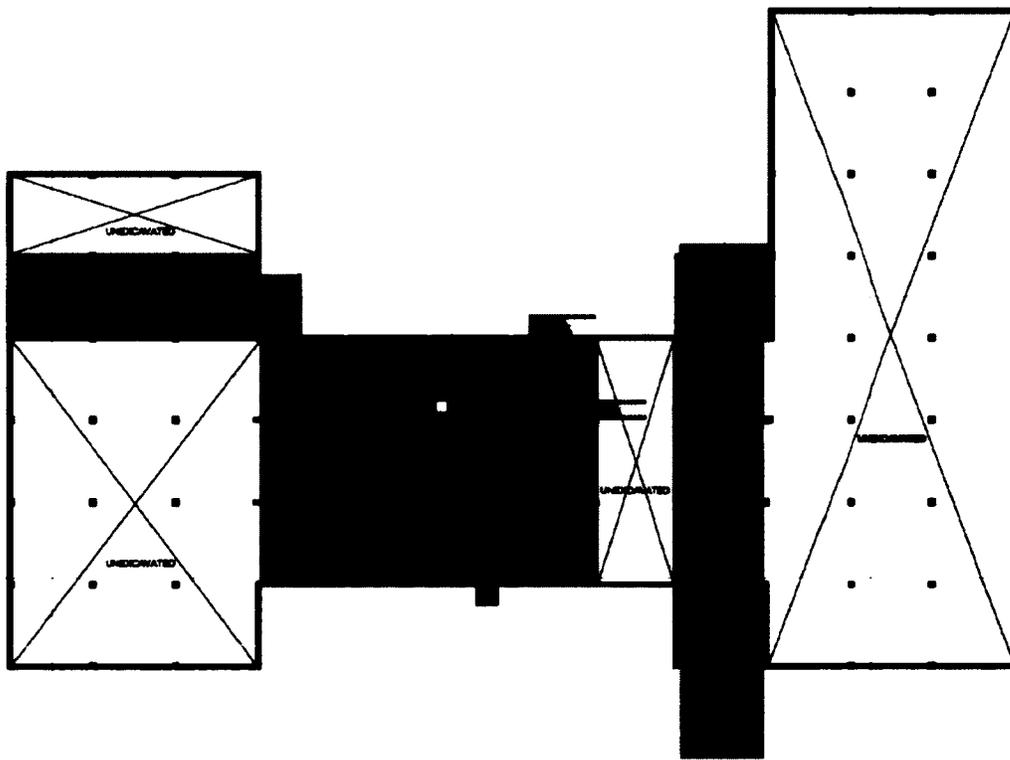
sales department are located on the second floor of the existing west block, consisting of open office space, a sales staff lunch room and lockers, public washrooms as well as a customer lounge overlooking both the Mercedes showroom to the north and east, and the smart showroom through an opening in floor by its convenience stair.

The parts department is located in the existing center block on every floor with the exception of the second floor expansion above the existing building. Parts can be further broken down into the parts storage areas in the basement level and parts half level, the technical research area located on the parts half level as well as the tool room on the far east side of the center block on the first floor. The parts storage is accessed by the public through the customer parts counter located off of the existing ramp within the Mercedes showroom and accessed by the mechanics beside the technical research area, which allows them to look up information on computer stations.

