Research and Proposal

Study on Types of Timber and Joinery in Japan and Malaysia


Timber in Malaysia

Malaysia forest resources produced more than 3,000 species of trees, however, only about 408 species extracted for timber production & traded. The difference between hardwoods and softwood is based on botanical and anatomical differences of trees.

There are 4 category of timber:-
1- Heavy Hardwoods
2- Medium Hardwoods
3- Light Hardwoods
4- Softwoods

Heavy Hardwoods	Medium Hardwoods	Light Hardwoods	Softwoods
Balau, Red Balau, Balian, Bitis, Chengal, Giam, Kekatong, Keranji, Malangangai, Merbau, Penaga, Penyau.	Alan Batu, Bekak, Entapuluh , Terutum, Kasai, Kapur, Kelat, Keledang, Kempas, Keruing, Kerutum, Kulim.	Ara, Alan Bunga, Babai, Berangan, Bintagor, Durian, Jelutong, Kedondong, Kelumpang, Ketapang, Kembang Semangkuk, Laran, Machang, Medang, Mempisang, Red Meranti, White Meranti	Damar Minyak, Podo , Sempilor.
1. Very heavy constructional timbers. 2. Density from 800 – 1,120 kg/m3 at 15% moisture content. 3. Naturally durable as they contain some toxic materials in their tissues e.g.: alkaloids /repellent to wood destroying agents. 4. Can be safely used without preservative treatment even exposed to fungus or insect activities.	1. Moderately heavy constructional timbers. 2. Density from 720 – 880 kg/m3 at 15% moisture content. 3. Some of these timber heavy/ strong enough to be classified as " heavy hardwoods' but in tropical climate they lack sufficient natural durability when exposed to the weather or in contact with the ground unless treated with preservatives before use. Can be used with preservative treatment in tropical climate but naturally durable in temperate countries where climate condition less conducive to the activity of wood destroying agent.	1. Include all relatively light weight and soft timbers 2. Density from400 – 720 kg/m3 at 15% moisture content. 3. "General utility" timber of Malaysia comparable with general utility timber in temperate climate –mainly softwoods " conifers" 4. Excellent for high class joinery work, cabinet making, furniture ,decorative paneling, ect. Not naturally durable in tropical climate but some quite durable in temperate region. 5. If proper precautions taken against attack by wood destroying agent , Light Hardwoods generally can make very satisfactory timber for general construction work.	1. Very few true softwoods of commercial significance in Malaysia. 2. None are durable in tropics 3. Main difference between hardwoods and softwoods(conifers) is the absence of vessels (pores) in softwoods.

Heavy H/woods	Air- Dry Density @15% m3 (Kg/m3)	Strength Group	General Information On Working Properties.
Balau	850-1,155	A	Generally easy to work. Smooth finish quality. Nailing Properties rated is very poor
Belian	835-1,185	A	Generally easy to work. Planes,bores and turn cleanly pro ducing smooth lustrous surfaces . Pre-bored before nailing
Chengal	915-980	A	Very good working properties and produces smooth finish. Very poor nailing properties
Giam	865-1,220	A	Generally easy to planes and bores but difficult to turn reducing smooth surfaces . Very poor nailing properties
Medium H/woods	**Air- Dry Density @15% m3 (Kg/m3)**	**Strength Group**	**General Information On Working Properties.**
Alan Batu	800-925	B	Generally easy to work. Can be planed to give a good clean finish
Bekak	705-1,025	B	Slightly difficult to planes and bore but gives a smooth finish. Excellent nailing properties
Kapur	575-815	B	Easy to work, produces fairly smooth finish. Poor nailing properties
Kelat	495-1,010	B	Easy to planes and bore but difficult to turn ; gives a smooth finish. Poor nailing properties
Kempas	770-1,1,120	B	Easy to work, planes to smooth finish. Boring and turning produces rough finish .Poor nailing properties
Light H/woods	**Air- Dry Density @15% m3 (Kg/m3)**	**Strength Group**	**General Information On Working Properties.**
Alan Bunga	575-640	C	Generally easy to work. Can be planed to give a good finish.
Bintagor	465-865	C	Good working properties. Quality of finish is comparatively smooth. Poor nailing properties
Durian	420-800	C	Moderately easy to work. Produce fairly smooth surface. Excellent nailing properties.
Yellow Meranti	575-735	C	Good working properties. Quality of finish is comparatively smooth. Poor nailing properties.
Nyatoh	400-1075	C	Generally easy to plane, produces fairly smooth finish. Excellent nail ing properties


Balau


Belian


Chengal


Giam


Alan Batu


Bekak


Kapur


Kelat


Kempas


Alan Bunga


Bintagor


Durian


Yellow Meranti


Nyatoh

Durability chart of Malaysian Timber

Group 1 Very Durable >10 years	Group 2 Durable 5-10 Years	Group 3 Moderate Durable 2-5 years	Group 4 Not Durable 0-2 years
Cengal Giam Penyau Resak	Balau Bakak Bitis Kasai Medang Mersawa Penaga Ranggi Tembusu	Balau Merah Dedalu Kedondong Kekatong Kelat Kempas Keranji Kerutum Rubber wood Medang Meranti Putih/Merah Mersawa Merawan Petaling Rengas	Ara Bintagor Damar Minyak Jelutong gerutu Pulai Perupok Petai Ramin Sesendok Senumpul Terap Laran Terentang Nyatoh

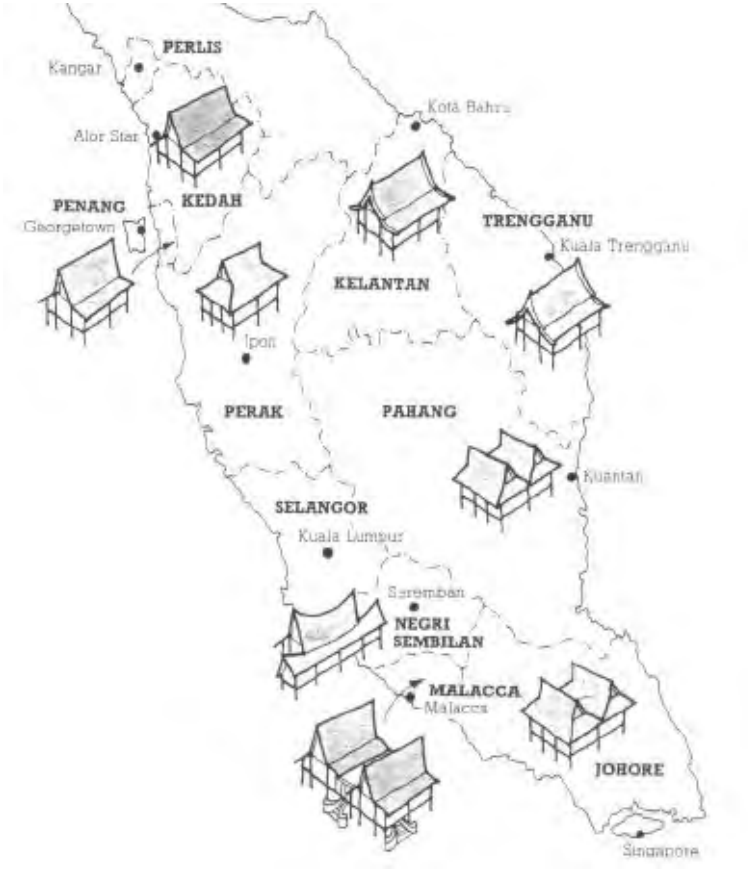
The Needs For Treatment

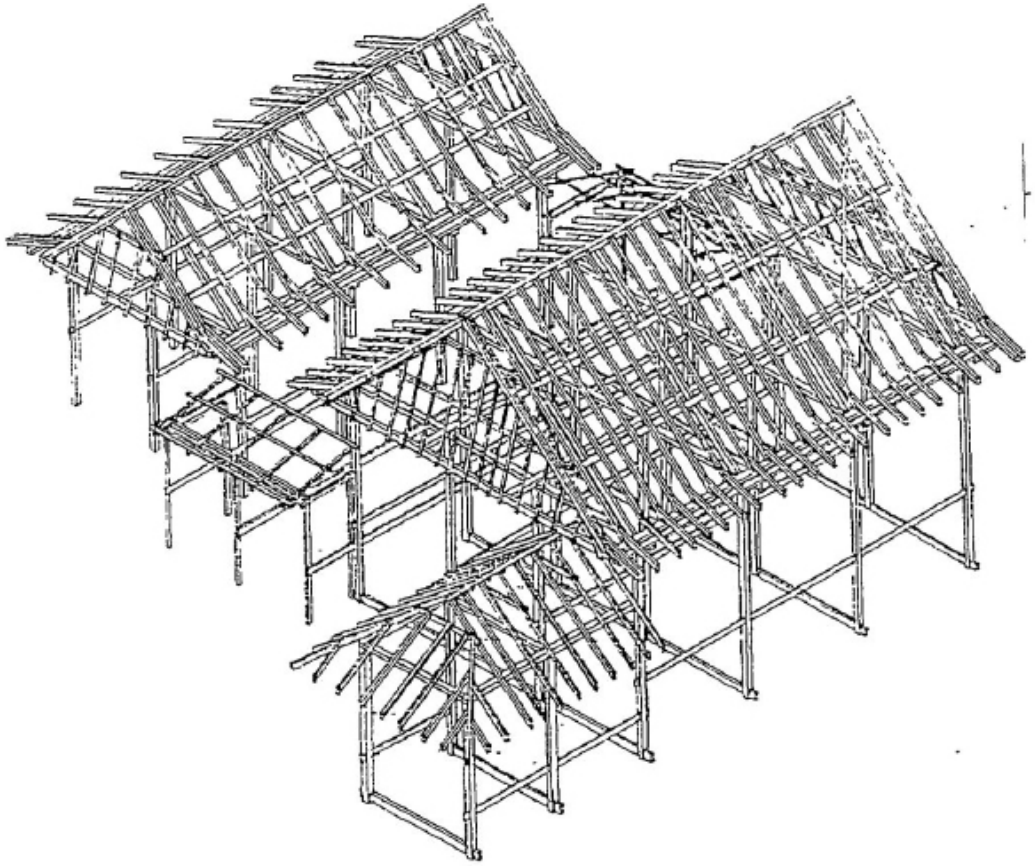
- Non- naturally durable timber need preservation – protection against timber damage & increase the durability of timber

- The durability of timber depend - condition of use & proportion of heartwood and sapwood found in timber. Sapwood of all timber is non- durable.

- Durability ratings of M'sian timber based on exposure of heartwood in the ground.

Malaysian traditional timber architecture & construction





Malaysia with its abundant of timber, (especially hardwood), has relied upon timber for all types of structures before modern industrialisation.

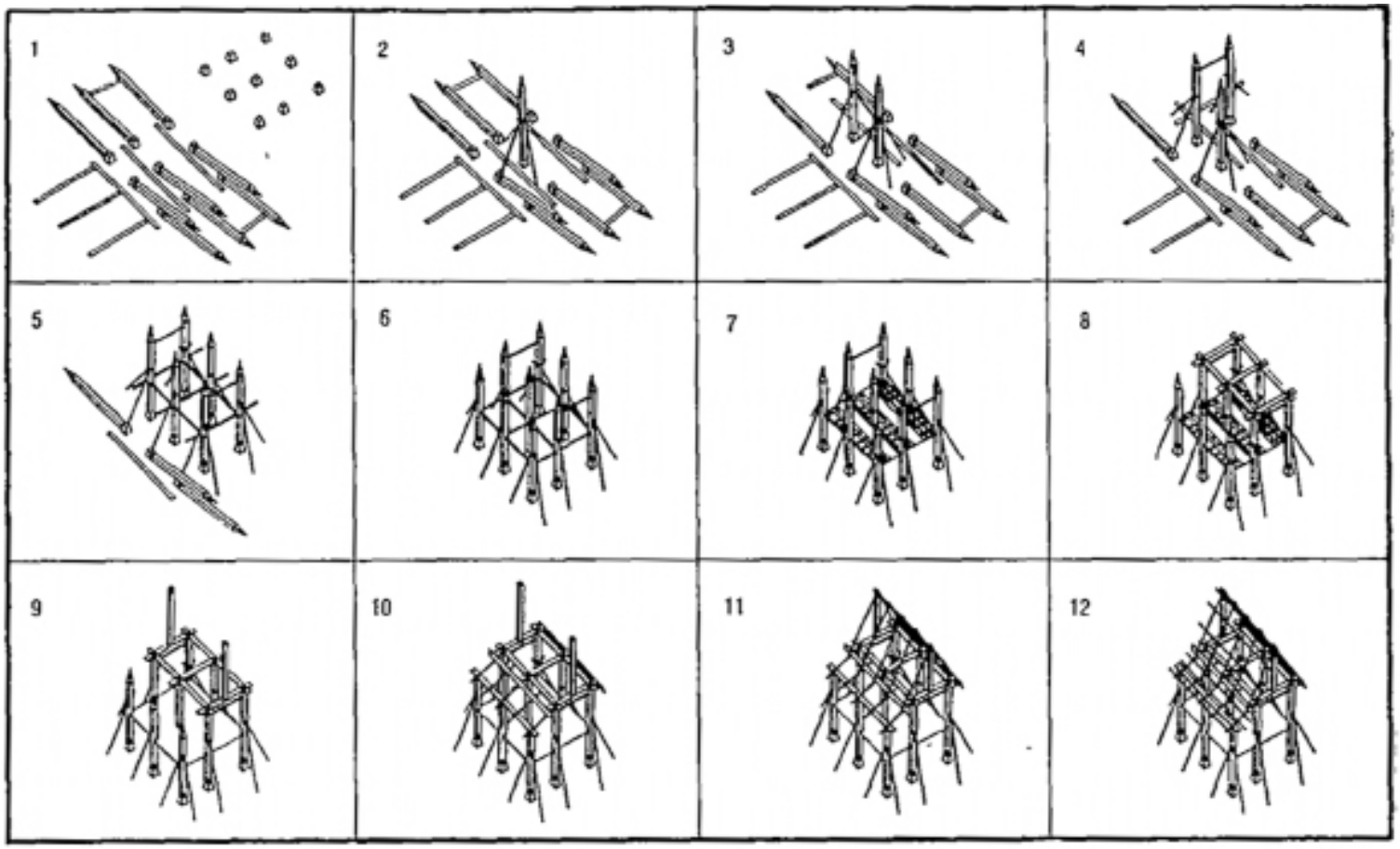
Historically, the ancient local dwellings are often built without the use of metal including nails. Instead pre-cut holes and grooves are used to fit the timber elements into one another, effectively making it a 'prefabricated house'.

In traditional building, the selection of timbers was very important and required expert local knowledge. Malaysian timbers, either produced by local labour or commercially milled, are entirely hardwoods.

1) Chengal species, being very strong, and relatively durable hardwood under exposure from sun and heavy rain, was the preferred species.
The dense timber contains oil which makes structures resistant to termite attack. It is not difficult to work and shrinks less than other Malaysian timber and is therefore suitable for heavy structural work (Malaysian Timber Industry Board, 1986 . p. 50).

2) "Merbau" is another common type which is strong, hard, heavy and resistant to termite attack.

Erection of structure



After cutting down the tree, the logs were usually kept in water or mud for 3 months as it was considered that the timber would be more durable after the sapwood had been broken down by immersion.

Later, the logs were exposed to sun for at least 3 years for seasoning to minimise dimensional changes in the wood and to enable the production of accurately shaped and sized components. Evidence for this can be found at "Rumah Pak Ali", Gombak at Kuala Lumpur which was constructed in 1917 and still exists today.

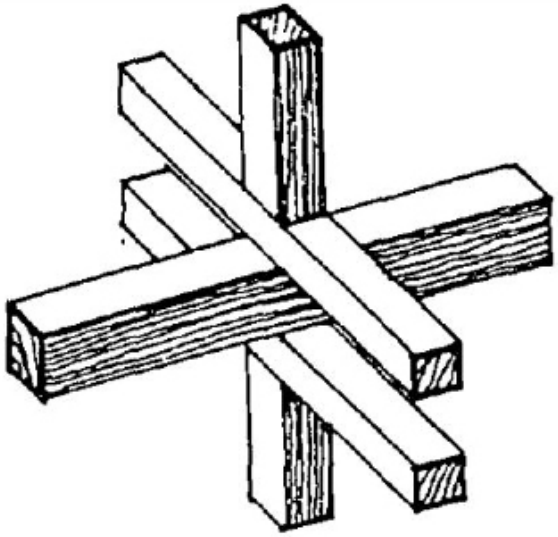
Ancient Malay community follow local taboo & principle of "one house, one tree" in erecting traditional vernacular dwellings.
- The nine major posts must be cut from a single trunk which is shaped into a square section and then split into nine posts
- When the posts are positioned, they must maintain the same relationship to each other that they had before they were cut from the tree.

The survival of many traditional buildings today is attributed to these traditional processing methods which ensured that the best possible materials were used.

Framing system

There are 8 basic ways of constructing a timber frame building in Malaysia
They differ m the spacing and arrangement of the load bearing members and the types of connections used.

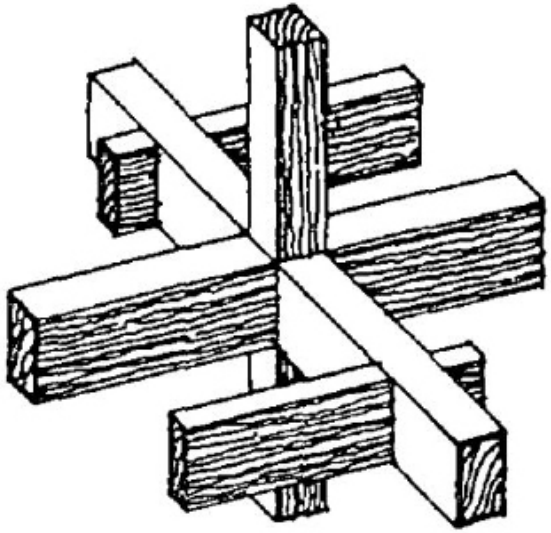
Different types of timber frames offer different advantages and are very adaptable to special situations



1) Traditional Frames

Consists of columns (post, studs) and main beams. The entire building rest on concrete stumps to prevent the structure sinking into the ground. Columns are tenoned into mortises in the sills.

The distance between the columns is kept as short as is necessary (not more than 3 metres apart) to carry loads.
The weakening of members caused by mortises and notches is compensated for by larger solid cross section hardwood timber members.

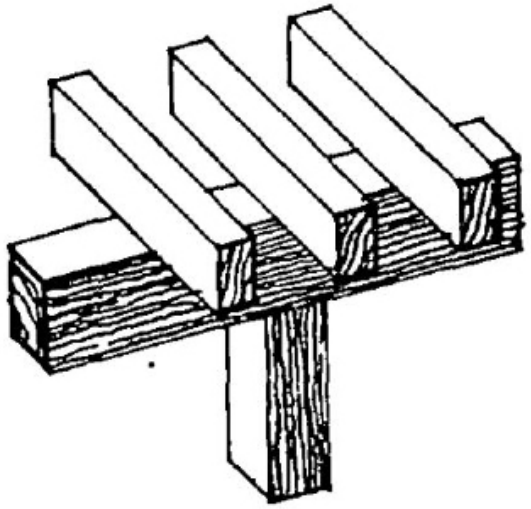


2) Tie Beam Construction

The bearers act as tie beams between the continuous posts with
identical details m all directions. All interior and exterior connections occur on the same level. The joists in the adjacent floor panels span in alternate directions m such a way as to equally load the bearers.

Disadvantage - not able to cantilever a structure away from the building

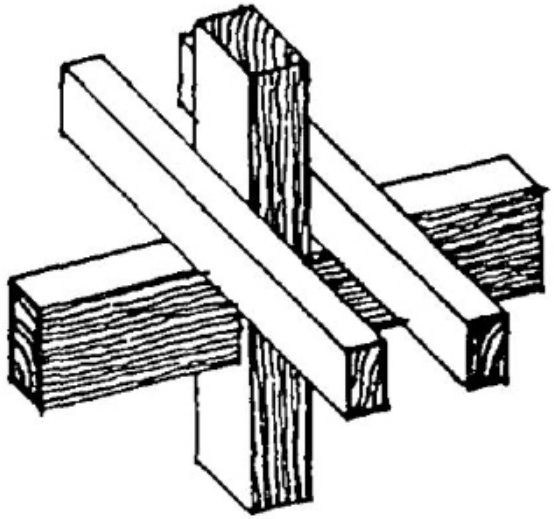
Tie beam framing can accommodate prefabrication systems, thus
it is economical for resort structures havmg a number of repeated units.



3) Post and Beam, Single Storey

Posts rest on parallel bearers; secondary bearers are placed onto them. If the bearing surface is not sufficient to transfer the load,
bearing areas must be increased by means of steel plates or angles.

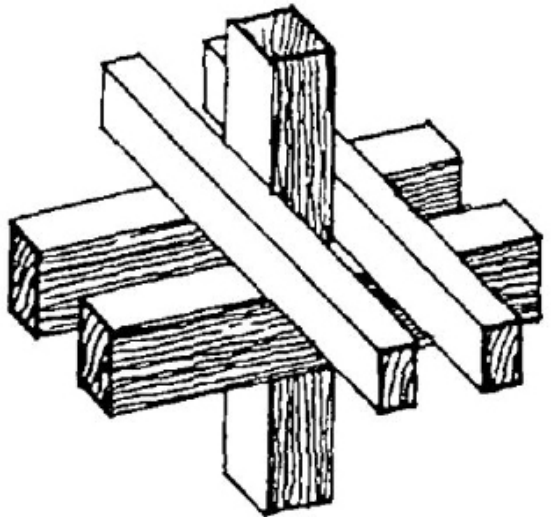
Advantage - potential for longer spans by using trusses or larger bearers.



4) Post and Beam, Two Storey

Connection bearers rest on columns; columns are interrupted by
the bearer: but are set up again on the next floor.

