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NATIONAL RESEARCH COUNCIL
DIVISION OF BUILDING RESEARCH

CANADA

A SURVEY OF RESIDENTIAL POST-AND-BEAM CONSTRUCTION IN GREATER VANCOUVER, 1957-1958

ANALYZED

BY

V. F. LYMAN, ING. ARCH.
ASSISTANT PROFESSOR, SCHOOL OF ARCHITECTURE
UNIVERSITY OF BRITISH COLUMBIA

TECHNICAL PAPER NO. 70
OF THE
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A SURVEY OF RESIDENTIAL POST-AND-BEAM CONSTRUCTION IN GREATER VANCOUVER 1957 - 1958

by

V. F. Lyman, Ing. Arch., Assistant Professor,
School of Architecture, University of British Columbia

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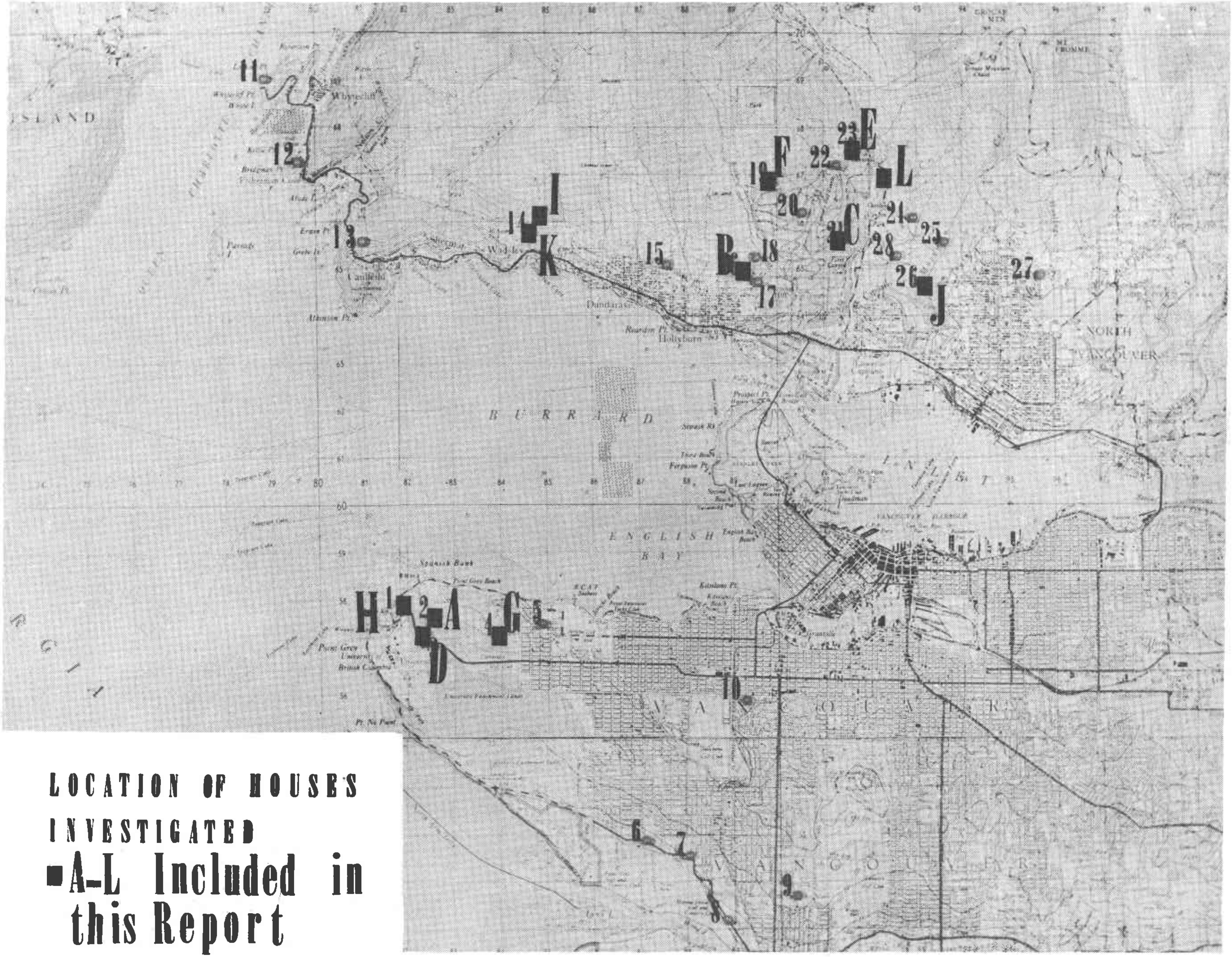

LOCATION OF HOUSES INVESTIGATED

■ A-L Included in this Report

PREFACE

This paper summarizes the studies of the post-and-beam method of residential construction in the Vancouver area carried out during the summers of 1957 and 1958 by Professor V. F. Lyman of the School of Architecture of the University of British Columbia. It is, therefore, a contribution from the University of British Columbia School of Architecture to the general fund of knowledge regarding building practice on Canada's Pacific coast.