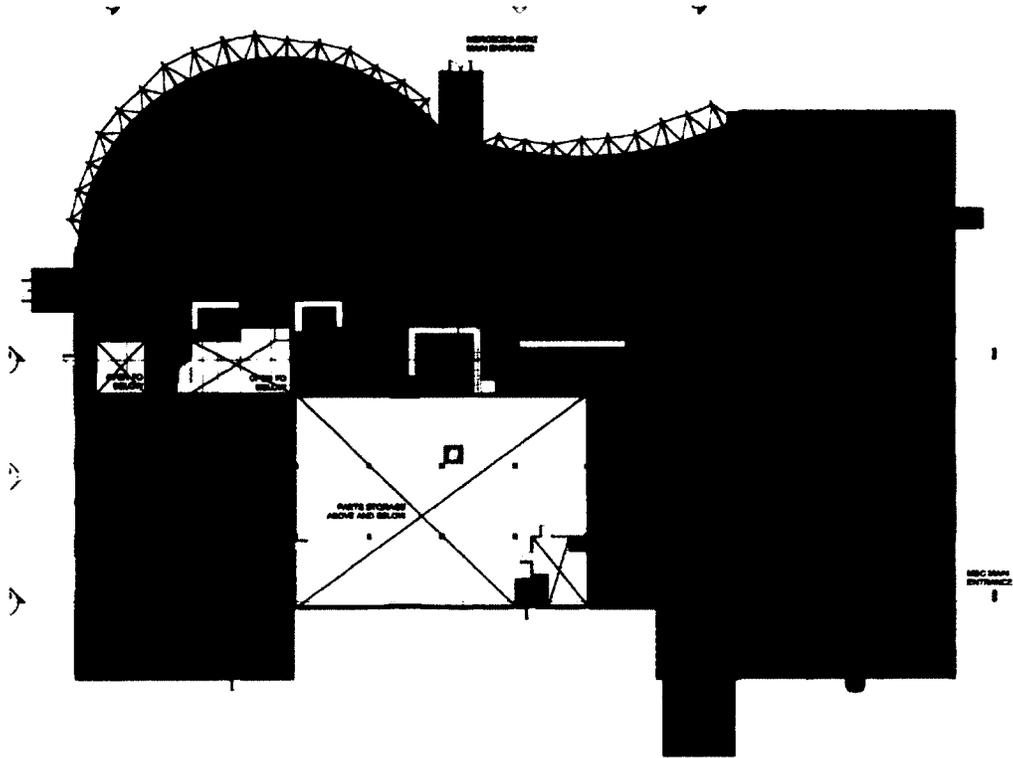
The mechanical inspection department is located along the west wall of the existing east block. This department can be further broken down into the mechanical inspection bay on a new portion of the basement level, under the existing center block as well as directly to the east of the Mercedes showroom to the north, the service desk located beside the inspection bay and the service and sales managers located on the second floor above the existing center block overlooking the service desk and inspection bay. The inspection bay accessed by public with a new ramp placed on Bayview that brings the customers below the existing center block in a dark underground space to then have them rise up into the bright and airy showroom expansion to the north. This inspection bay is meant as the first point of contact with the service department; the customer's vehicle is inspected and repairs needed are accessed by the service department representative as well as the time it will take to complete the repairs. If the repairs are not

worth the investment in the older vehicle the customer is encouraged by his view of the showroom to go look at a new car. If the repairs are judged worth while the customer pays at the service desk and the car is driven into the service department to the east.

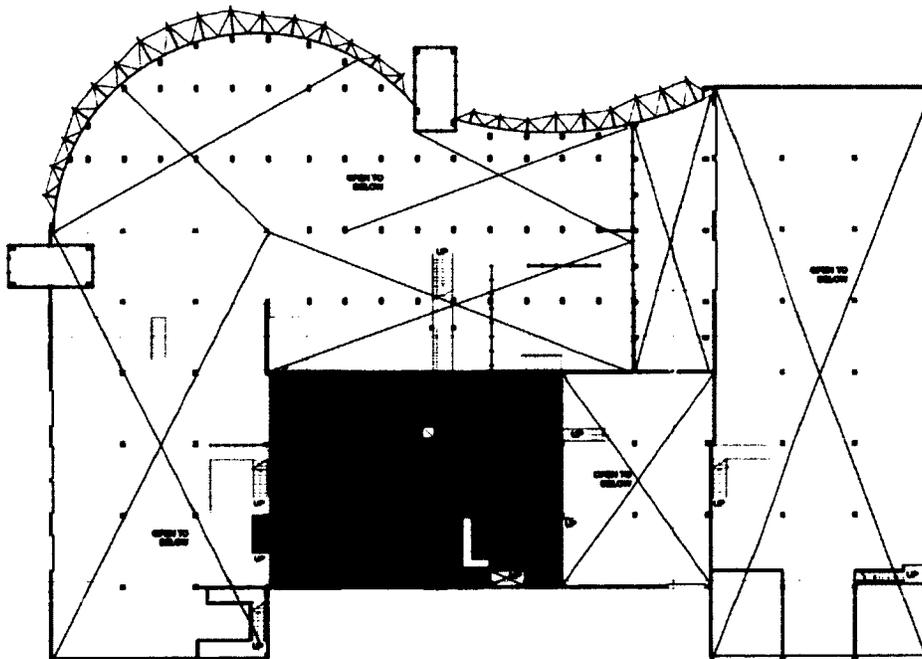
The service department is located in the entire existing east block of the building. The service department can be further broken down into the service bays located on the first floor, two sprinter bays located adjacent large existing garage doors for deliveries and large vehicle repairs and two wash bays to the south along Bayview. The support spaces for the service department are located above the service bays on the mezzanine level which houses the mechanics locker rooms and washrooms and the second floor above the mezzanine, which houses the mechanics lunch room, a training room as well as the warranty office in which the service department determines if the service provided is under warranty or not.