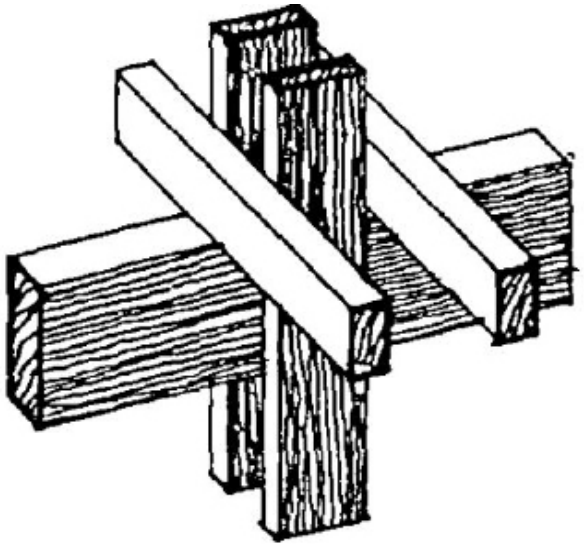
Connection between bearers and columns can be made in various ways. Load from the upper column is not transferred to the lower one through the bearer, because compression in the bearer might be exceeded. It is necessary to use steel or timber gussets for this purpose.



5) Twin-Girder Framing

Continuous twin bearers span between continuous columns and
attached to their sides.

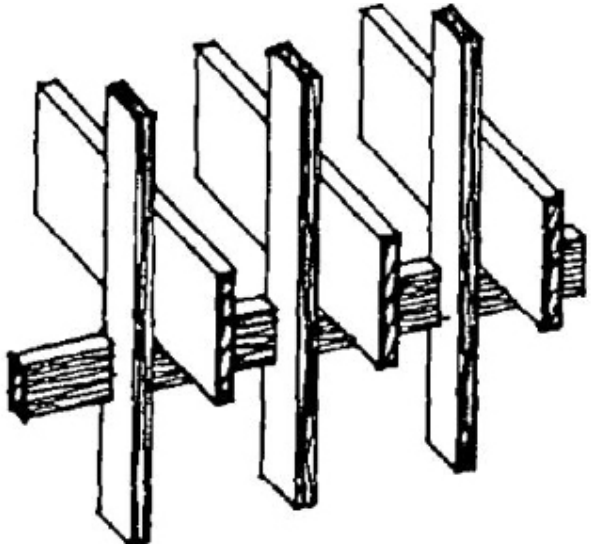
Advantage - both columns and bearers are continuous. A hallmark of this construction are the protruding ends of twin bearers, necessary in most cases due to the distance required between connections
to the post and the end of bearers.
This construction is the basis of pole frame construction for the long houses in Sarawak.



6) Split Column Framing

Continuous bearers are fixed between continuous split columns.
Twin column structure layout is a reversal of twin girder framing type. Quadruple split columns allow a two-way layout of girders.

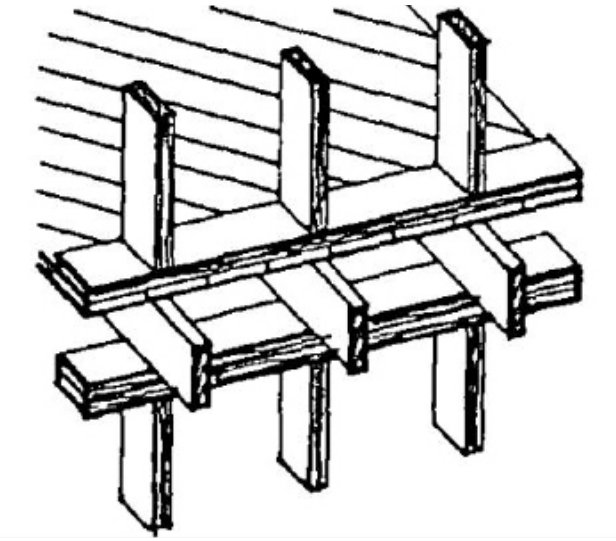
Split columns are suitable for long span structures found in industrial building, such as the General Lumber Prefabrication and Builders Factory, Selangor.



7) Rib/Stud/Balloon Framing

The load carrying members generally consist of standard timber studs placed a relatively short distance apart.
The studs carry sheathing on one or both sides, which takes some load and provides much of the stiffening. It represents the transition between skeleton and panel framing.

Balloon construction, the wall studs continue through all the floors. Uprights planks are cut into the studs as sills at every floor and the joists resting on them are nailed into the studs.



8) Platform Framing

In platform construction, a continuous timber plate is fixed on
top of the wall studs, the joists of the next floor rest on the plate and a deck is laid on the joists to form a new platform.


Timber in Japan

Types of Wood commonly found in Japan

Zelkova

Wood grain is bold and beautiful, strength and durability, hardwoods representing Japan.

Deciduous broad-leaved trees of the elder family Zelkova. Ring material. The material is heavy hard and has excellent moisture resistance and durability. Meanwhile, it takes a considerable drying time until madness and decay settle.

From the viewpoint of both durability and beauty of grain, it has been used extensively as a building material, furniture material, joinery material, construction material from ancient times. It is a representative tree of Japanese hardwood trees, which was particularly useful as temples company architecture and the main pillar of farmers.

Tochi

A beautiful gloss and ripple mark are popular, unique and familiar material.

Deciduous broad-leaved trees of the genus Pinacea. Diffusion material.
A similar species of malonie (horse chestnut) is famous as a street tree in Paris.

In fact it grinds and makes tochi mochi and real rice crackers of tochi etc.
Drying of the material is easy, but it is easy to go wrong, and if the condition is bad, the material rots quickly.
Tochi wood with appreciation value and decorative property is called white aotoki, which is not uniform in color of false hearts and colors close to it, red tend to be avoided because it is said to be reddish.

Sen

Easy-to-use materials that can be colored even with white wood

Deciduous broad-leaved trees of the genus Leuca. Ring material.

Branches thick, also referred to as Harikiri (kalopanax)from that sharp thorn in many cases. The material is light, soft and easy to process.

The appearance of color, grain and the like is similar to “Ash”, but it is not as strong or durable as white ash or European ash.

One is for plywood die as the current application, Sen plywood interior wall material, door, one of the most exclusive as furniture.

Nara

Representative of domestic hardwoods popular as furniture material

Deciduous broad-leaved trees of the Fagaceae Family. Ring material. Narras are called aquaria by another name because they spray a lot of water when cutting down.

The color is generally dusky brown, and in the straight-line material it shows a distinctive pattern commonly called tigerfish (torafu). The material is heavy and dense. Moisture content is high, the shrinkage rate is large, it is easy to go wrong. Difficult to dry.

Sapwood is easy to rot and weak against insect damage. It is common with furniture material, and it is also widely used for various equipment materials and mechanical materials.

Walnut

Easy to process, less cracks and madness, sticky material

Deciduous broad-leaved trees of the walnut walnut. Diffusion material. It is hard and soft and its eyes are straight and easy to process as a material.

What is well-known for the use of walnut wood through the east and west of the ocean is gun bed material. It is relatively light, that there are few deviations and cracks, that when you wipe the oil well, it will be shiny, but also that shocks are well absorbed and not repelling.

Tamo

Tree that can be used for a wide range of applications with strength and elasticity

Deciduous broad-leaved trees of the genus Monocotyledonaceae. Ring material.

Somewhat heavy-duty, easy to cut and process. Although it has few disadvantages, it suffers from insect damage.

It is used not only as materials for furniture, decorative materials, everyday appliances but also for plywood materials. It is also a material used for baseball bats and tennis rackets because it is rigid and rich in elasticity.
Good ones grow to exercise equipment. Things with poor growth are useful as furniture materials.

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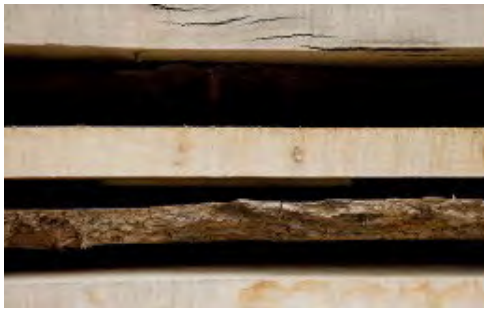
Maple

Smooth, rigid and sticky elegant material.

Deciduous broad-leaved trees of the Mapleaceae maple. Diffusion material.

There are only 200 kinds of maple which is useful as wood in over 200 kinds, and itai yaka maple is one of them. It is strong, stiff and sticky. Eyes are precise and precise. Kihada is smooth and elegant.

Drying is difficult and hard to process. It is useful as a material for musical instruments, and it is used as harmonica and piano action material, back deck of violin · guitar and side plate material etc.



Cre

Wood of excellent durability that has been useful since Jomon period

Deciduous broad-leaved trees of the genus Fagaceae. Ring material. It is hard, sticky, strong in water, excellent in durability, little rampage and cracking. Utilizing these characteristics, Japanese have been used for various purposes such as the foundation of buildings and sleepers since the Jomon period.

Apart from its use as a building material utilizing the strength of durability, it is also popular as a furniture material from distinctive beautiful wood grain.

Takayama Hida

a city near the northern Japan Alps of Gifu prefecture, and
her importance in Japan wood crafting

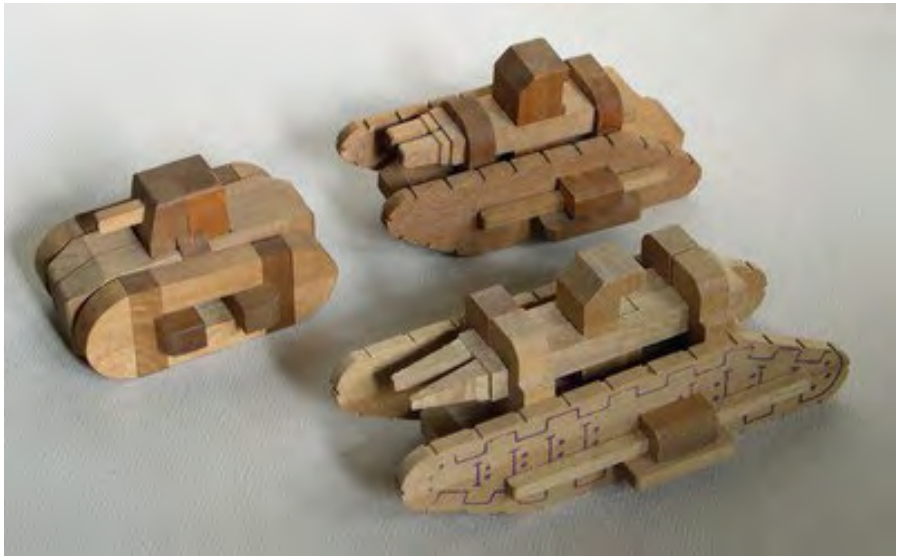
Takumi (匠) is a Japanese word meaning “artisan”. One of the main region in Japan has its master builders dating back to Nara and Heian periods (710CE-1185CE) is Hida. Hida no Takumi （飛騨の匠）are craftsmen in Hida who had superior skills in wood crafting.

Takayama is where Hida is located. Today, Takayama's culture is still based on the scrupulous nature of the master woodworkers who utilized wood with a prowess and sensibility that was nurtured in Hida's rich natural environment. Visitors to Takayama can witness shrines and temples from the Middle.

During the old times, Hida officials would despatch skilled carpenters to the then capital of Nara to construct buildings and temples in lieu of paying taxes. Some of these magnificent temples, including Tôdai-ji, Yakushi-ji and Hôrûy-ji are designated as Unesco (United Nations Educational, Scientific and Cultural Organisation) World Heritage Sites. The most notable temple is the Hôrûy-ji pagoda, built 1,400 years ago, and apparently is the oldest wooden building in the world.

Dubbed Hida no takumi, these craftsmen mastered the art of joinery in which a piece of wood is fitted into another using various joinery techniques, or tsu-gi-te (a generic term for joinery including spliced and angled joints). This technique is called Kumiki.

The timber-framing joints, help isolate vibration while maintaining structural integrity – a vital trait needed to construct flexible (ie, can be disman tled) yet structurally strong houses in earthquake-prone Japan.



Modern Day Kumiki

A craftsman who has mastered the traditional wood crafting techniques and tools can now apply his knowledge and expertise to modern machines and different materials. The modern carpenters and woodworkers, use a combination of traditional hand tools, like chisels, saws and wooden planes, and machines. to create modern furniture andarchitectural elements.

To ensure nothing goes to waste, the leftover wood is used for smaller products like toys and stationery.

Types of Tools used for wood crafts and joinery

Nokogiri (Japanese saw)

They are divided into two broad groups: the ripsaw, which cuts along the wood grain and is known as tatebikinoko and the crosscut saw, which cuts across the wood grain, and is known as yokobikinoko.

The blade is made from a thin steel plate with teeth, nokoba, on one or both sides, which have been tempered by heating . The difference between the ripsaw and the crosscut saw is in the shape of the cutting teeth. The ripsaw has wedge-shaped teeth with sharply pointed tips, whereas the teeth in the crosscut saw are not pointed, but finish in a blade edge.

Incidentally, most Japanese saws cut during the pull stroke, not the push stroke.

Kanna (plane)

A plane, used to shave away the surface of timber to get a smooth finish. There are many different varieties and shapes of planes depending on their use.

These included the smoothing plane hiraganna, the corner-cutting plane kiwaganna, the side-shaving plane wakiganna, and the grooving plane maruganna.

Nomi (chisel)

A tool used by a carpenter to bore holes in timber.

The first type is the tatakinomi, an extremely strong chisel fitted with a metal ring called a capping hoop, katsura , at the end of the handle, and is used by hitting it with a hammer. The second type is the tsukinomi , which is used by gripping the handle and applying hand pressure.

Genno (Chisel hammer)

Flat face on one end which is used for most purposes and slightly convex face on the other end for fine finishes. Some hammer have an angle to the handle, the handle angles towards the flat face. This makes it very easy to know which face is which when you pick up the hammer.

Marking tools including sumisashi (bamboo brush) and sumitsubo (ink line)

The tip of a piece of bamboo is sharpened into a pallet shape and then split very finely (approximately 30 divisions) to form a brush. The long-grained Japanese bamboo madake is used and the tip measures 10 to 15mm wide.

The bristles are soaked in the silk wadding of a carpenter's ink pad sumitsubo, and the sumisashi is used in the same way as a cartographer's pen; to draw a line or special marks as a guide to cutting or notching on wood for construction.

Often used in conjunction with the carpenter's ruler kanejaku.

Toishi - whetstones.

A whetstone, grinder, or grindstone. A tool used to sharpen the blade of a plane or chisel. Carpenters used a set of ranging whetstones from very coarse, 800 grit to an unbelievably fine 6000 grit, a coarse, rough whet stones were called arato, the whet stones midway between rough and smooth were called nakato, and a very smooth grinding stone was called awasedo.

A blade was sharpened in stages: first sharpened with the arato, then the nakato, and finally the awaseto was used to achieve a fine cutting edge.

Kumiki in Architecture

There are several reasons why Japanese use kumiki for building constructions:-

1- Great strength can be achieved

In the process of connecting squared timber pieces together, it is required as a matter of course that the junctions be strong. The strength achieved by making different squared timber pieces as if one dissipates vibrations and shocks, and is designed to remain high. Nowadays, it is usual to use the so-called "conventional method of construction," which uses ironware like screws and bolts. However, there is a risk that, because of corrosion and wood aging, the ironware will become loose and the strength will deteriorate.

2- Wood can be lengthen with joints

The length of timber is limited. However, by using joints it is possible to make a 1-meter piece as long as 3 meters. It is possible to make timber pieces of any length while imparting them strength.

3- In the case of rotten wood, the particular part can be replaced.

All materials decay with time. However, it is possible to remove a decayed part, make a kumiki, and substitute the new part. This is also a reason that wooden structures are some of the longest-lasting ones in the world.

4- Building done with such technique can be dismantled and rebuilt

"Relocation and reconstruction," where a house is dismantled and built again in another place, has been done from time immemorial. At present, too, the number of people is also growing who settle in old Japanese-style houses that have been relocated after becoming vacant. This is also possible only because they are built without using nails.

5- The technique only the knowledgable artisans can attain

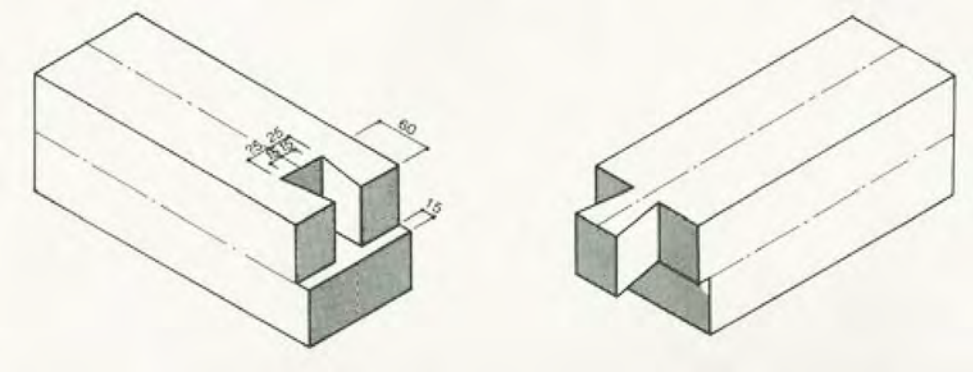
Wood is a living thing. Therefore, it should be used in such a way as to stay strong as long as possible and preserve its beauty after the artisan examines its grain direction and natural wear and tear. This kumiki technique is exactly a technique that highly skilled artisans have developed while making good use of the properties of wood.

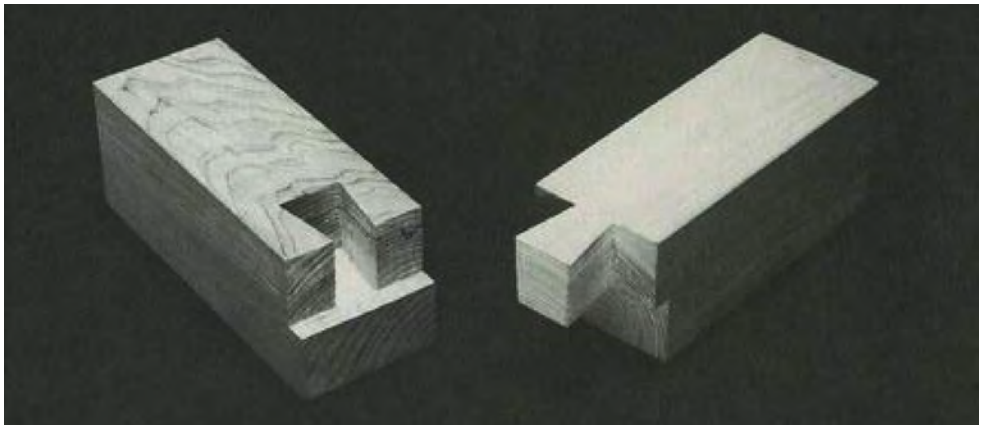
Kumiki

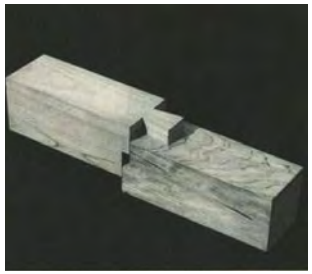
"woven or interlocking wood" -
a technique dated more than 1300 years old.