The Division of Building Research of the National Research Council was glad to assist the School of Architecture in the carrying out of this survey which constitutes one result of an earlier survey carried out under the same joint auspices of residential construction in general in greater Vancouver. The Division of Building Research hopes to continue this co-operative work with the School of Architecture in keeping with its continued interest and concern in building problems of British Columbia.

It would appear that there are probably two thousand residential buildings in greater Vancouver of the post-and-beam type and this number is steadily increasing. It is, therefore, hoped that Professor Lyman's paper will be of assistance to those who wish to know more of this building method.

Acknowledgement is here recorded for the kind assistance of members of a Special Advisory Committee who guided the development of this project under the Chairmanship of Professor F. Lasserre. The willing agreement of the architects responsible for the buildings illustrated at the end of the paper is also acknowledged with appreciation.

Ottawa,
May 1959.

Robert F. Legget,
Director,
Division of Building Research.

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A SURVEY OF RESIDENTIAL POST AND BEAM CONSTRUCTION IN GREATER VANCOUVER

by

V. F. Lyman, Ing. Arch.

INTRODUCTION

The growing popularity of post-and-beam construction in this region, particularly the Greater Vancouver area, as well as a lack of information and literature on the subject, have made an investigation into this field important. The purpose of this report is to satisfy the need of interested organizations and individuals for information on this subject.

The field work was carried out during the summer of 1957. Information was gained by personal interviews, questionnaires, and through field inspections. Forty houses were thoroughly investigated as to their performance, architecturally and structurally. Thirty-one of these houses are described in the report. Architects, designers, builders, owners, CMHC officials, and city building inspectors were interviewed and asked to give their opinion on this method of construction. Questionnaires were sent to some fifty other architects and builders. The information gathered by the author for his article on post and beam construction in the May 1957 issue of "Western Homes and Living" was also used.

This project has been made possible by the co-operation of Mr. Robert F. Legget, Director of the Division of Building Research, National Research Council, and his staff.

The author would like to thank Professor Frederic Lasserre, Director of the School of Architecture at the University of British Columbia, for his advice and assistance and for the facilities of the school.

The work was further assisted by the particular co-operation of Mr. Alan Veale of the B. C. Regional Station of the Division of Building Research, National Research Council; Mr. Ron Thom, architect in Vancouver; by the other members of the architectural profession; and by the West Vancouver contractor, Mr. Robert G. Lewis. Also of special assistance were Miss Melva Dwyer of the U. B. C. library, and Miss Eva Lyman for her secretarial work.

GENERAL DISCUSSION

The original plank-and-beam construction first used in the U. S. about 1938 as an experimental system for floor and roof construction was an adaptation of the heavy timber construction (mill, or slow burning construction) for residential use. The origin of heavy timber construction, which is really the forerunner of the post-and-beam idea, dates far back in history. The buildings of early Greece were chiefly made of wood using a post-and-beam form. The traditional Japanese house, the half-timbered Tudor house, the early American and English Colonial wood frame were all of a wood skeleton construction similar to this method. It is probable that the idea of post-and-beam construction is as old as the use of wood itself as a building material. On the other hand light wood-frame construction was developed in the U. S. in the middle of the nineteenth century. Under the names of "braced frame", "balloon frame", and "platform frame", it spread so widely and extensively over the North American continent that it is now referred to as "conventional".

During the first period of application of the plank-and-beam system for roof and floor construction, the post itself did not play a very important role visually. Originally this roof and floor construction was meant to be used with the conventional, bearing stud-wall with double studs under the beam, the beam bearing on a plate. Influenced by the trend in architecture of "the expression of the structure in the facade of the building", the post came out of its hiding in the wall and became clearly visible as a prominent part of the system. Whereas the term "plank and beam" describes only one particular method of floor and roof construction, the term "post-and-beam" is used for a greater variety of framing types. It is used for any skeleton-type construction, as well as for heavy timber construction. The term "post-and-beam" is very fitting, and is very widely used.