**Figure 69** Basement floor plan



**Figure 70 Ground floor plan**



**Figure 71 Parts half level floor plan**

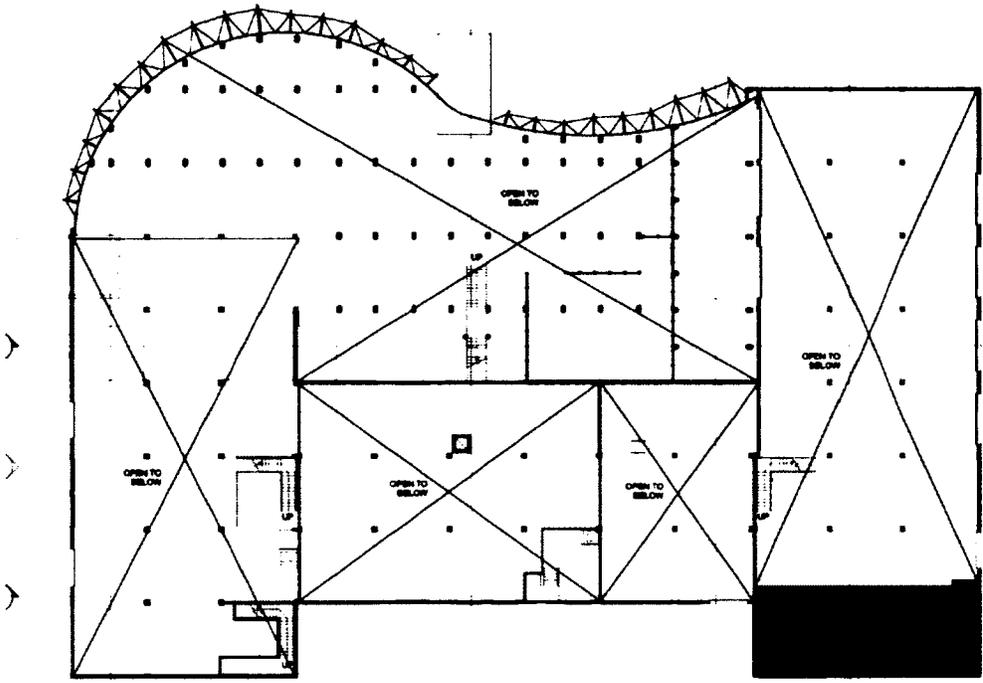