2 Types of Joints -
(a) Splicing Joint
(b) Connecting Joint

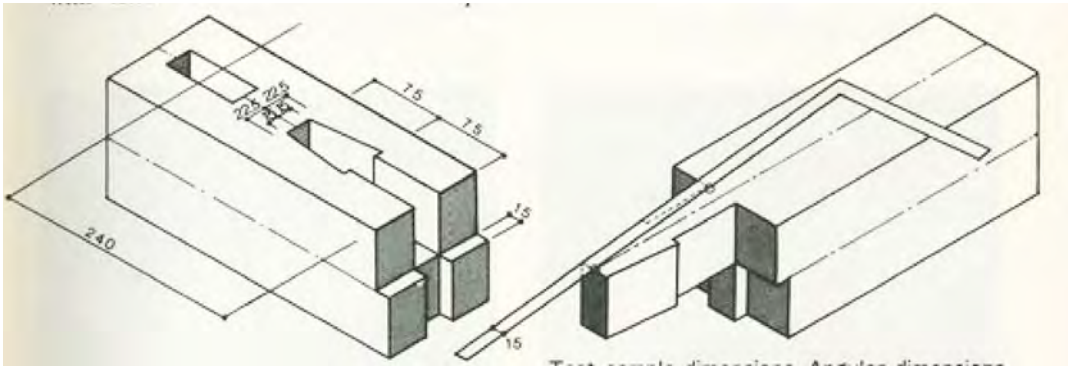
1- Stepped dovetailed splice

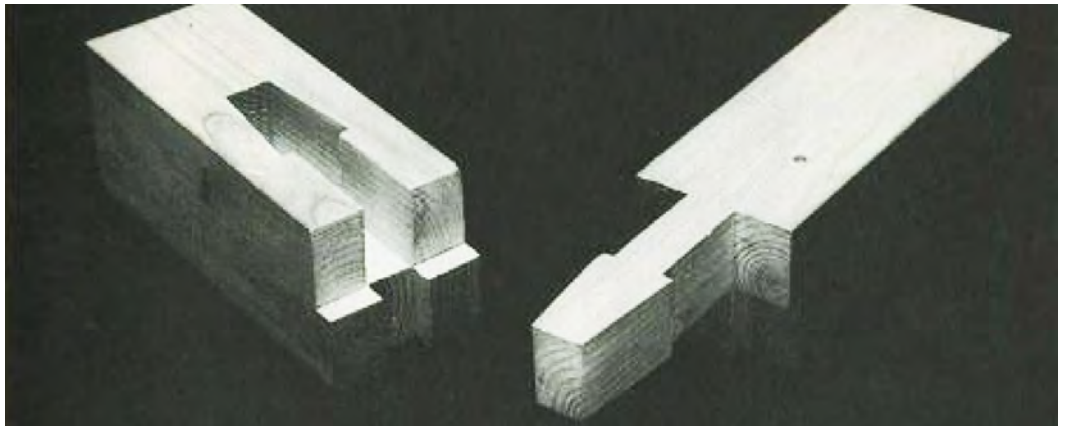


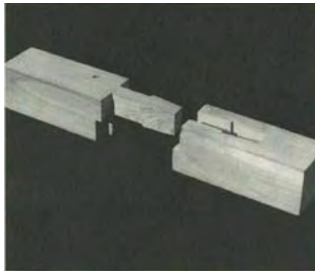


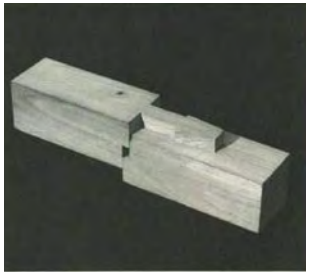


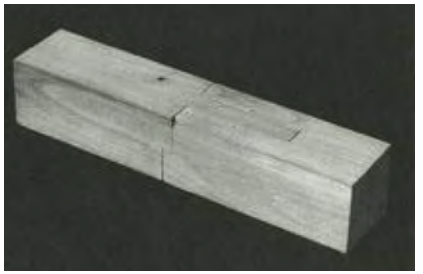
2- Stepped gooseneck splice



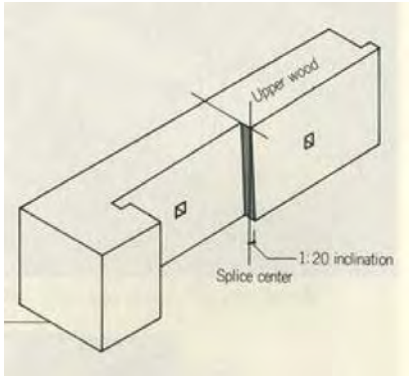


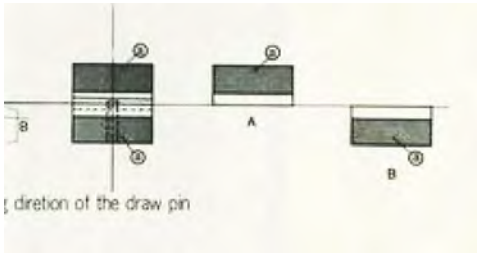


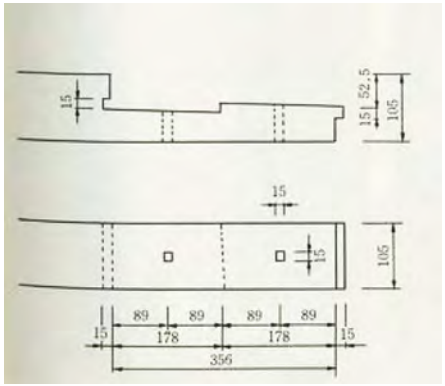


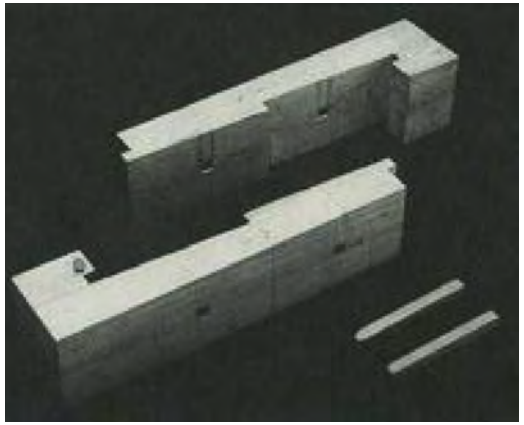


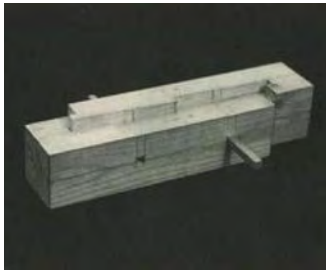
3- Rabbeted oblique scarf splice



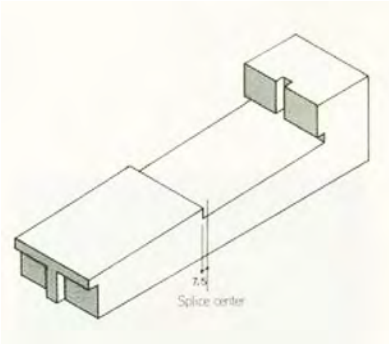


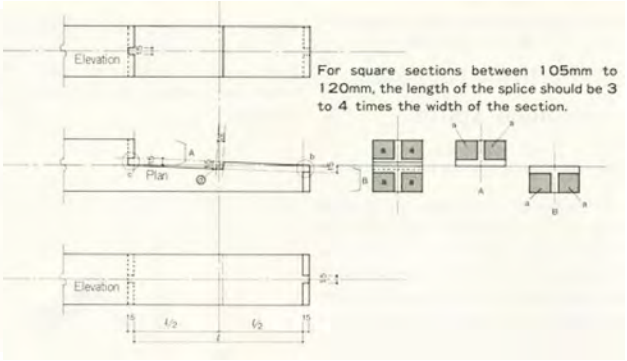


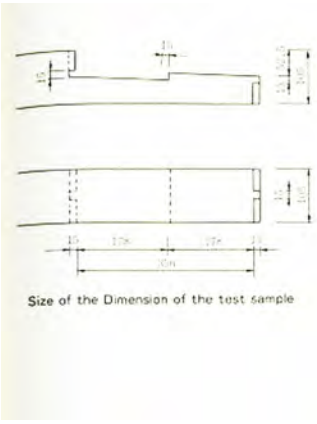


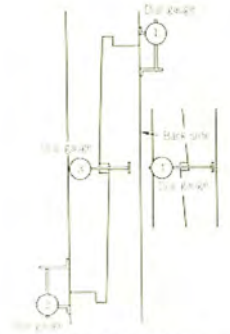


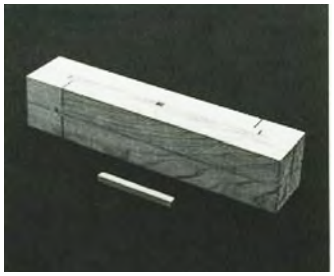
4- Mortised rabetted oblique splice



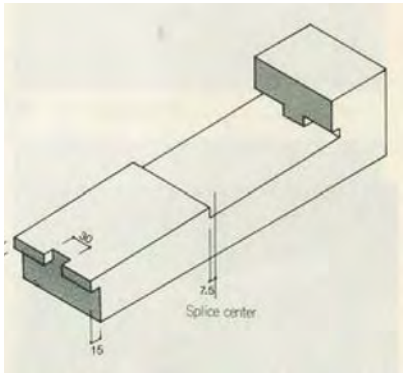


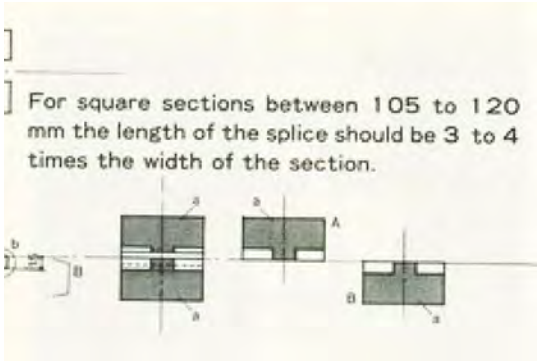


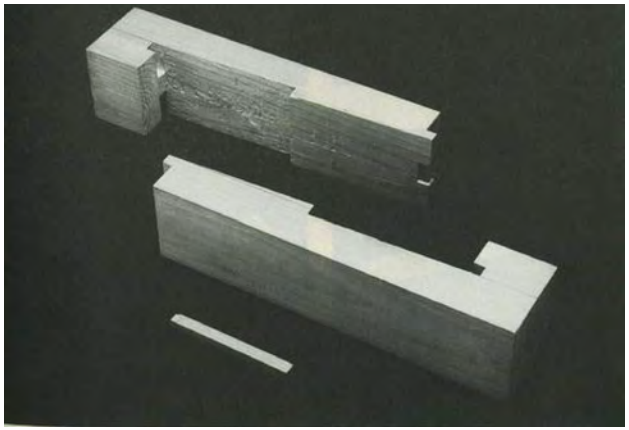


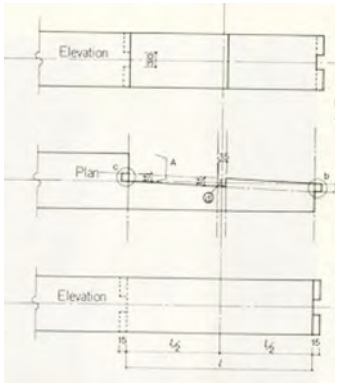


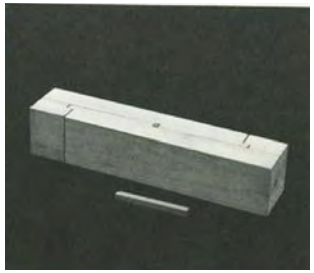
5- Blind stubbed, housed rabbetted oblique scarf splice

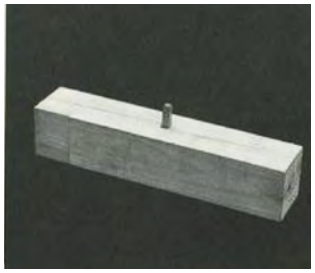






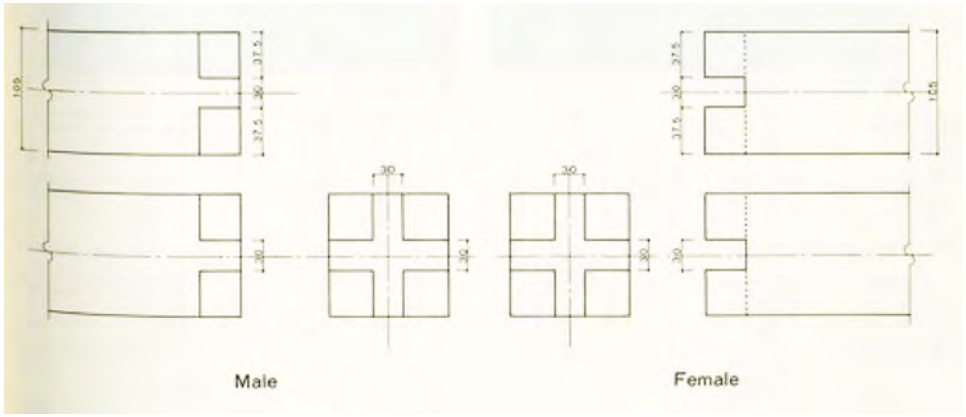


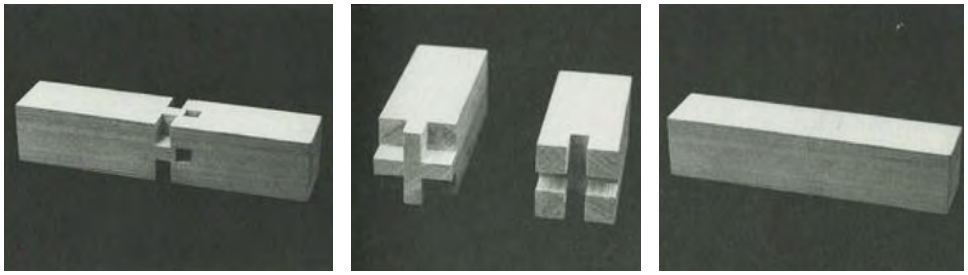




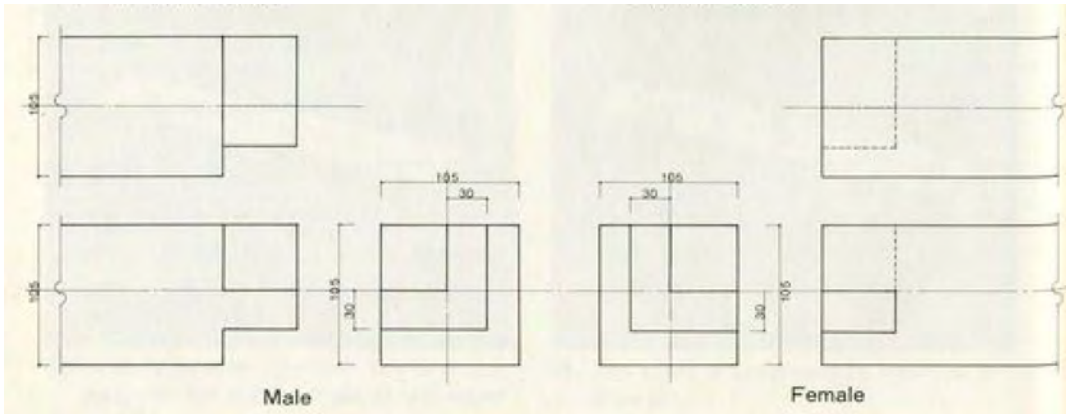
6- Tenon and mortise splice

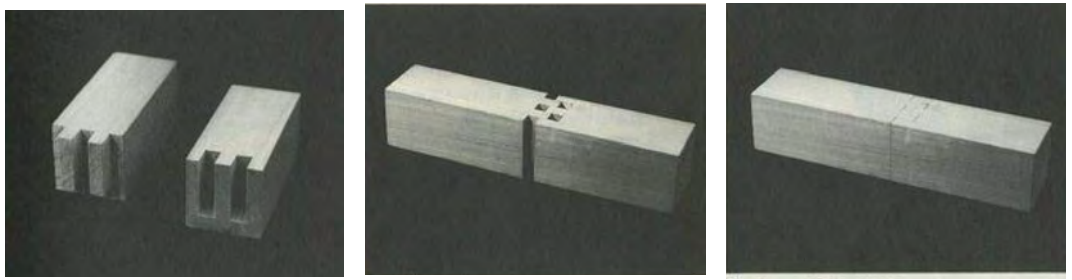
(a) Cross-shaped tenon and mortise splice



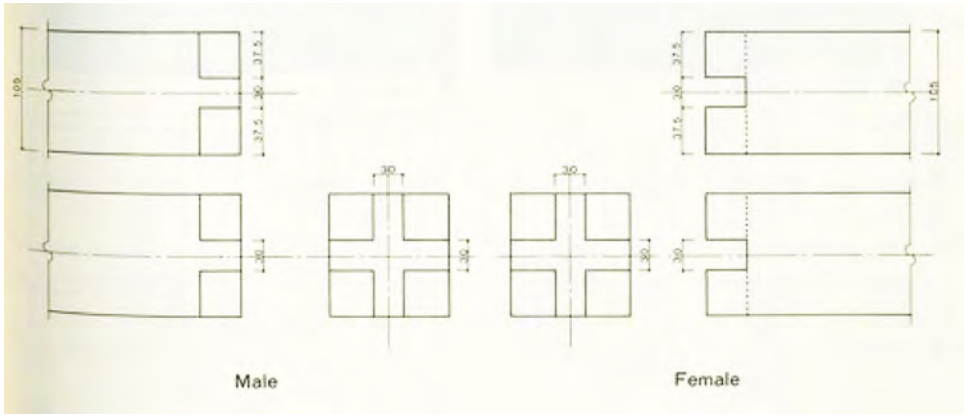


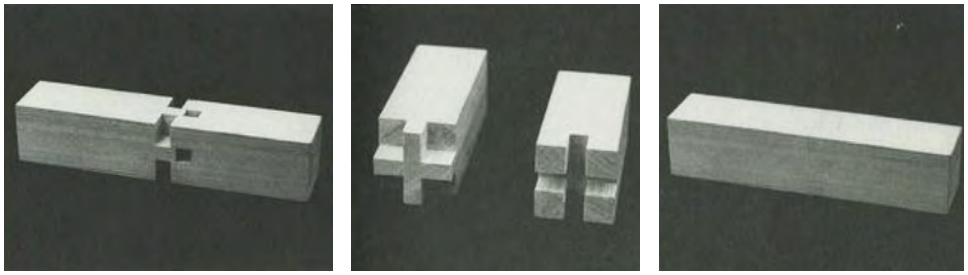
(b) Right angle tenon and mortise splice



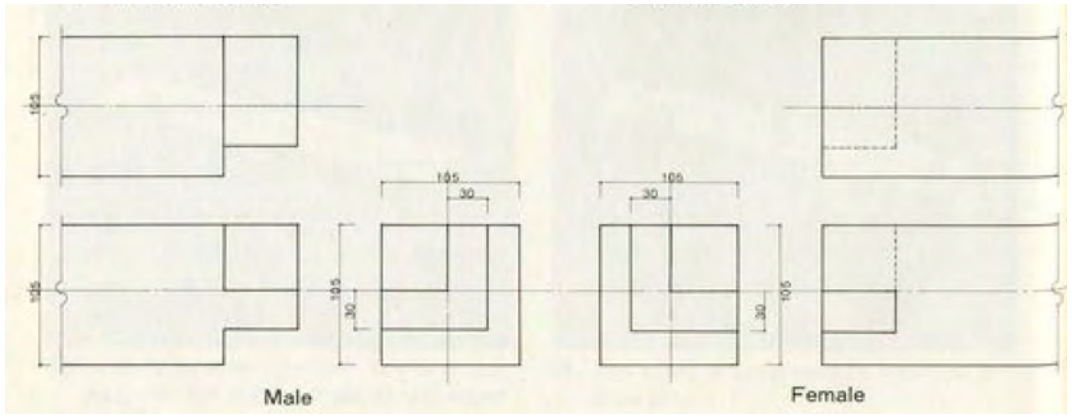


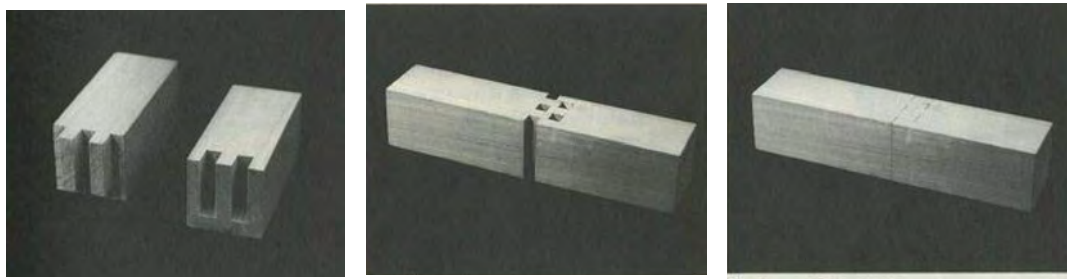
(a) Cross-shaped tenon and mortise splice





(b) Right angle tenon and mortise splice

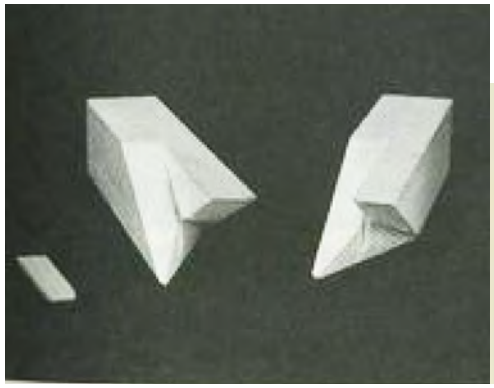


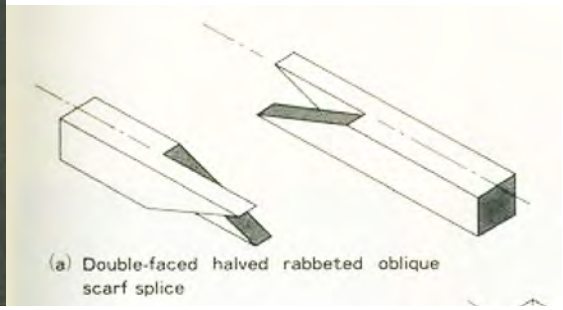


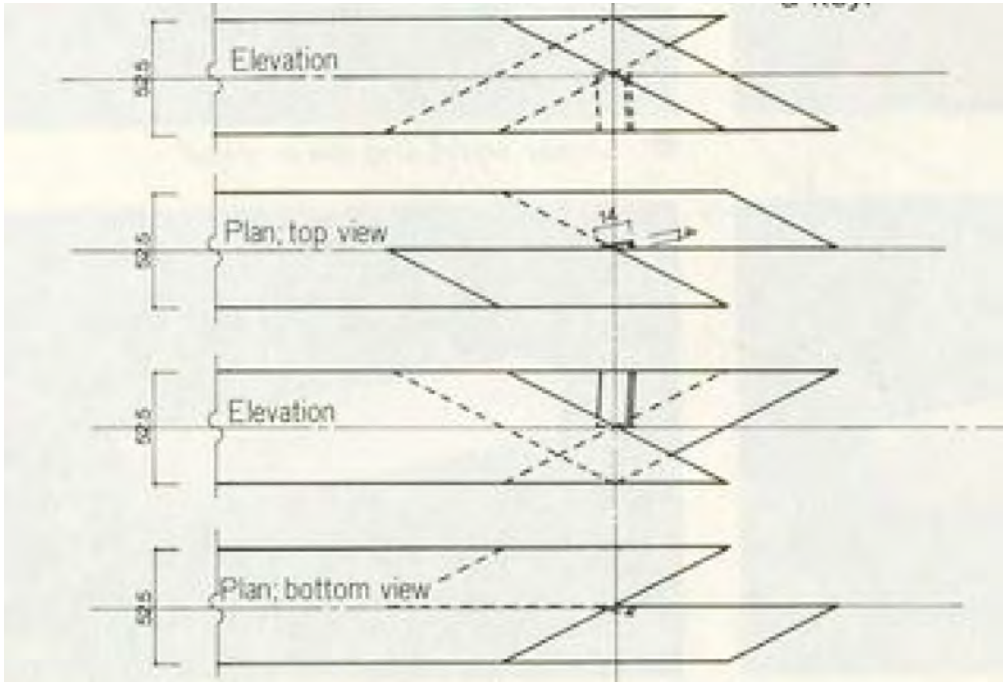
7- Halved rabbeted oblique scarf splice

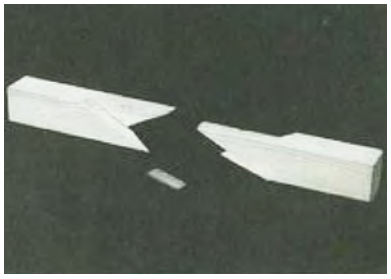
(a) Triple-faced halved rabbeted oblique scarf splice with key

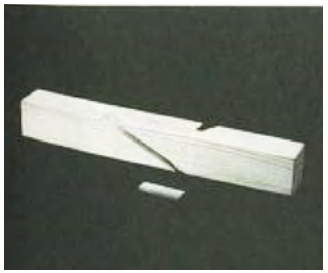
(b) Miyajima splice

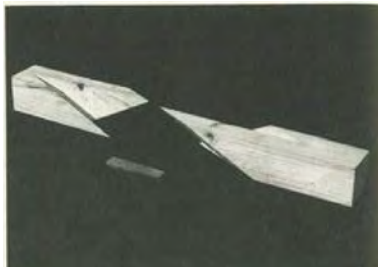


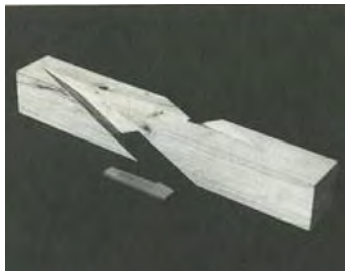


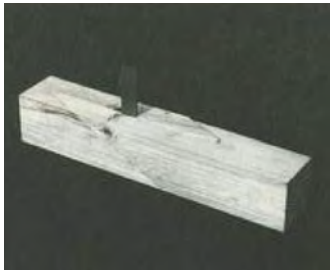




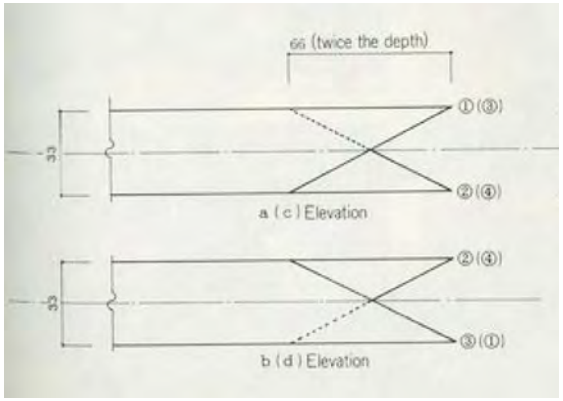


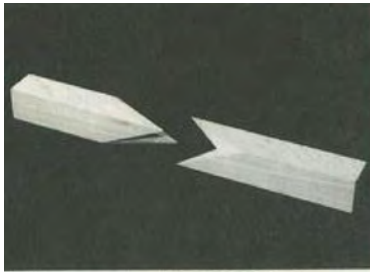


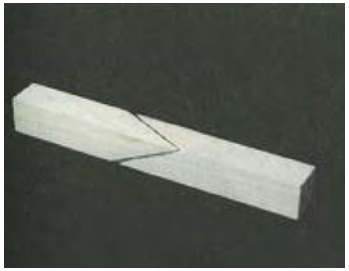


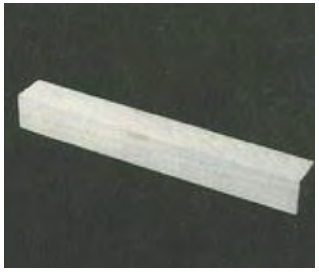


(c) Quadruple-faced halved rabbeted oblique scarf splice



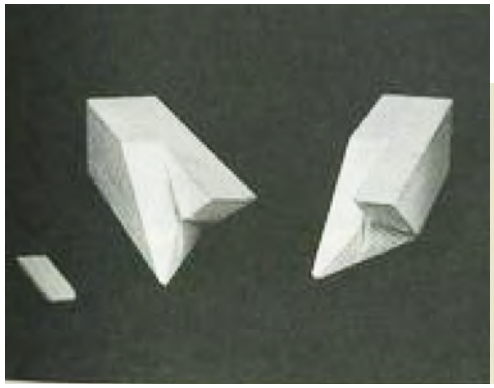


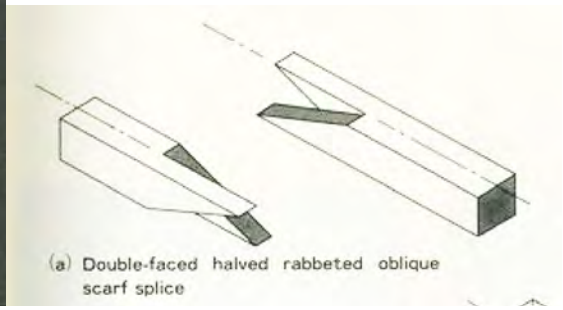




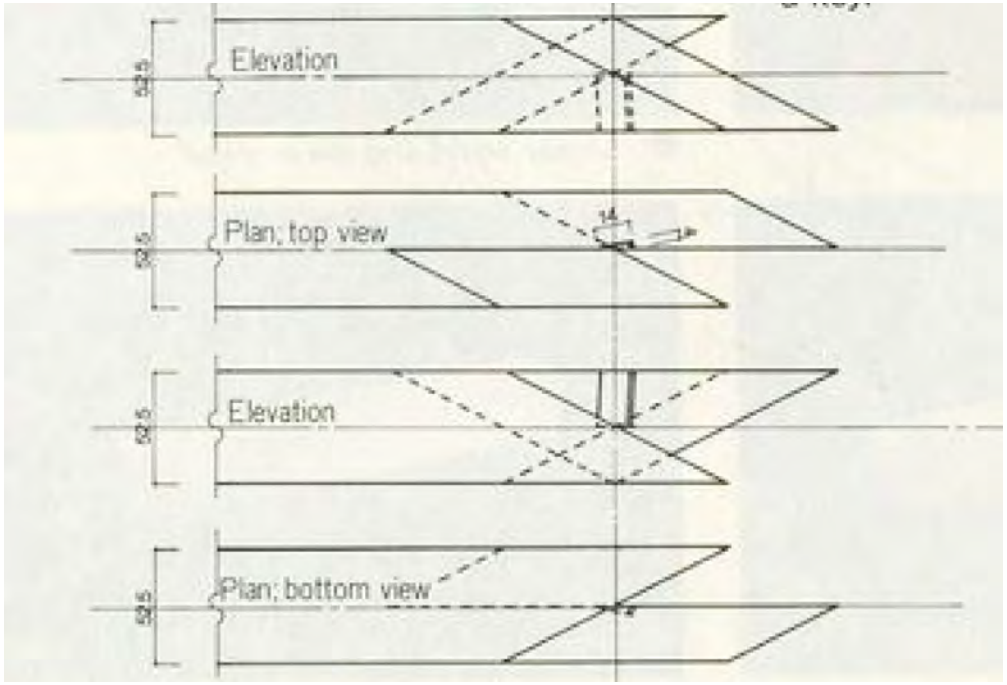
8- Housed splice

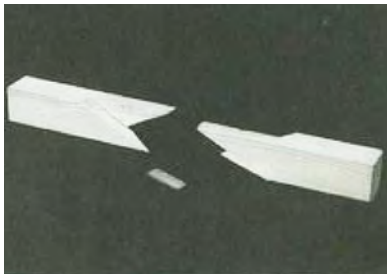
(a) Housed rabbetted oblique scarf splice

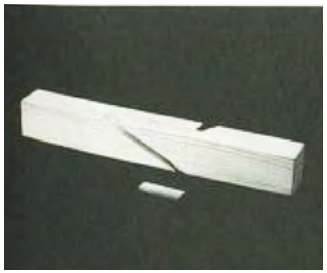


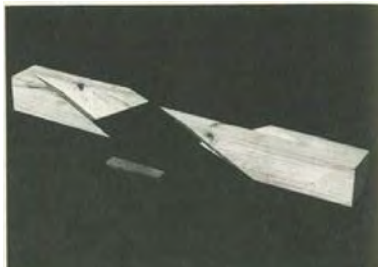


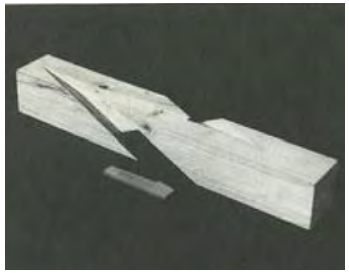
(b) Miyajima splice

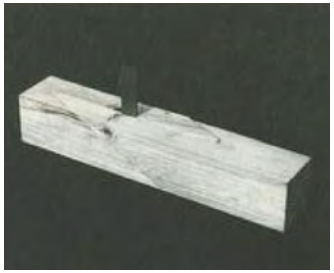




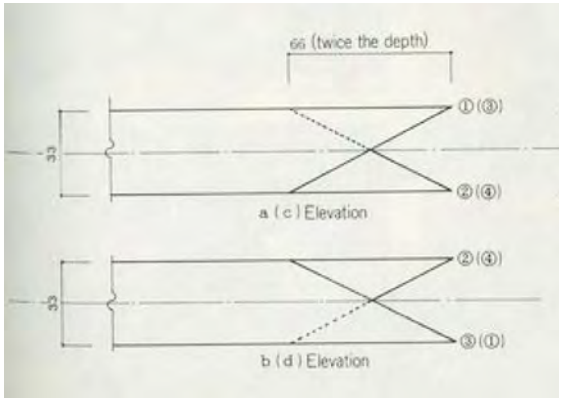


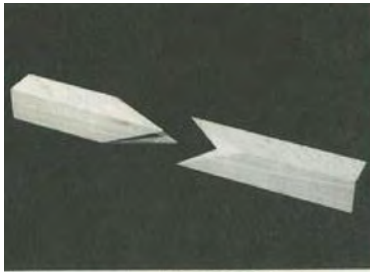


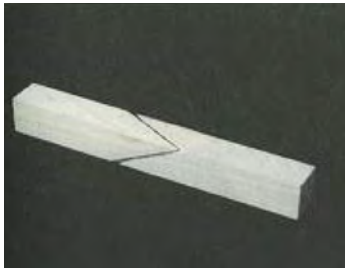


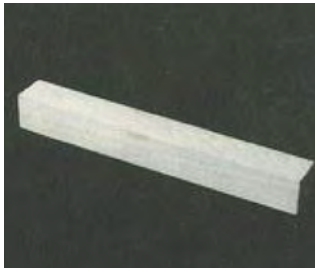


(c) Quadruple-faced halved rabbeted oblique scarf splice



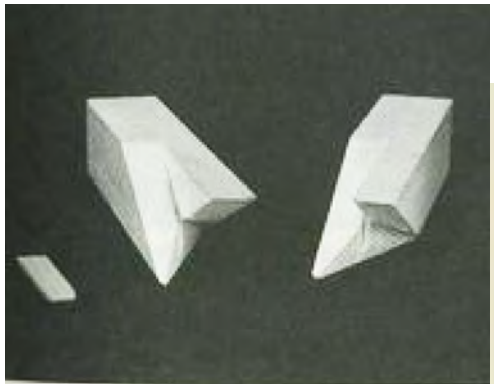


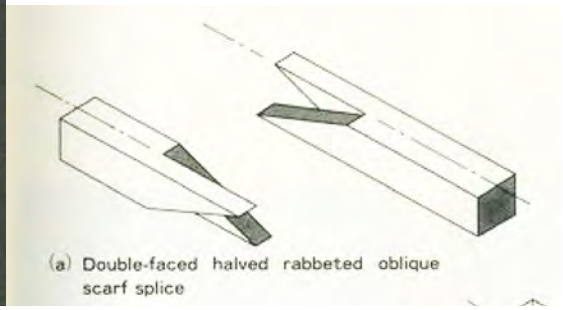




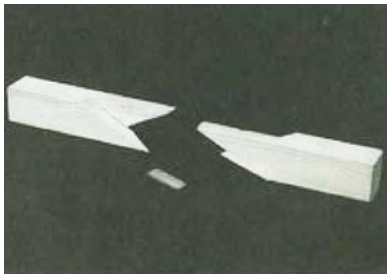
8- Housed splice

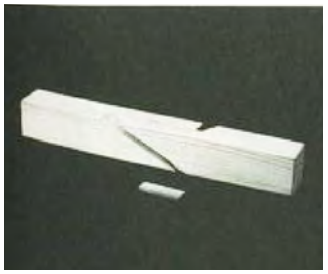
(a) Housed rabbetted oblique scarf splice