Figure 72 Mezzanine floor plan

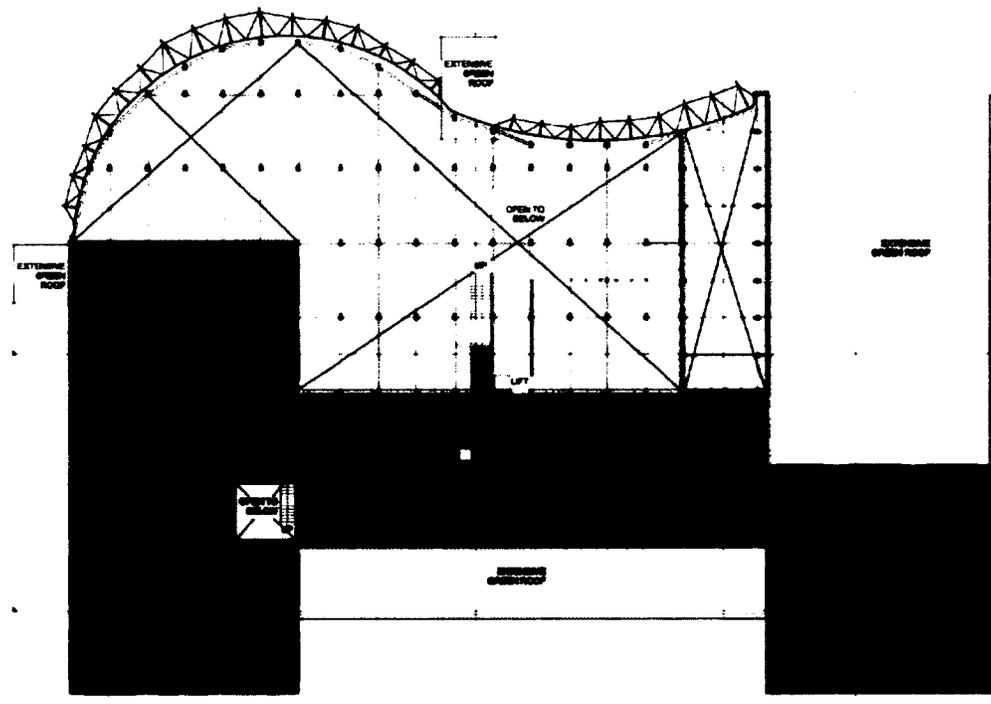
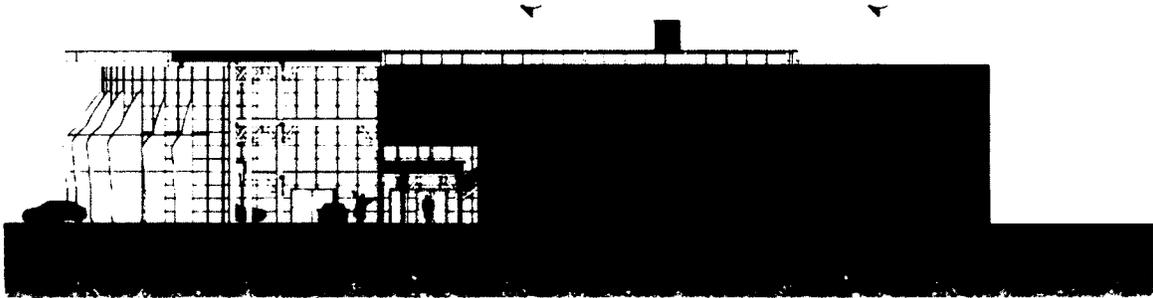