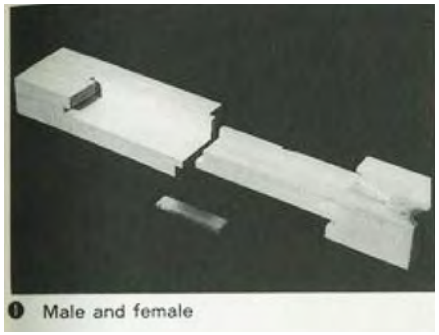


(a) Double-faced halved rabbeted oblique scarf splice

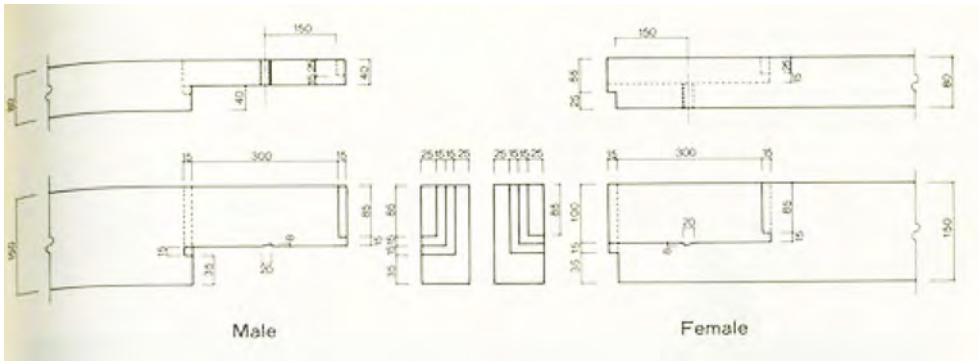


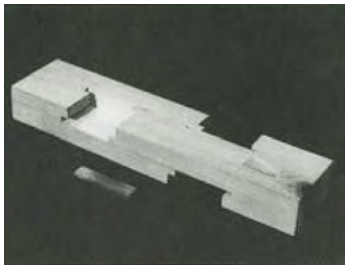


(b) Blind tenon and mortise

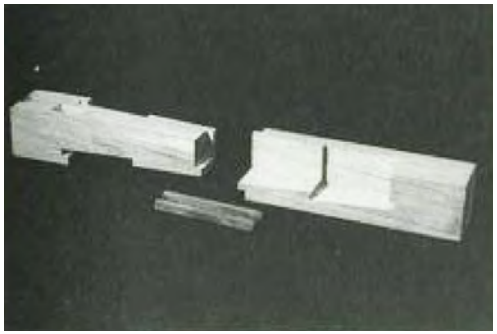


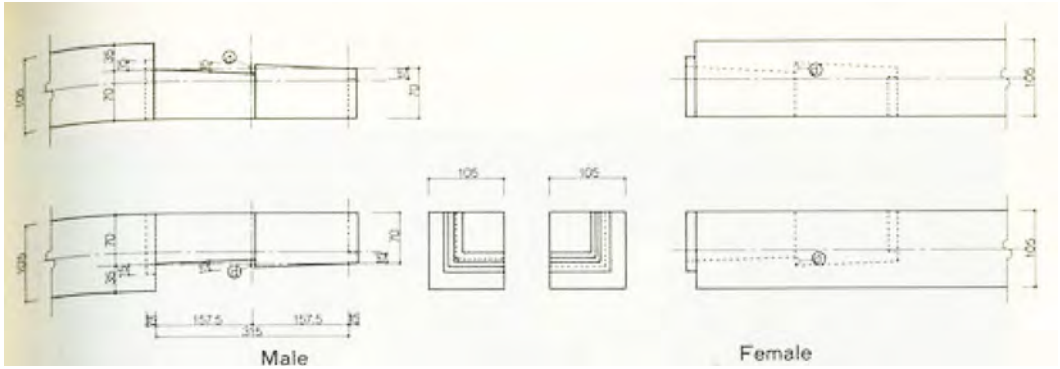
❶ Male and female

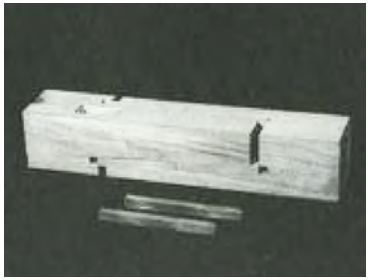


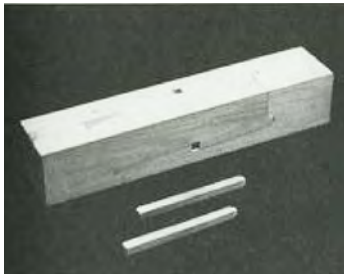


(c) Blind pin

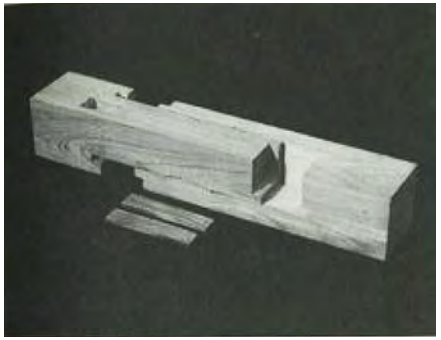


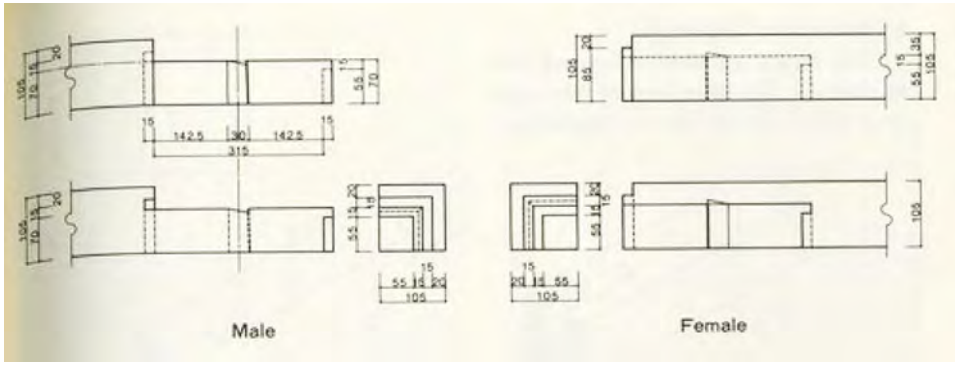






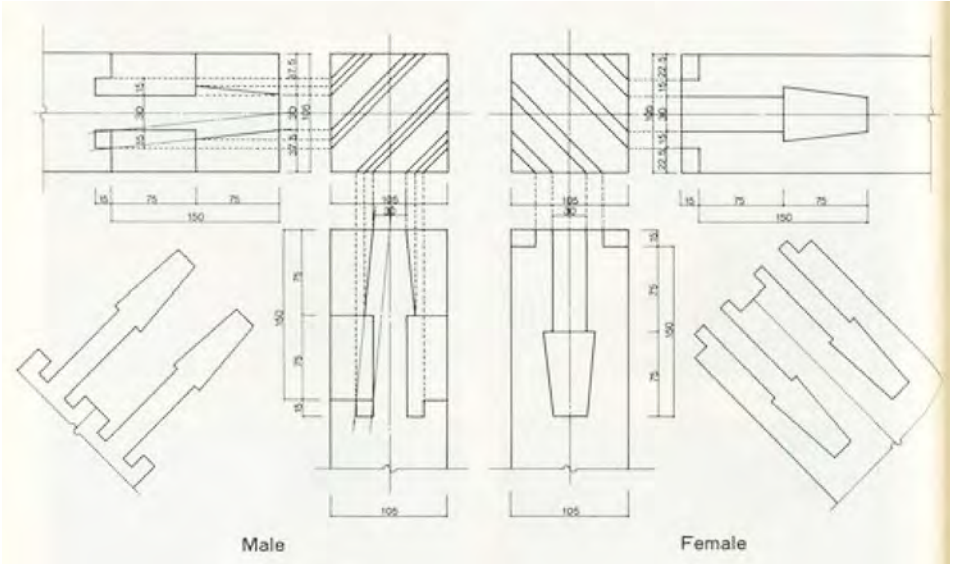
(d) Blind key

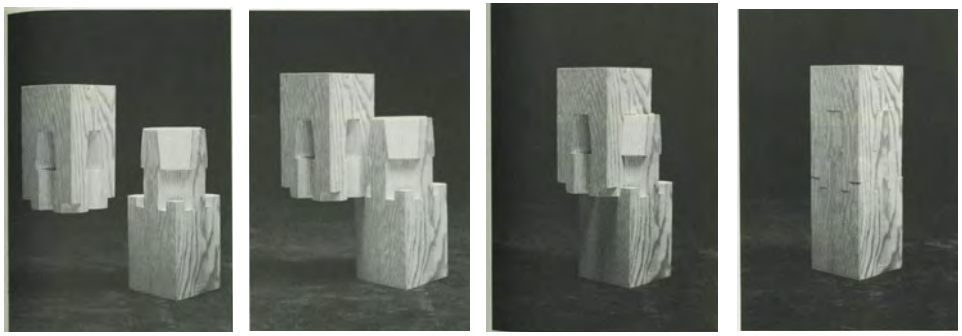




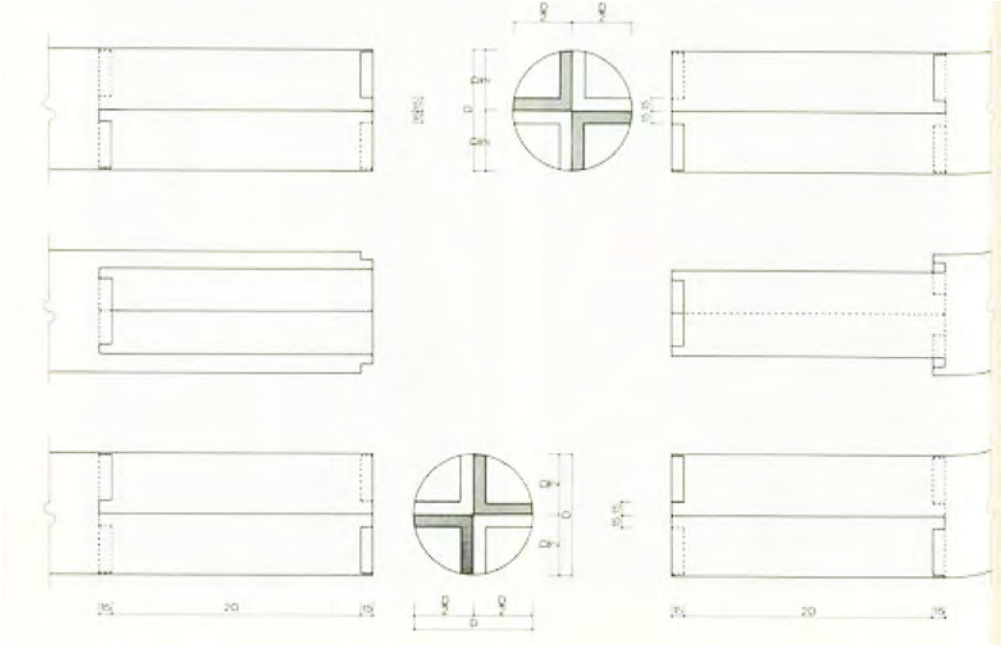
9- Column splices

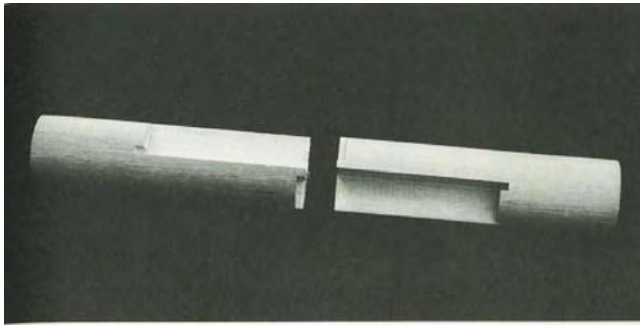
(a) Four faces gooseneck splice

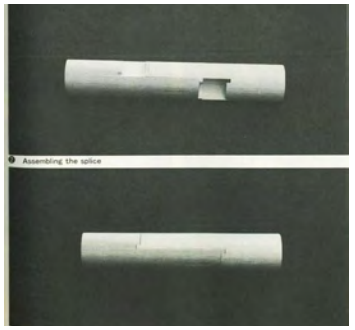




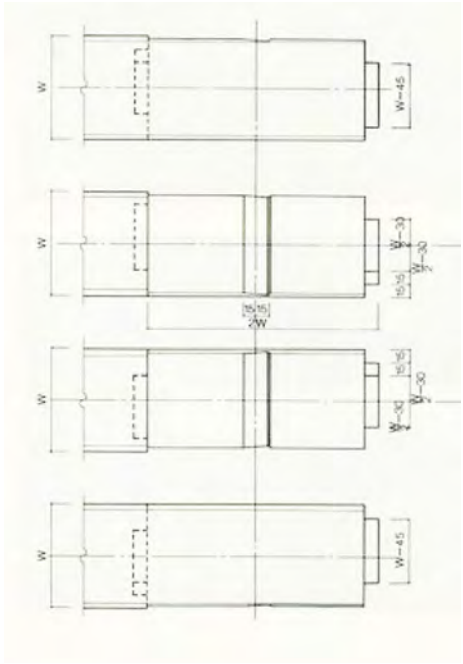
(b) Clamped shaped splice

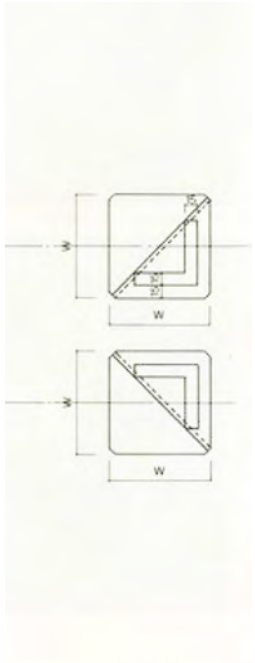


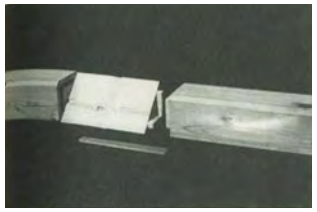


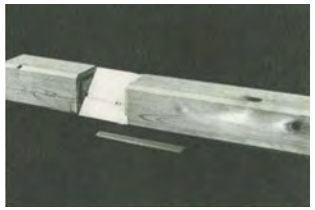


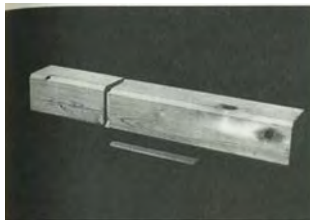
(c) Blind splice

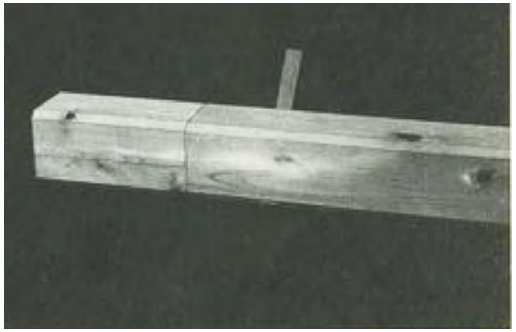


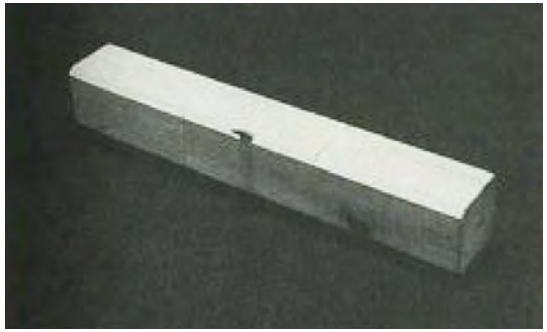




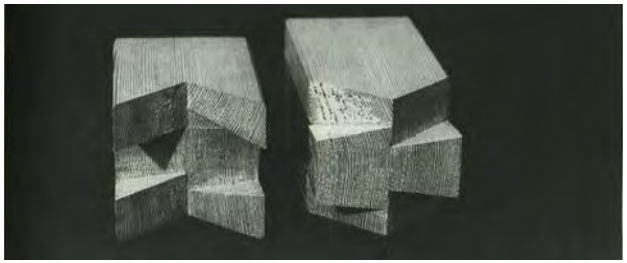


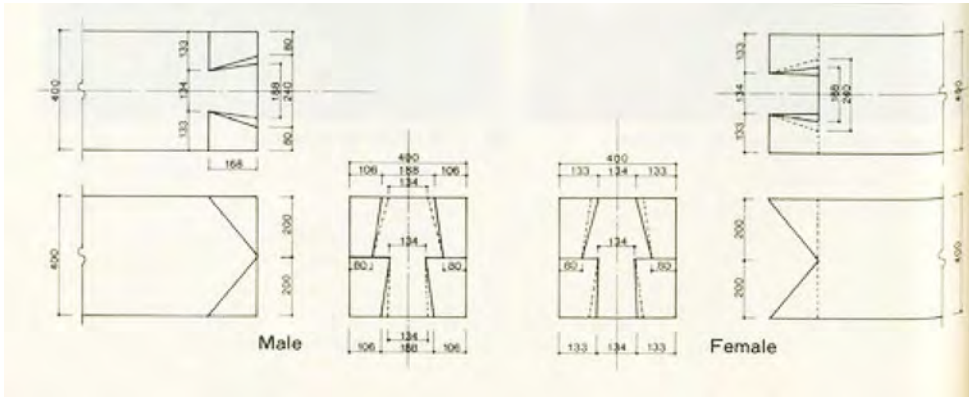


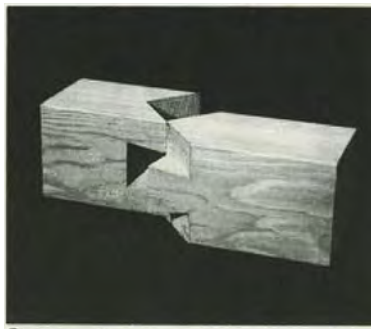




(d) Osaka castle - Otemon Gate's Pillar splice

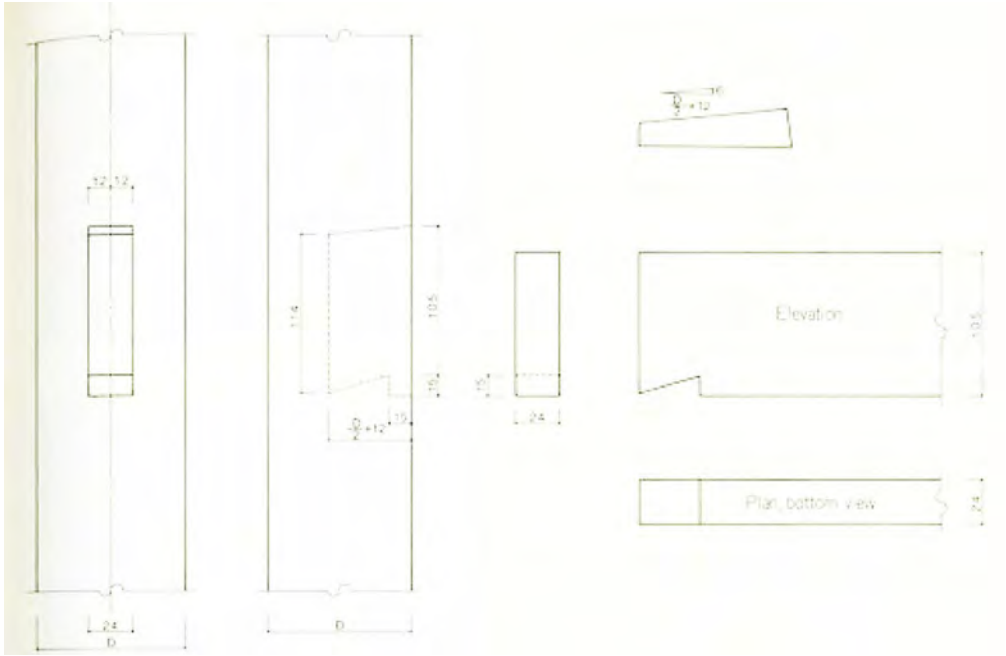


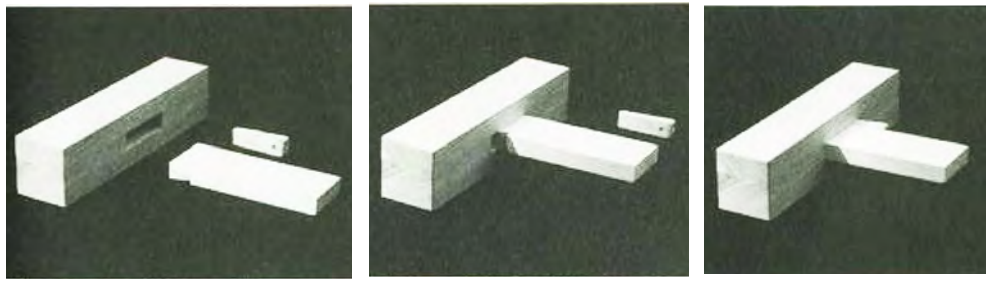




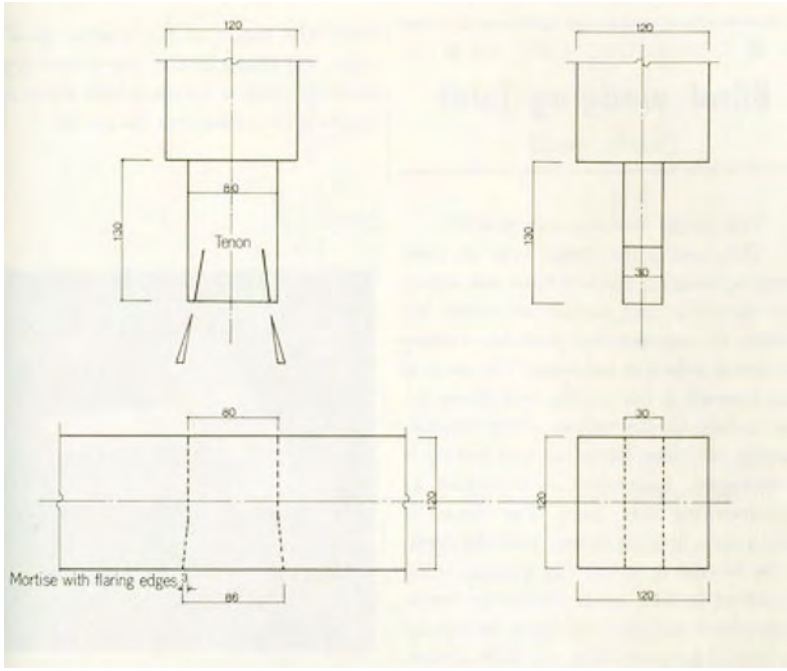
(b) Connecting Joint

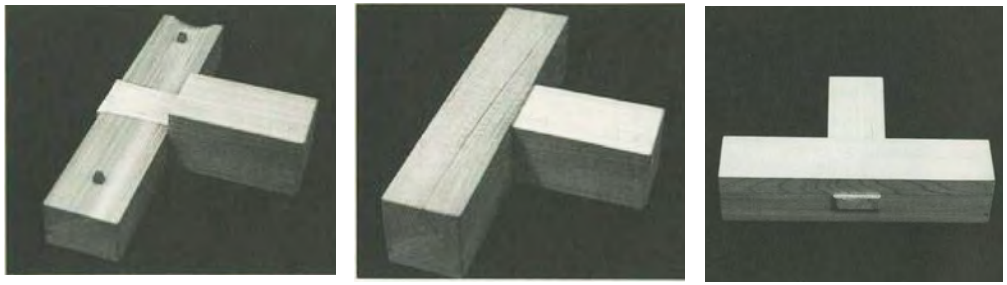
1- Half dovetailed joint



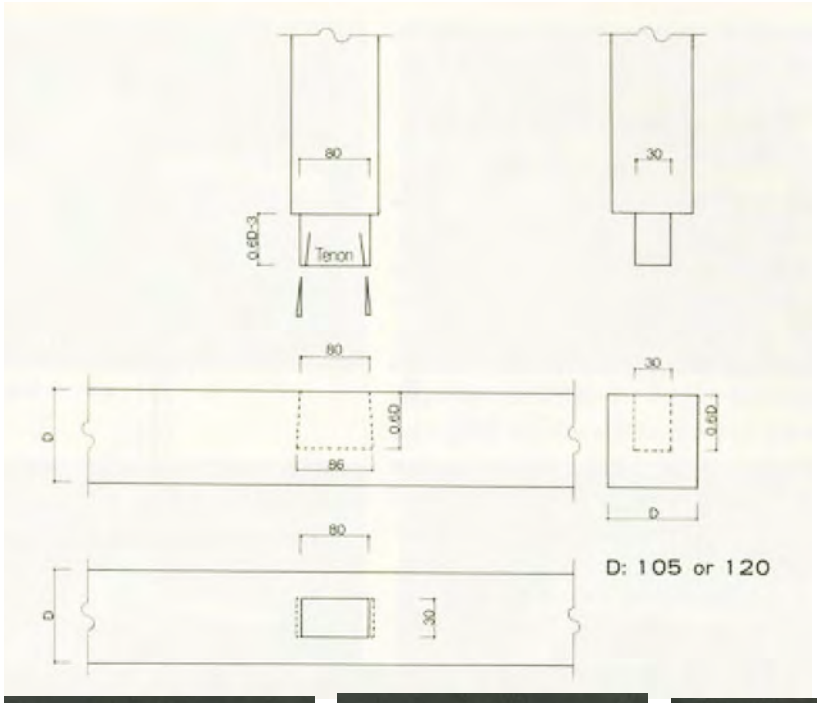


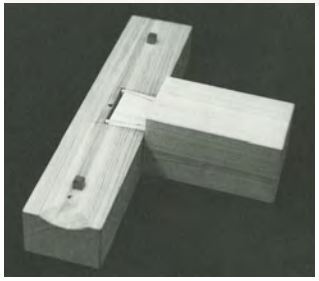
2- Wedging joint

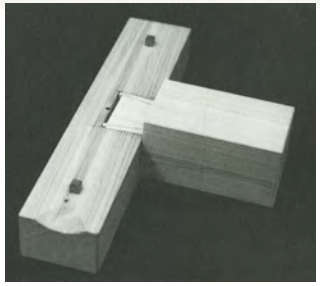


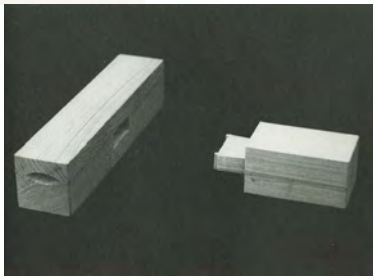


3- Blind wedging joint

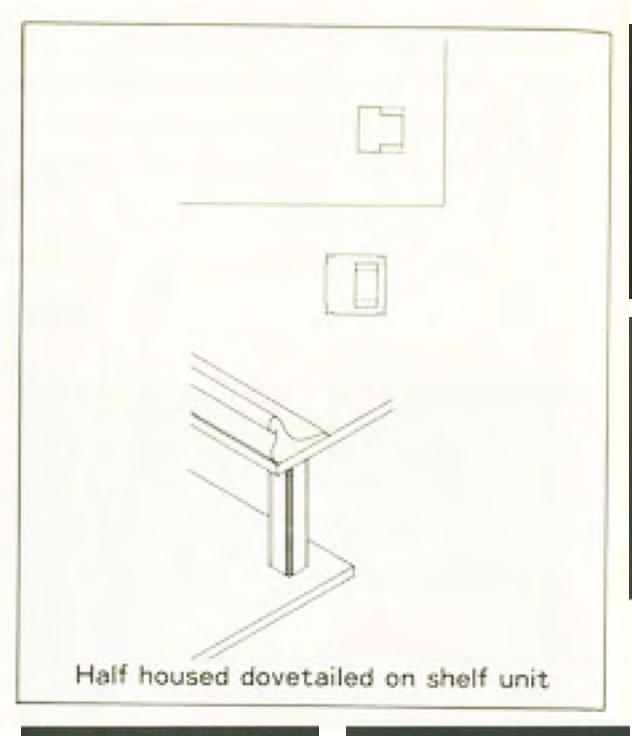


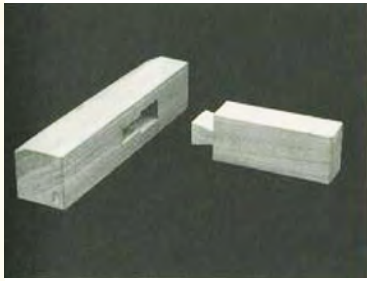


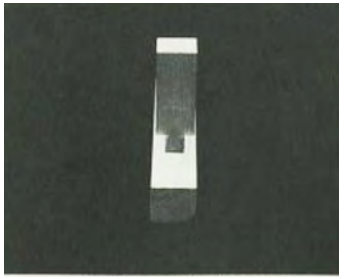




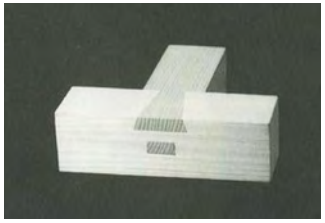
4- Housed dovetailed joint

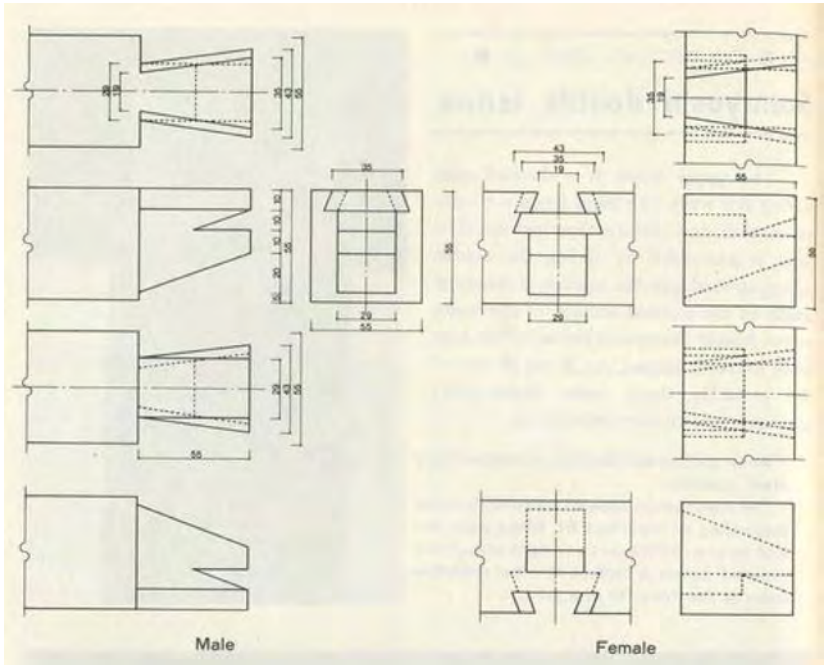


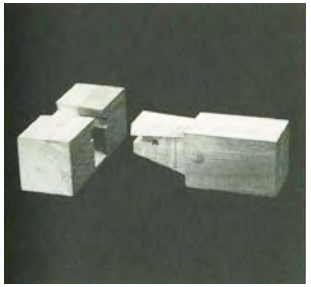


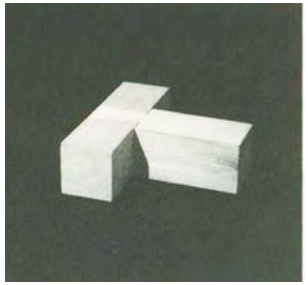


5- Sumiyoshi double tenon

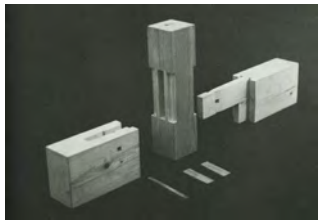


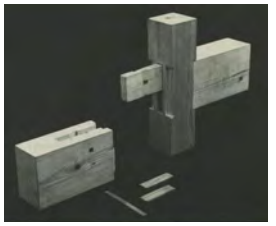


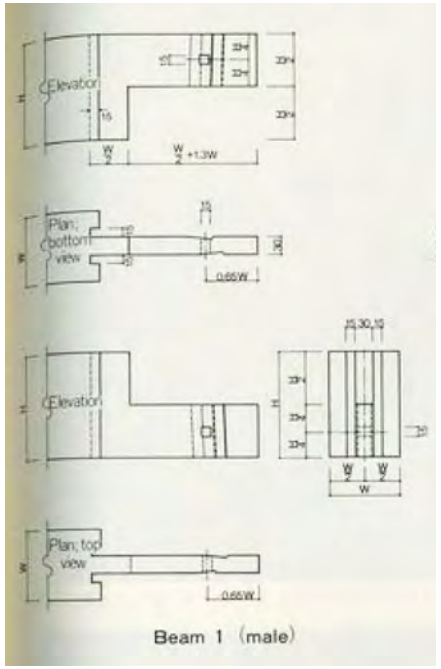


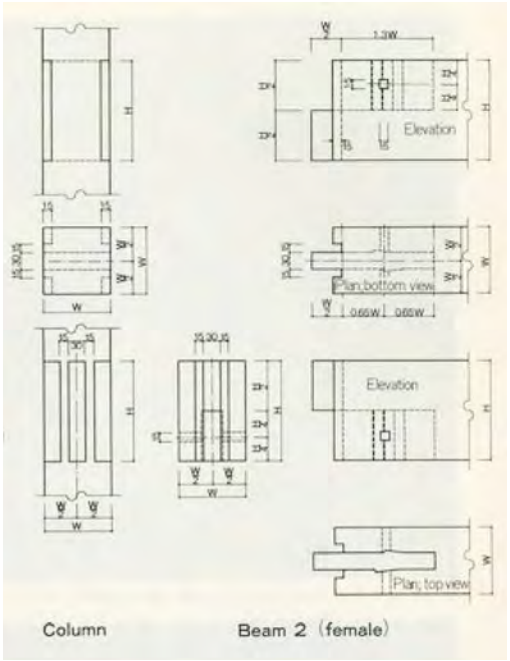


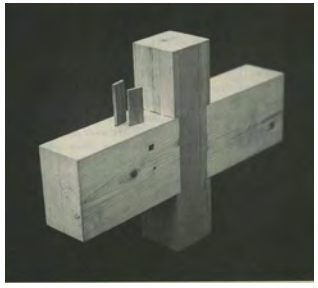
6- Double plug



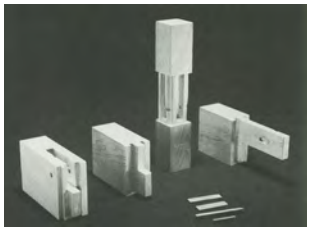


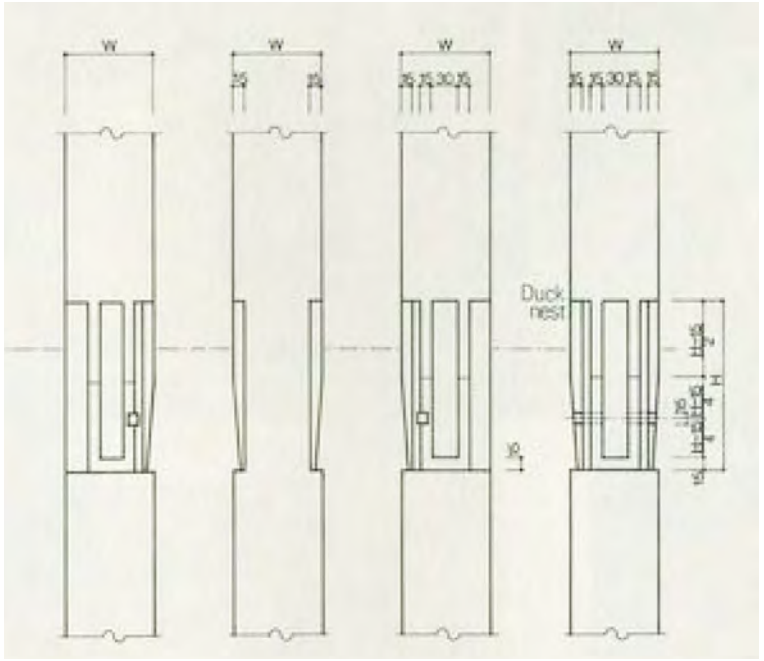


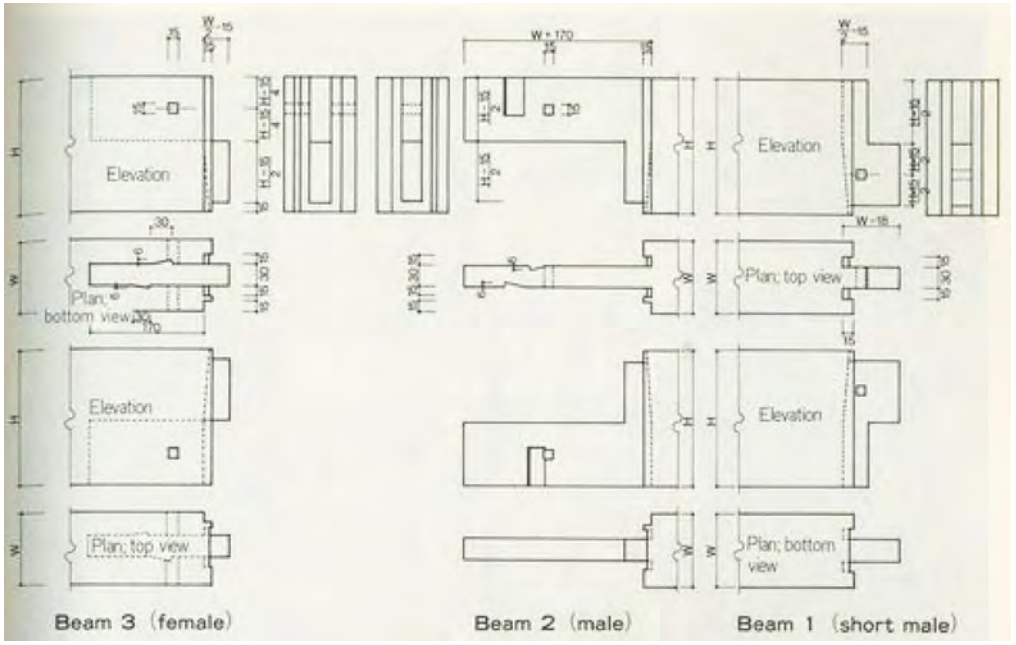


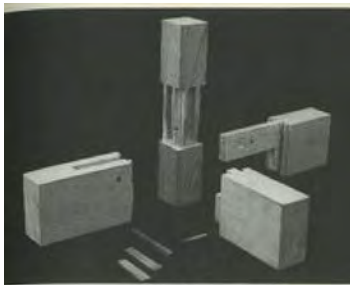


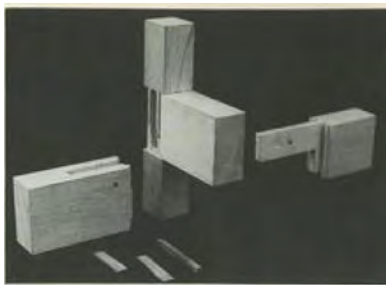
7- Triple plug

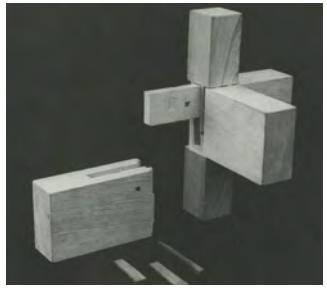


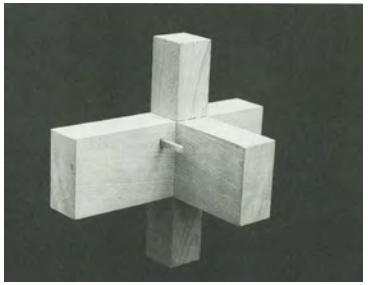




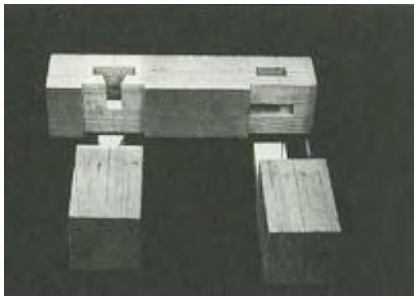


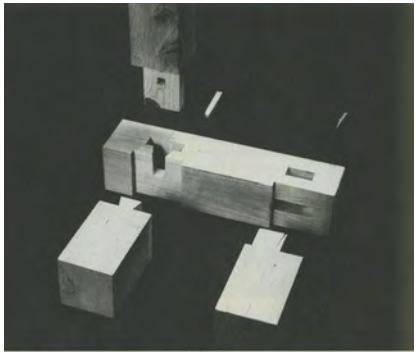


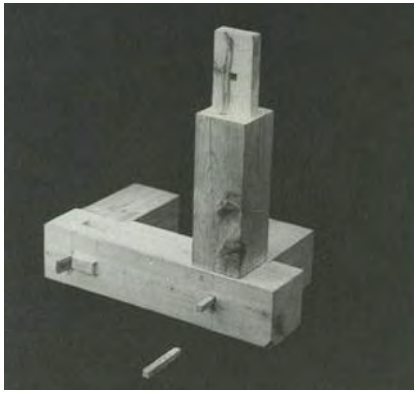


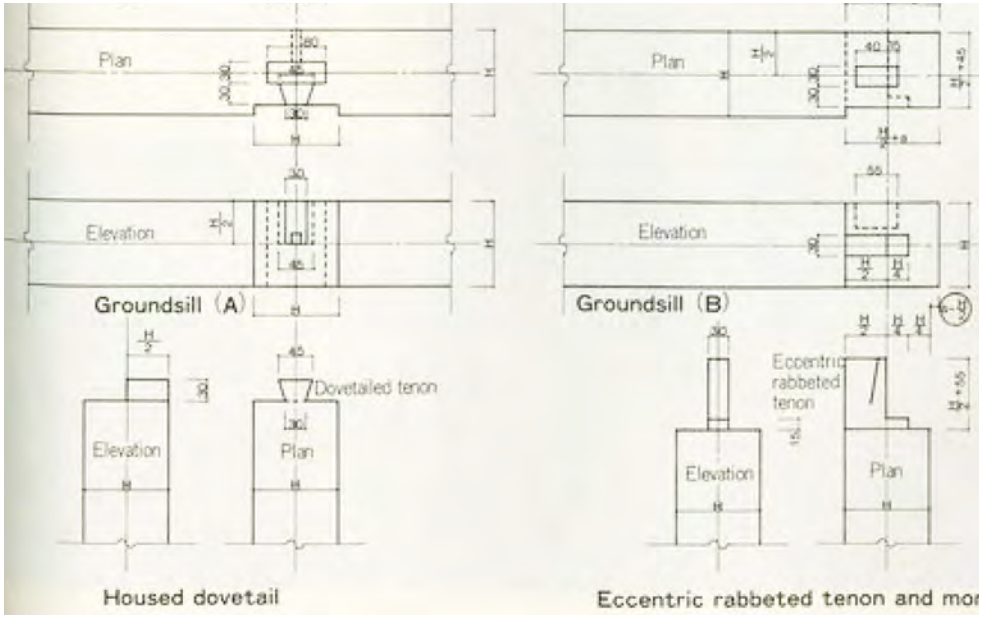


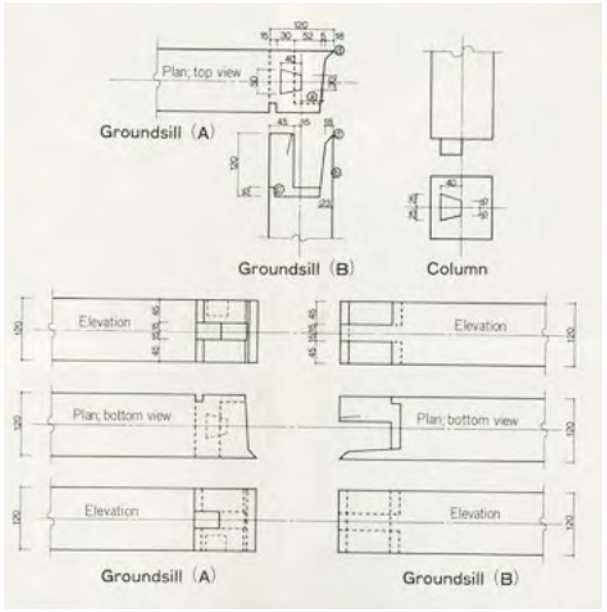
8- Groundsill connectors

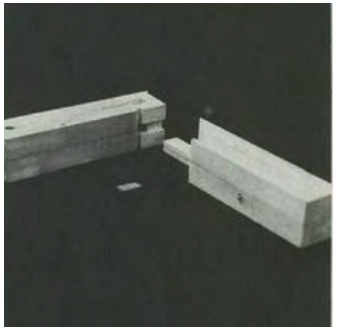


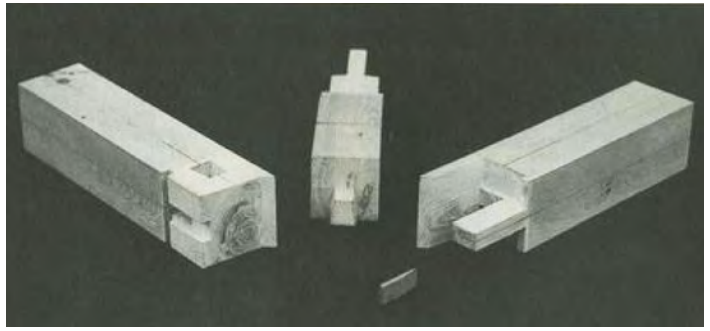












The Clover
(Ipoh, Perak, Malaysia)
The Architect's New Office & Home

Ar. Shyuan Kuee has always wanted to have a place of her own which combines live, work, play and eat under one roof.

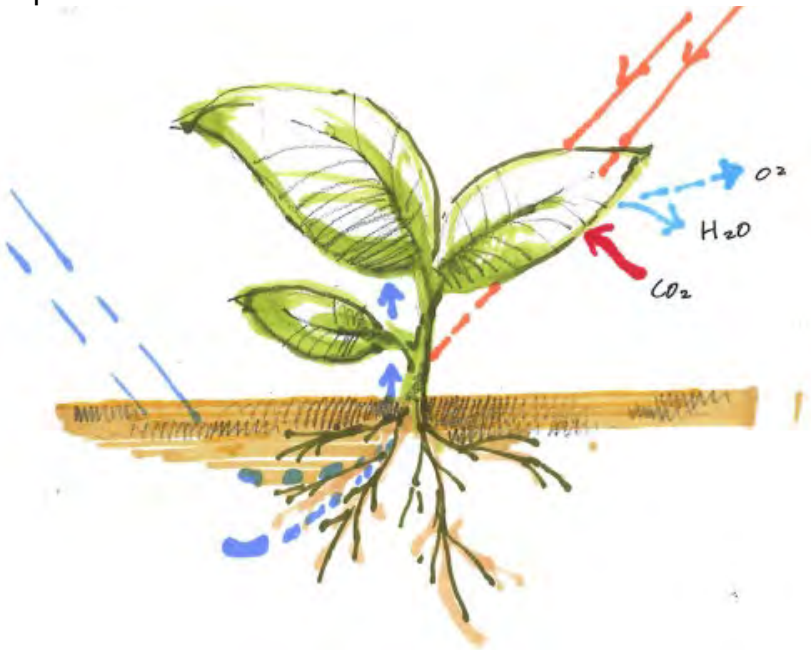
Her dream finally came through when she came across this derelict house along Tiger Lane and believe that it was a perfect site for constructing the building.

Space programme

Design intention

As a vegan, Ar. Shyuan Kuee is keen to build a green, sustainability building which will house her office, a vegan farm-to-table cafe and her family home.

Design Concept



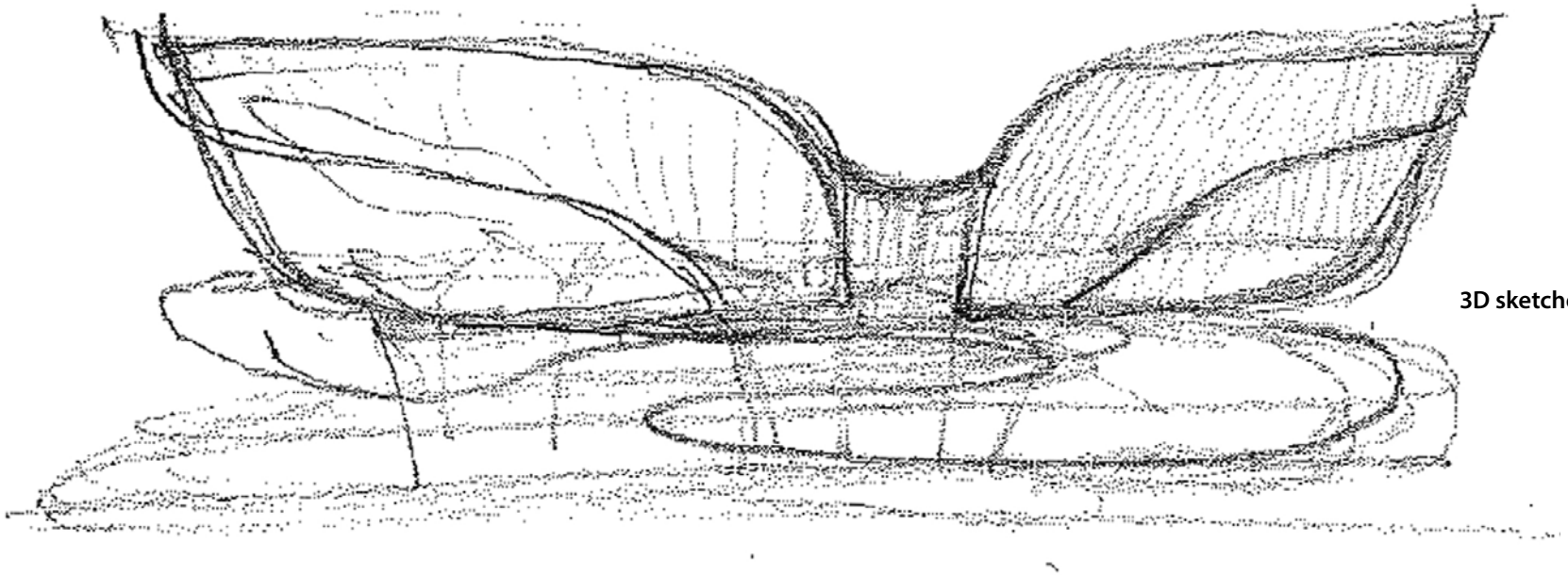
Taking the analogy from a plant, the proposed building should have the following qualities:-

- Self sustainable
- Responsive & adjustable
- Contribute to provide comfortable living environment

Ar. Shyuan Kuee chose four leaf clover as a symbol of luck - her luck of getting hold a perfect site to build her home and office.

Clovers occasionally have four leaflets, instead of the usual three.

Appearing only 1/ 10,000 plants, finding one has come to be considered extremely lucky. The analogy serves as the best concept for designing the building.