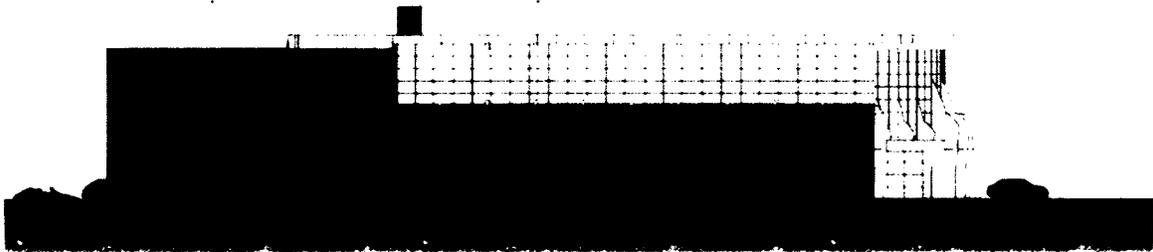
Figure 73 Second floor plan



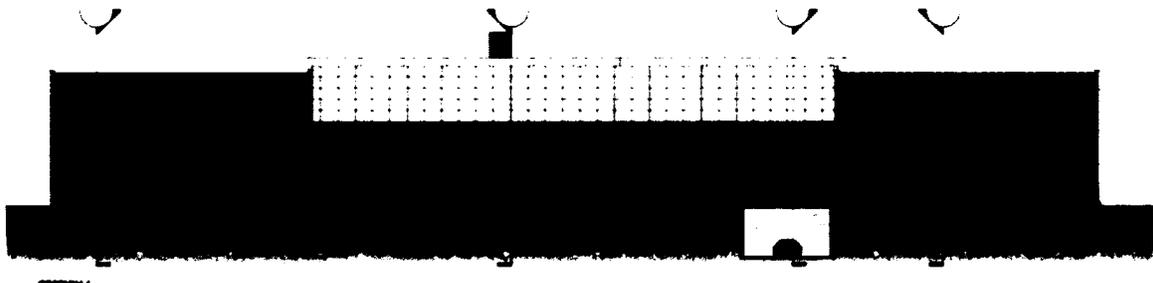
**Figure 74 Section through existing centre block and showroom expansion**



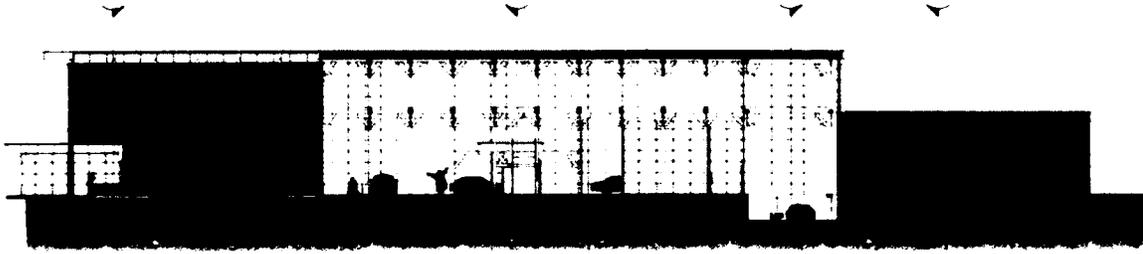
**Figure 75 Section through new car showroom and existing West block**



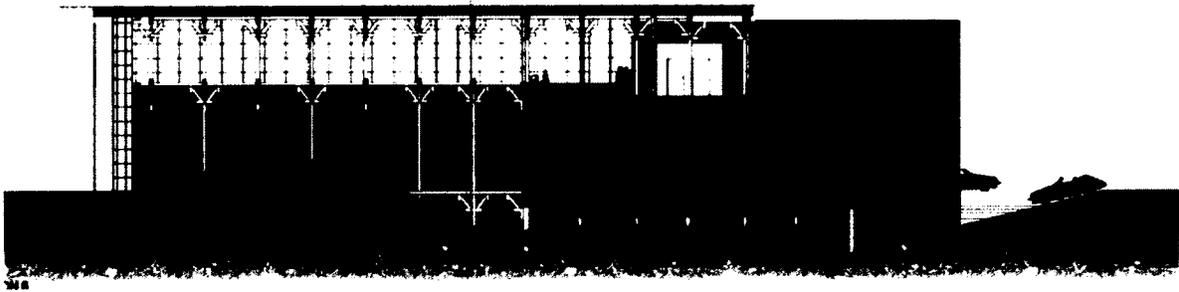
**Figure 76 Section through existing East block**