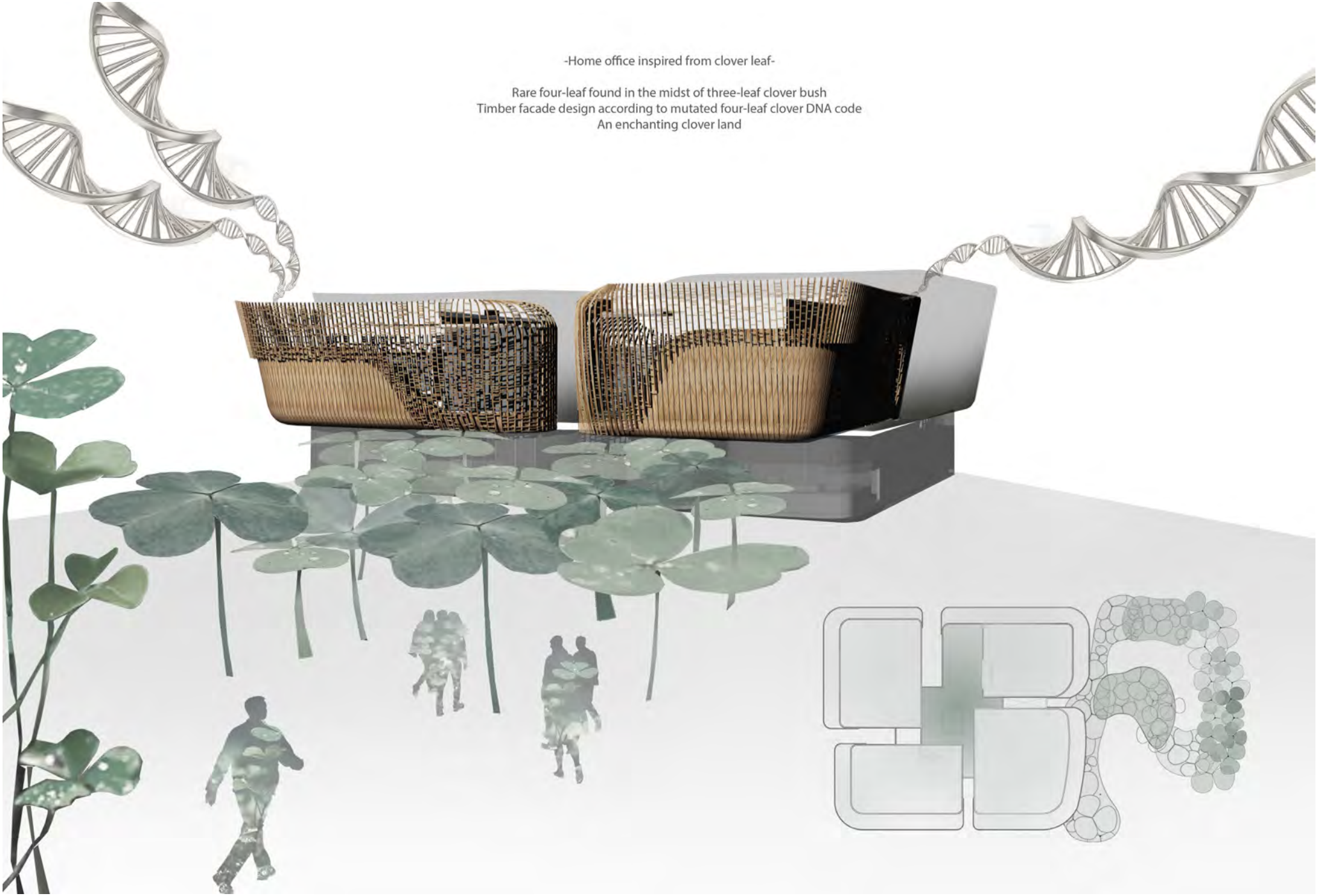


3D sketches - biomimicry of a 4-leaf clover

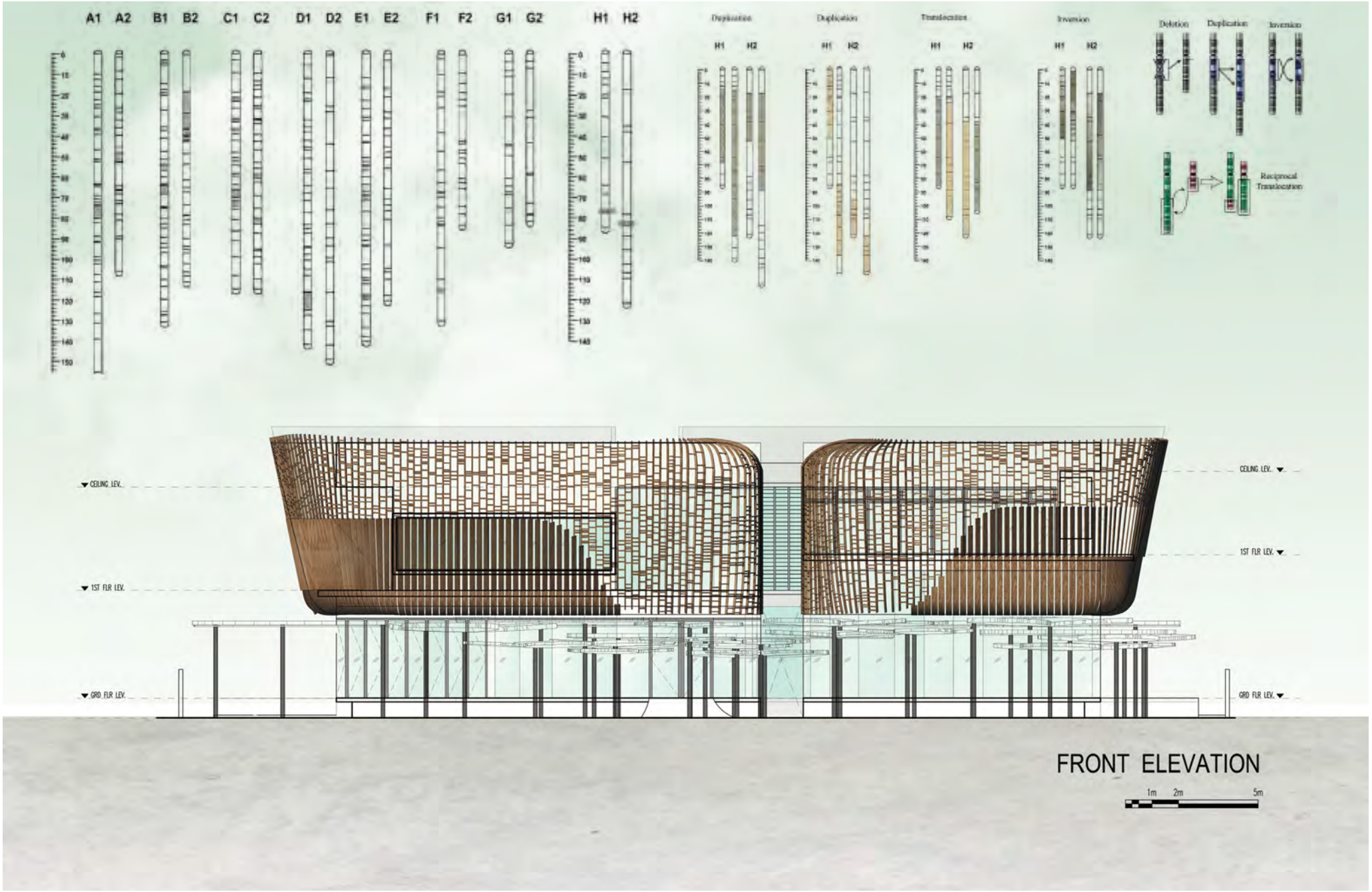
Ground Floor Plan

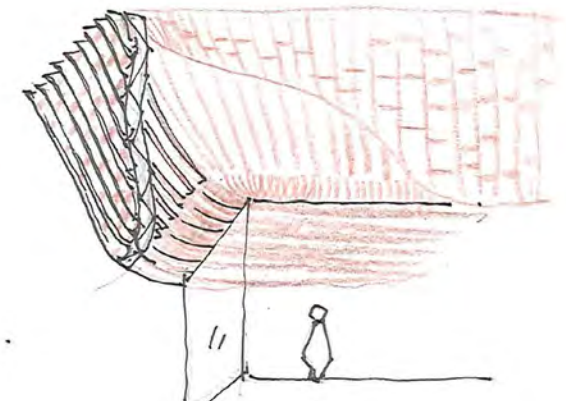
-Home office inspired from clover leaf-

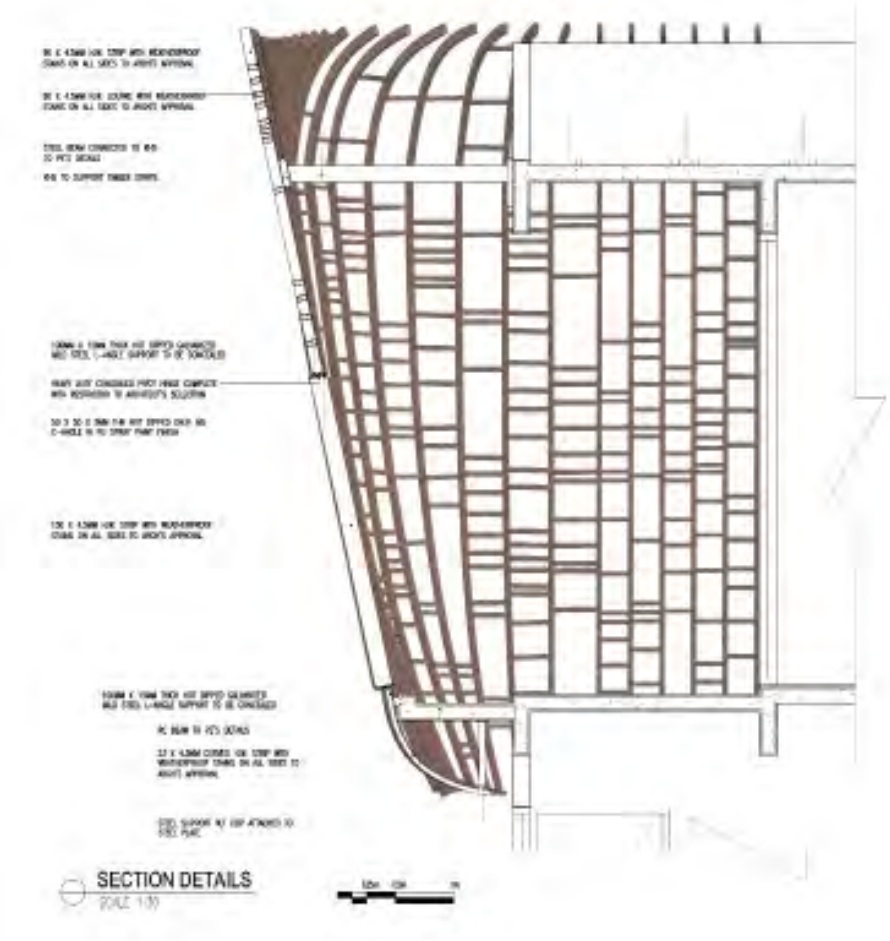
Rare four-leaf found in the midst of three-leaf clover bush
Timber facade design according to mutated four-leaf clover DNA code
An enchanting clover land



Manipulation of DNA for a 4-leaf clover on the building facade





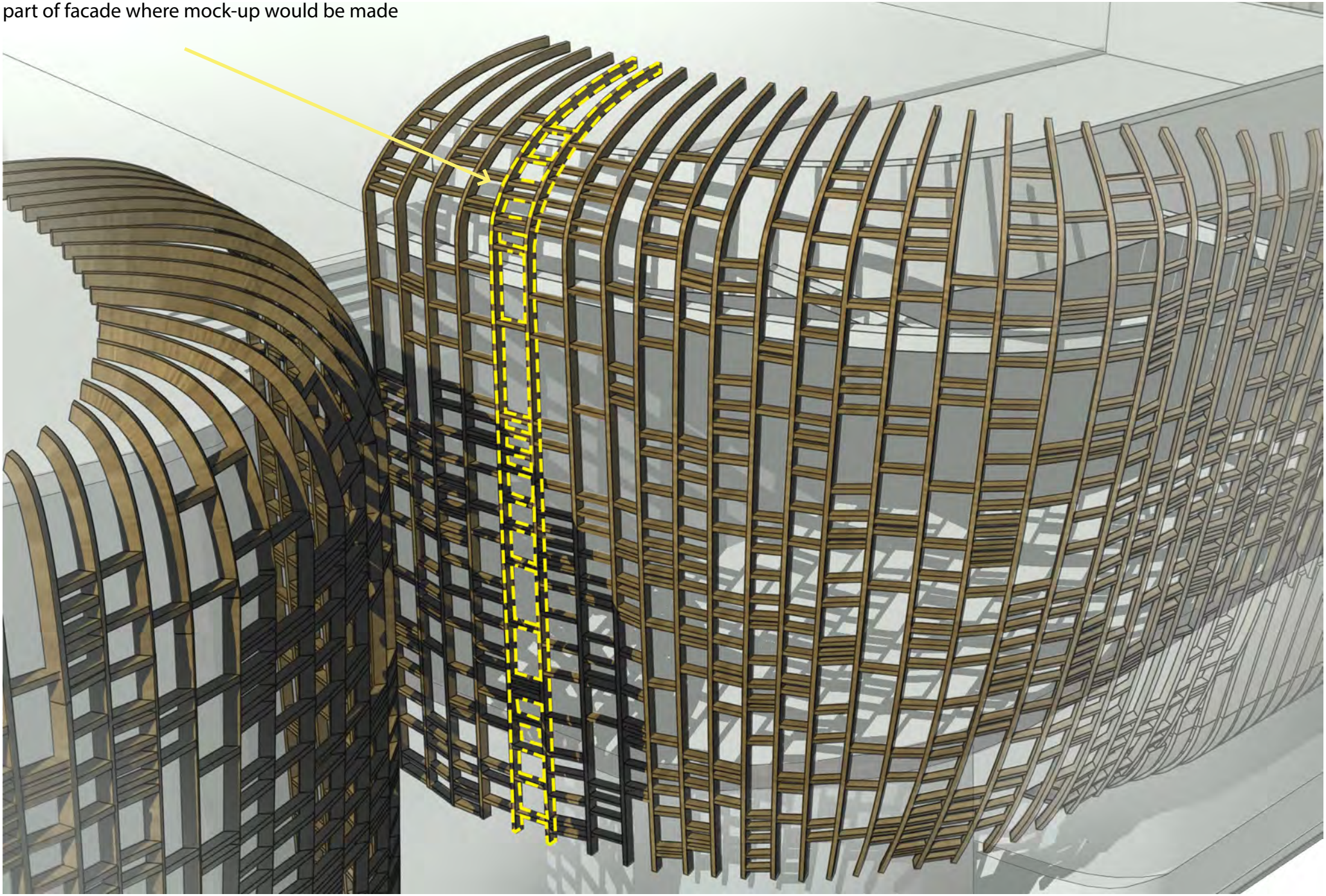


To shield off morning sun from the East and evening sun from the West, a timber facade was designed, using recycled wood from the original building and old buildings in the city.

The pattern of the facade were derived from a series of studies on mutated DNA of a four-leaf clover.

In order to experiment with the facade timber joints, a 1:1 mock up was arranged to be made in a local timber workshop.

part of facade where mock-up would be made



Site Demolition
(Ipoh, Perak, Malaysia)

During the demolition of the old existing house on site, many old timber was retrived and stored for future use.

With a size smaller than our proposed building, we have no choice but to demolish the existing house. However, we intend to recycle and recover as much materials as possible from the original building. One of the main materials we wanted to keep was timber, which was retrievable from roof truss, flooring and furniture. We managed to retrive several types of hardwood such as balau, cengal batu and maranti. The timber was then transfered to a timber workshop where they would be planed and saved for the construction of the new building.


Mar 20, 2018

The Workshop
(Ipoh, Perak, Malaysia)

First Visit- demonstration, picking the right wood, and making the sample joint

Located in Pengkalan and about 15km from Kuee Architect's office, the workshop which was chosen to work with was owned by Soon and Onn. The duo was expert in local timber and has produced many interesting design with the material. Their exquisite craftsmanship was very impressive. Young and adventurous, they were probably the only one in our city who was willing to take on the challenging job for producing the timber facade for this project.

The old wood retrieved from our site were laid in the workshop for measurements and sorting. Timber planks of similar types and tones taken down from other buildings were also being selected to be used for the project since the quantity retrieved from our demolished building was inadequate.

The idea of using recycled timber for this project was due to the following reasons:

1- To achieve Green Building Index Platinum Certification, there should be as much recycled material as possible used for the new buidling. A number of timber was retreived from the demolished house and it was the most sensible material to use for environmental and economic reasons.

2- In comparison to new timber (freshly cut and treated), old or recycled timber would be much more stable. It has gone through years of expansion and shrinkage, and its character would be more predictable.

3- Also with a lower water content, the old timber would be lighter and will help save on the structural support for the overall timber facade. By saving the foundation material cost, a portion of our construction cost would in turn be saved.

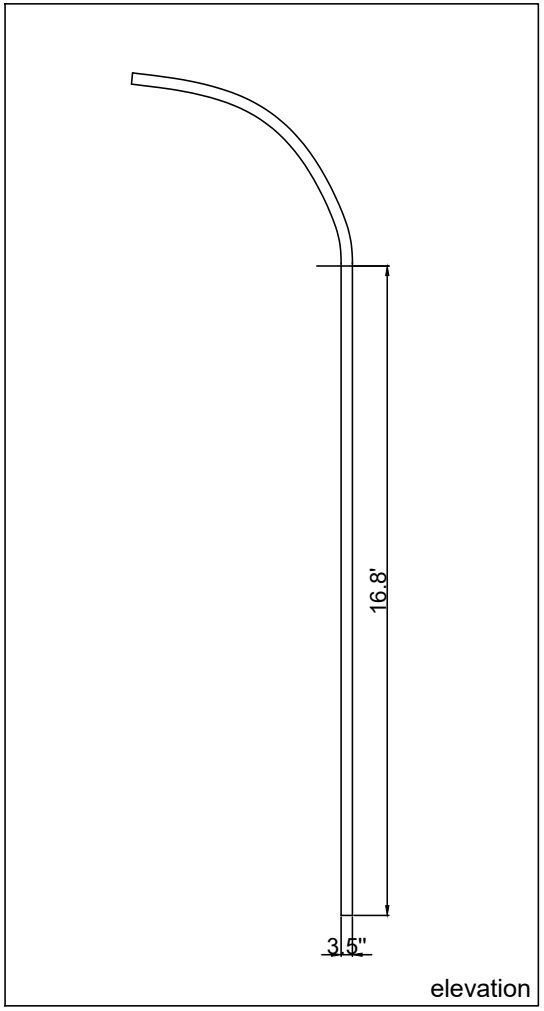
After the preliminary discussion with Onn, Ar. Shyuan Kuee made a sample joint which is recommended to be used for the facade for The Clover. This joint was rather simple to make, has a clean finishing and sturdy. According to Onn, this type of joint has been widely used in their factory and they were confident in applying it for the entire facade.

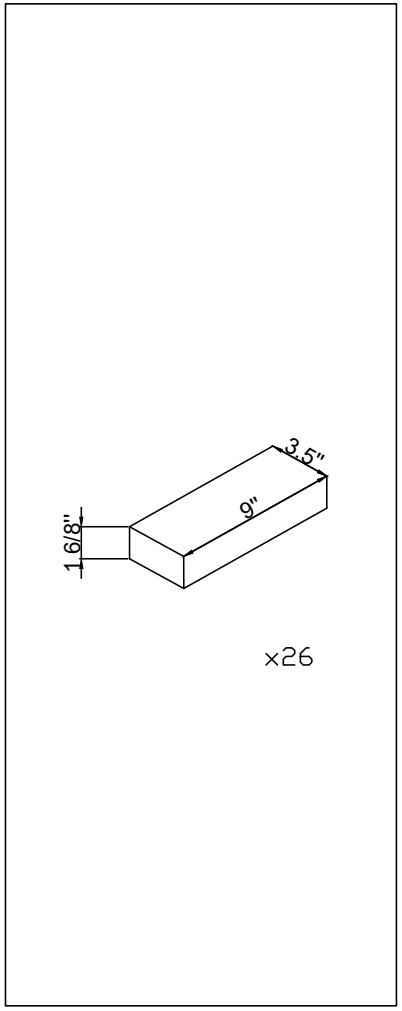
With the exporesure to the weather, Onn suggested using stainless steel bolts and nuts for the actual facade cladding.

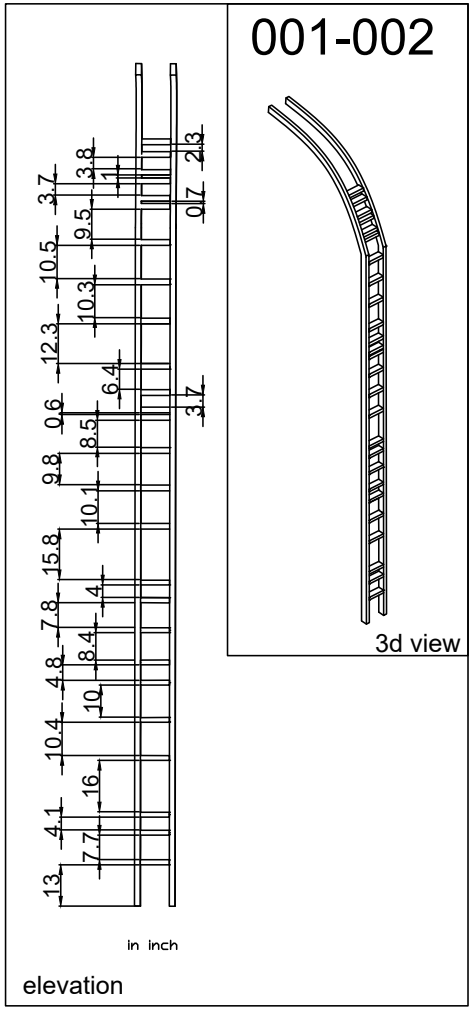
The Workshop
(Ipoh, Perak, Malaysia)

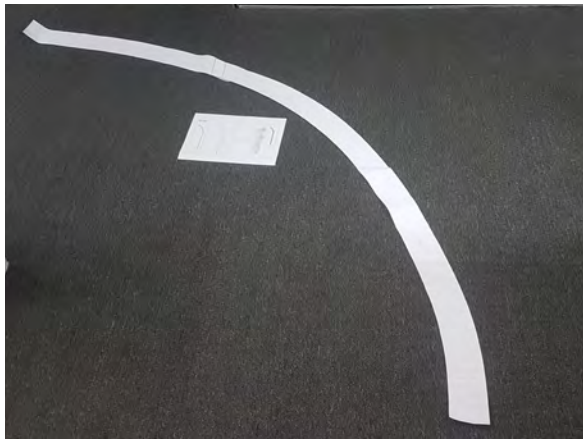
Making the 1:1 mock-up

For the making of the sample, Onn has chosen an older Balau wood recovered from the demolished building. He instructed his worker to plane exterior part of the wood to remove the weathered and any discolouration. Fresh timber grain was then revealed.