**Figure 77 Section showing all existing blocks and inspection bay passing under**



**Figure 78 Section through Smart new car arrival, new showroom, inspection bay and service bays**



**Figure 79 Section through inspection bay and existing center block**

Conceptually, the program can be understood through a spline timber joint between a beam and a post. The sales department serving as a beam absorbing the initial forces of load, meaning a public space bringing people in to view and buy cars, which is connected to a spline, programmatically the parts department. The parts department or spline resists tensile forces and keeps the joint and the program tied together. The parts department serves both the public in the sales department as well as the mechanics in the service department. The mechanical inspection department, where the public drive their cars into the dealership to be given an initial inspection by the service department, is the transitional space or housing in which the sales department (the beam), the parts department (the spline) and the service department (the post) come together and function as one. The service department serves as the anchor or post for the entire dealership supporting the sales department and all the customers who need service done to their

cars. The entire program is held together by the existing chimney visible from almost every portion of the building and goes through all floors, it which acts as a peg tying the joint together.

## **XII:**

### **Art as Architecture**

In conclusion, if, as architects, we are interested in craft rather than the fine arts, then in George Kublers words: “[...] we are interested more in long durations than in brief ones, [...]. [Simple] tools and instruments commonly have extremely long durations.”<sup>73</sup> As architects we must chose a template jig to guide our minds as the trades’ hands are guided.

This is as opposed to the fine arts or a fashion which as George Kubler writes, “[...] obeys special demands to which the longer evolutions are impervious. A fashion is the projection of a single image of outward being, resistant to change during its brief life, ephemeral, expendable, receptive only to copying but not to fundamental variation. Fashions touch the limit of credibility by violating the precedent and by grazing the edge of the ridiculous.”<sup>74</sup> A fashion can be for example the use of a curved member in a construct that has no basis in material logic, structural logic, technique, geomatter or geometry, its reason for being unexplainable.

This reveals the idea held most dear by the artists that of ‘originality’ which in turn as Richard Sennett describes, “[...] brings to the surface the power relations between

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<sup>73</sup> Kubler 38.

<sup>74</sup> Kubler 38-39.

artist and patron.”<sup>75</sup> The common defence of the artist in this case is ‘it looked right’ or even worse it is defended by an extrapolation of some abstract notion completely unrelated to the inhabitation and crafting of architecture.

This form of architecture does not push the industry to innovate as they would claim, but rather it is but an expression of its creator’s nihilistic ambitions, nothing but a dead end. In George Kubler’s words: “They belong not to a connected chain of solutions, but they constitute, each fashion in turn, classes of only one member each. A fashion is a duration without substantial change: an apparition, a flicker, forgotten with the round of the seasons.”<sup>76</sup> The solution required by architects that is connected to a chain or solution or algorithms, is a solution that can be shared with the crafts by way of a physical object, a template jig. Architects of craft realised as “[...]Louis Kahn once commented that while a painter can paint square wheels on a cannon to express the futility of war, and a sculptor can carve the same square wheels, an architect must always use round wheels. [...] a building must not just look good; it must also serve a purpose. It must house or contain, protect and sustain.”<sup>77</sup>

If we are to be architects of craft then we must come to understand that crafts, therefore tools and technique, are not a hindrance to the expression of meaning in architecture, as the artist would believe, but rather a provider of meaning. In Sennett’s words: “Technique has a bad name; it can seem soulless. That’s not how people whose hands become highly trained view technique. For them, technique will be intimately linked to expression.”<sup>78</sup> If the crafts are a provider of meaning and expression in

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<sup>75</sup> Sennett 72-73.

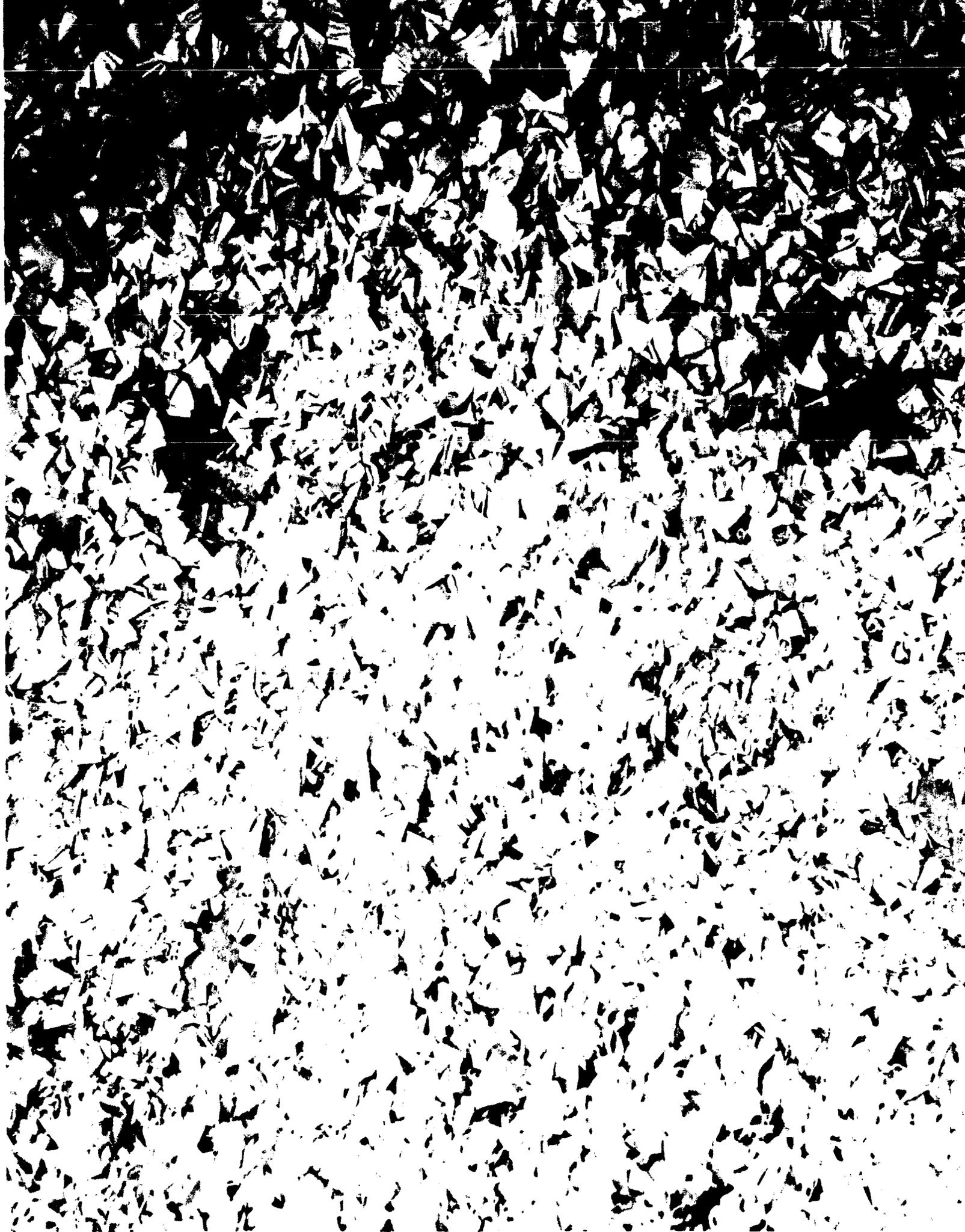
<sup>76</sup> Kubler 38-39.

<sup>77</sup> Whyte, William, “How do buildings mean? Some issues of interpretation in the history of architecture,” *History and Theory* 45 (2006): 158.

<sup>78</sup> Sennett 149.

architecture then we must undoubtedly come to understand and use the tools and techniques that have evolved for a millennia in order to utilise them.

It is not just by way of drawing, but by way of the template jig, an extension of our minds, that can be shared with the trades. Architects must realise that it is a necessity to get their hands dirty in order to gain the tacit knowledge required to think with these template jigs. As architects we must embrace the concept of instrumentation in order for these tools to be of use in the verification of our buildings and become its very expression. Architects must stop blaming the trades for their misunderstanding and take ownership of their own craft by learning from their mistakes. With the use of this shared mind in conjunction with digital technologies like parametric modeling and digital fabrication, architects can usher in a new era of craft unlike any seen before.



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