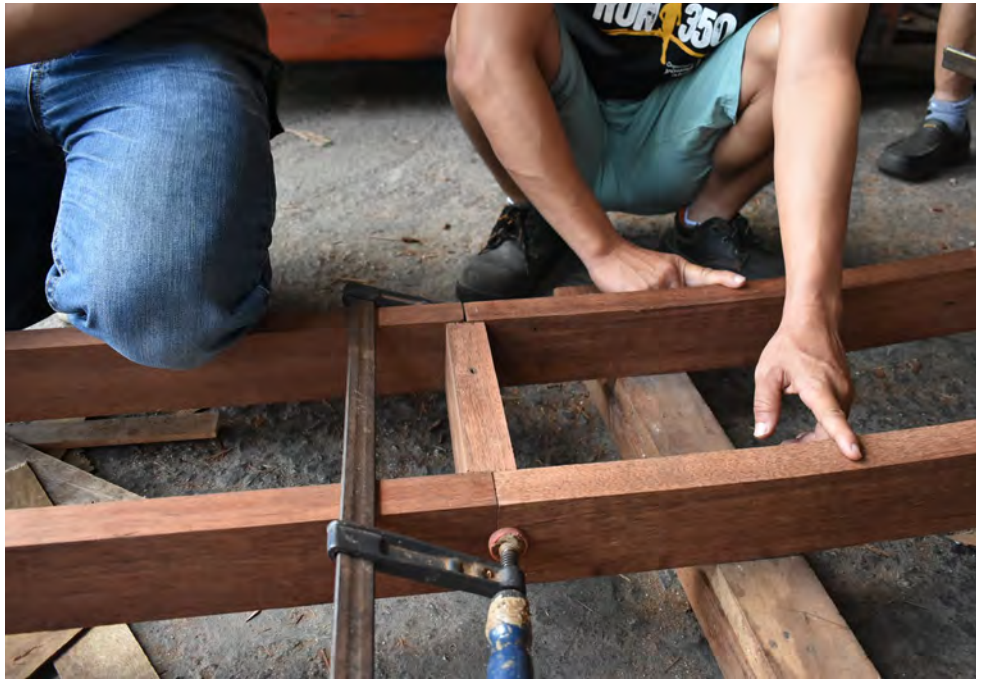
The first step involved in marking the wood with a 1:1 sample printed out from Kuee Architect's office. The 2 strips chosen from the timber facade was exported from the 3D drawing to 2D and sent to printer for a 1:1 drawing to be printed out.

The 1:1 drawings was brought to workshop as a stencil for production of the mock up.

Ar. Shyuan made a series of sample joints as instrcuted by Soon and Onn before joining the team to make the actual joint. A stainless steel nail and bolts are inserted before two pieces of wood are joined. The reason given by the carpenters was that a boltless join was not recommended due to exposure to sun and rain, the wood may weather and a boltless joint may deteriorate. The stainless steel bolt and nuts would act as extra support in such condition.

(Ar. Shyuan was not recommended to use heavy saw machines to cut out the curve timber as she was not fully trained. Such part was solely cut by the experienced carpenter in the workshop as she focused on the joinery techniques.)


income



1:1 mock up of the timber facade

The Proposal

If chosen to learn about
kumiki techniques in Hida, Japan

Although I have full respect of the local carpenters and their expertise, I am still doubtful of the use of bolts and nuts of the timber facade in my project. I would like to study the opportunity of using joints without bolts and nuts, by learning from the local Takumi in Japan.

I have always been fascinated by the Japanese wood joinery techniques even before my architecture education in year 2000. I stayed in Ogaki, Gifu in year 1998 on a student exchanged programme and visited many amazing shrines in Japan during that time. Upon returning to Malaysia, I enrolled into to Japanese language school in the hope that I could further my architecture studies in Japan. However, the wish did not realise as I was unable to pass the Level 1 Japanese language test - a pre-requisite to attend universities in Japan.

After discussing with my family members, I decided to further my studies in the UK instead. I was admitted to University of Sheffield for BA(Hons) Architecture, and later Bartlett UCL for my master degree, both were top ten architecture schools in the UK at the time. I never regretted going to the UK, despite the hope to somehow study the exquisite wood joinery techiniques in Japan was always kept at the back of my mind.

While planning for my new office building recently, the possibility of learning about kumiki in Japan came about and I am thrilled.

If I am lucky enough to be selected as one of the participants, I would like to study the Japanese technique of making connecting wood joints in more depth. With the recommendation from the local takumi, I hope that the wood joints that are taught will have the following characteristics:-

1- The boltness joints are to withstand deterioration from sun and rain. The tropical weather can be damaging so an exceptionally robust joint is necessary.

2- The joints are to be as simple as possible to work on manually, as it is too costly to cut wood using CNC or any other AI machine in Malaysia. It will be ideal if the joint can be cut using a simple machinery which can also be found in Malaysia.

I hope that together with the local craftsman, I will be making at least 3 types of connecting joints using Hida traditional or modern techniques, suitable for producing the timber facade for my project.

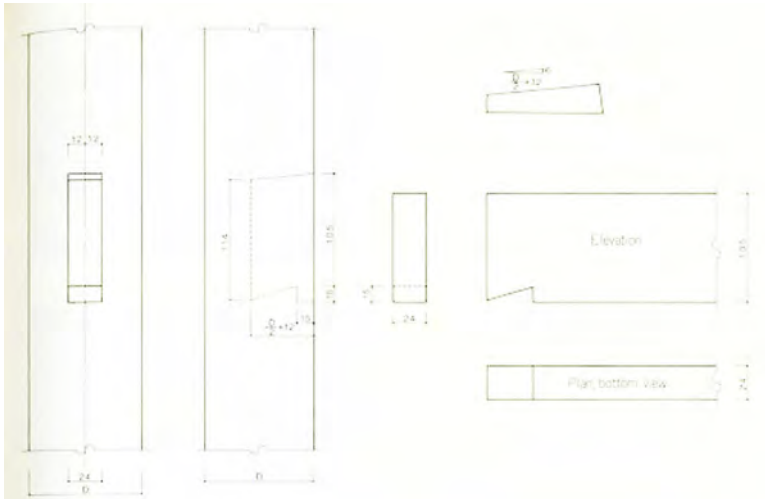
At the same time, I will also be exchanging malay wood joining techniques with them, by making a small a model of malay traditional kampung house. There will be 3 types of joints I will be sharing with the local takumi. Using these types of joints, a simple Malaysian kampung house can be made without using any bolts and nuts.

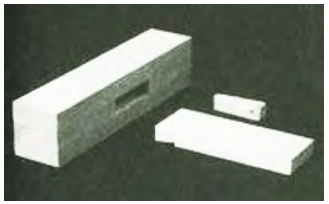
These techniques have lost its glory as most of the craftsmen have become too old to continue while the younger generations are most interested in modern construction technique and materials. By producing the boltless wooden house, I am hoping to revive the forgotten techniques and to bring back its glory it deserved.

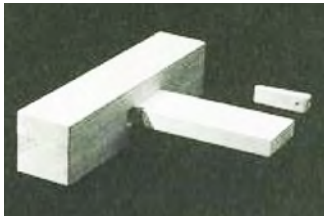
Yours sincerely,
Ar. Shyuan Kuee

3 Proposed Types of Connecting Joints to be learnt and made in Hida

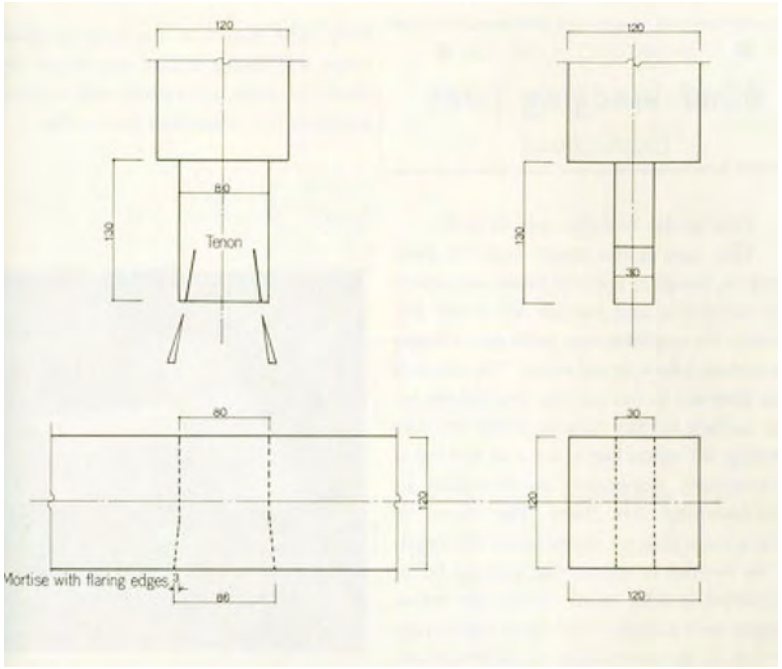
1- Half dovetailed joint

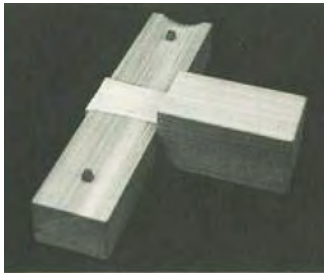


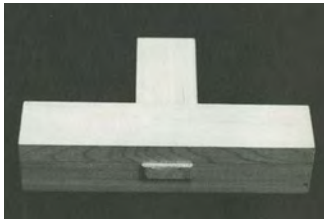




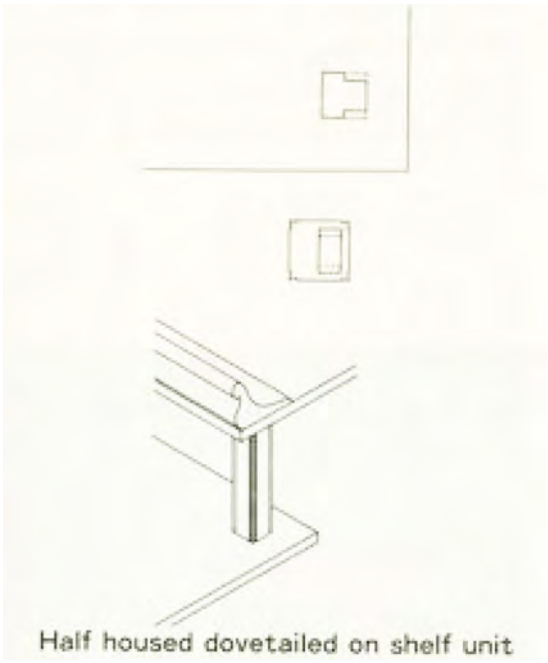
2- Wedging joint

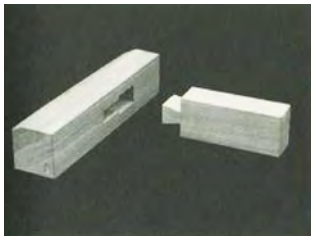


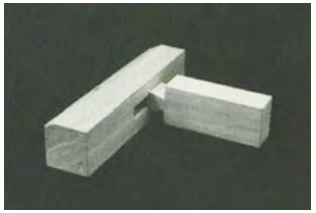


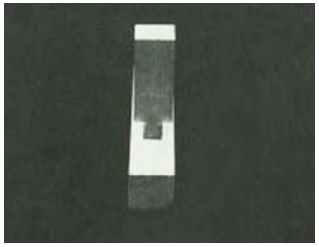


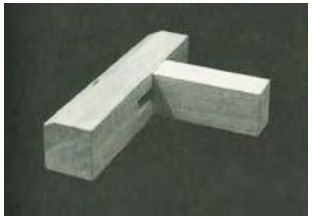
3- Housed dovetailed joint











Model to be made in Hida as exchange of wood joinery technique:-
A typical Malay Kampung House to be made without bolts and nuts

1) Post & Beam

1. 150mm x 150mm "Chengal" hardwood post

2. 200mm x 100mm hardwood bearer

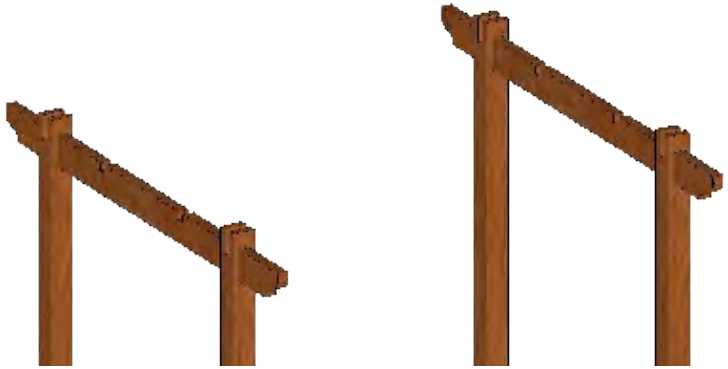
3. 125mm x 75mm hardwood floor joist
   at 600mm centre

4. 150mm x 25mm "Resak" hardwood
   tongue & groove timber board

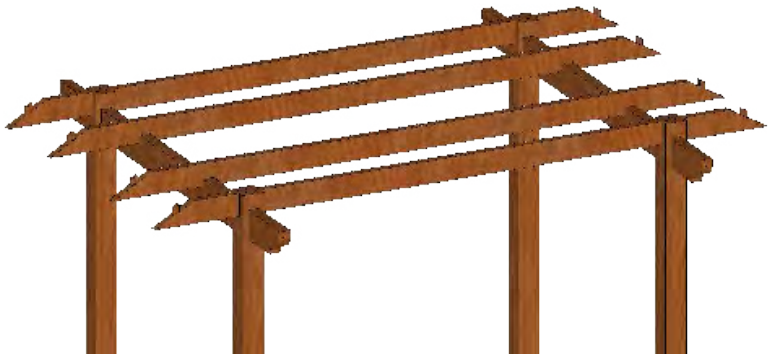
2) Post & Beam & Roof Truss

1. 150mm x 150mm "Chengal" hardwood post

2. 50mm x 150mm "Chengal" hardwood tie beam



3. 50mm x 150mm "Chengal" hardwood tie beam

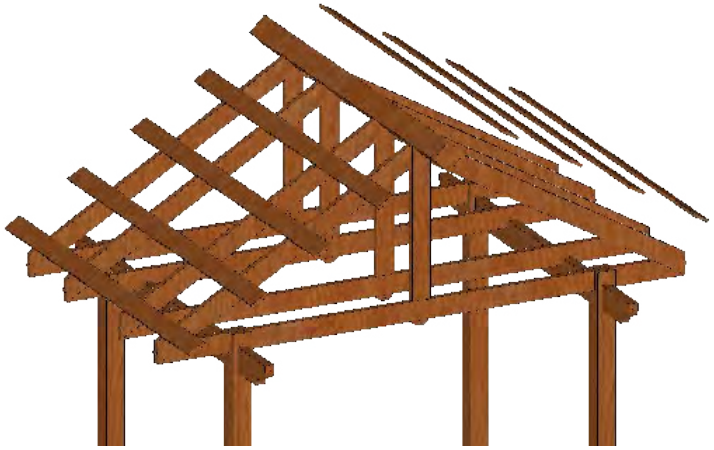


4. 175mm x 175mm hardwood ridge beam
5. 150mm x 50mm hardwood king post with wooden dowel

6. 50mm x 150mm "Chengal" hardwood tie beam at 30 degree angle

3) Roof

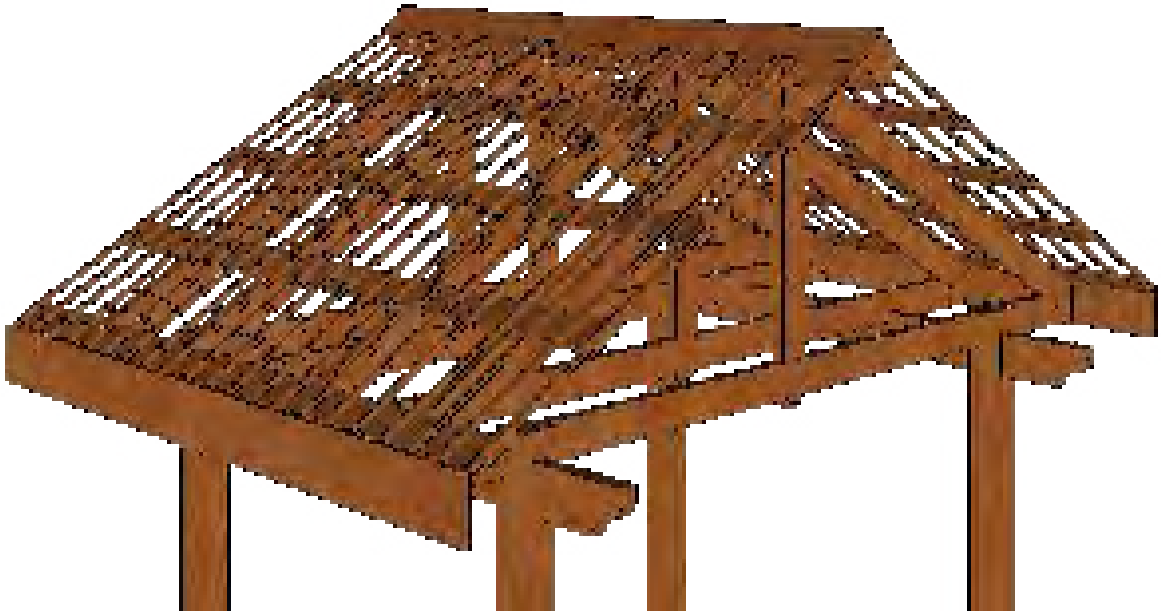
1. 25mm x 175mm hardwood purlin rest on tie beam



2. 25mm x 25mm hardwood batten rest on purlin

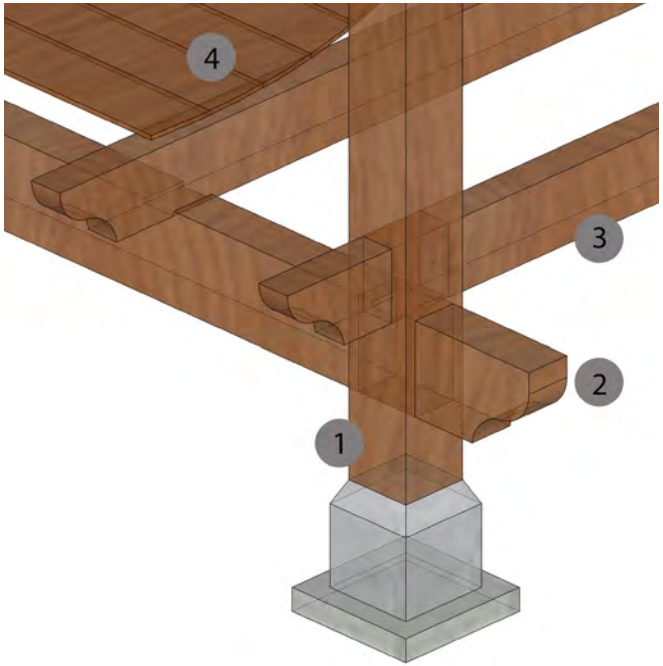
3. 30mm x 200mm hardwood fascia board attached to tie beam

4. Roof structure with finishes



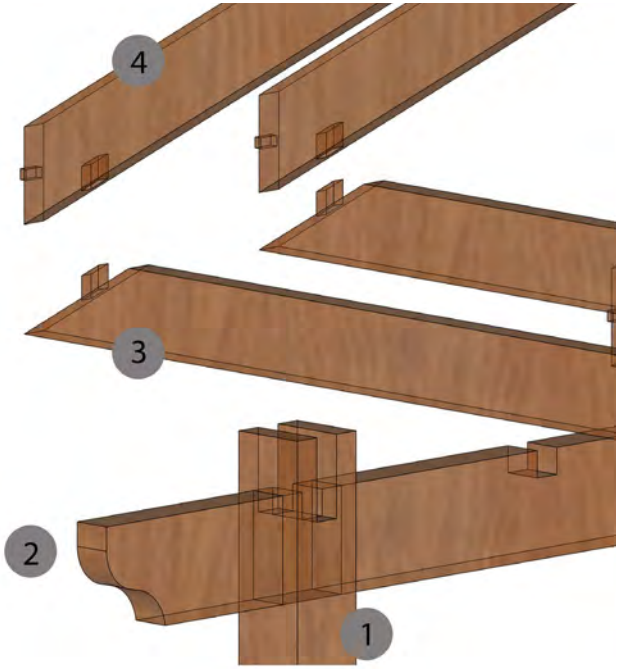
Zoom in of Joint details

1) Post & Beam



1. 150mm x 150mm "Chengal" hardwood post with 200mm x 100mm bridle joint
2. 200mm x 100mm hardwood bearer
3. 125mm x 75mm hardwood floor joist at 600mm centre, rest on 10mm depth housing joints
4. 150mm x 25mm "Resak" hardwood tongue & groove timber board flooring

2) Post & Beam & Roof Truss



1. 150mm x 150mm "Chengal" hardwood post
2. 50mm x 150mm "Chengal" hardwood tie beam with 50mm depth housing joint
3. 50mm x 150mm "Chengal" hardwood tie beam with 50mm x 45mm mortise & tenon joint
4. 50mm x 150mm "Chengal" hardwood roof truss at 30 degree angle , attached to 50mm x 45mm mortise & tenon joint of roof beam

3) Roof

1. 25mm x 175mm hardwood purlin rest on tie beam
2. 25mm x 25mm hardwood batten rest on purlin, at 150mm centre
3. 30mm x 200mm hardwood fascia board attached to 40mm x 15mm x 20mm mortise & tenon joint of tie beam

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