In residential architecture today wood post-and-beam construction systems consist essentially of beams spaced 3 to 12 or more feet apart, supported by isolated columns - the posts. Tongued-and-grooved planking, 2 or 3 inches thick, usually spans between the beams, forming a complete floor or roof construction. Joists or prefabricated panels are frequently used, instead of planks. Siding, sheathing, or solid panels take care of necessary bracing. When this is nor sufficient, rigid connections between the post and the beam are used. The walls carry no load. They may be full glass panels or light wood-frame panels topped by a strip window from beam to beam. In fact, they may be panels of any non-bearing type. It is the post that supports the beam and the roof. The post may be exposed, concealed in the wall, or standing free in front or back of the wall. The roof may be pitched, flat, or curved. With a flat roof, the beams spanning the whole width of the house are supported with posts which are part of the outside walls. When the span is too wide the beams can be supported by interior posts which are either free standing or as part of a partition. With a pitched roof, whether low or high, the beams may rest on a ridge beam which may be omitted if the beams are connected at the peak with structurally sufficient metal connectors or gussets. The beams may also run lengthwise to the house, in which case the tops of the beams are usually bevelled to provide parallel bearing surfaces for the roof decking laid at right angles to the beams. In contemporary houses where most of the walls are glass, the interest seems to be focussed on the roof design and the roofline diversity is increasing. In the U. S. flat arches, vaults, and paraboloids are being used with the post-and-beam system; the curved beam being formed of glued-laminated wood. The curved beam and the post may then form a rigid frame together. These are just a few examples of the versatility of this system and of its range of design possibilities.

Popularity of Post-and-beam System

The popularity of this system of construction and of its derivations is understandable, considering the trend in contemporary architectural design in media other than wood. The similarity between post-and-beam construction and modern steel construction is striking. In reinforced concrete construction the skeleton design is common. It is natural that wood construction expressing the contemporary trend in design should be gaining popularity.

Because the system is very well suited for the installation of large glass areas, its greatest extension in Canada has developed in the West Coast's relatively mild climate. In Greater Vancouver the first houses built in this way were summer houses in West Vancouver, where the southern slopes of the mountains terminating in beaches provided ideal locations for week-end and summer residences. Local stone and unfinished cedar were used for building materials, giving the building a rustic quality. As a result the first post-and-beam constructions in Vancouver were usually associated with naturally finished, wood-covered houses. This association gave rise to the opinion that post-and-beam construction is suited for the rocky, sloping lots of the North Shore and would be less successful on level terrain. These early houses were cheaper than those built in the "conventional" manner. Today there are contractors specializing in this construction who state that they can build a house cheaper per square foot than the same house built in light-frame conventional system. This accounts for the popular belief that every "post-and-beam house" is more economical to build than a "conventional" one, and hence its still greater popularity. Furthermore, many American magazines popularized the "post-and-beam house", and thus contributed to the increasing number of houses constructed in this method in the new fashionable districts of Greater Vancouver.

Types of Post-and-beam Construction

During the survey in Vancouver of "post-and-beam houses" a pattern of different types became evident. For simplicity and better understanding, the author divided the different types into four categories according to the execution of the post and the beam.

1. The group belonging in the first place historically, and for its simplicity of construction, is the post-and-beam system that uses solid wood for both post and beam. Cedar planks are used for the roof, for partitions, and sometimes for outside walls. (See plates 2B, 3C, 4D, 5E, 6F, and Fig. 1)

2. The construction of the houses which belong in the second group can be best described as vertically laminated post-and-beam construction. The details of this may vary, but the main idea is the same for all the derivations. To form a beam three pieces of 2 in. by 12 in. are usually employed or, alternatively, a beam could be formed of two pieces of 3 in. by 10 in., or 3 in. by 12 in., with a filler or blocking of different thickness in between. The central member of the post, which is similarly made of three pieces, runs between the side members of the beam. The central member of the beam stops short of the post and recurs on the other side of the post. (See plates 7G, 9I, 10J, and Figs. 7, 8, 9)

3. Houses which belong to this third group have both the post and the beam made of glued-laminated lumber. (See plate 11K)

4. To this fourth group belong houses which are built with prefabricated plywood box beams and, to some degree,

prefabricated wall panels and laminated posts. (See plate 12L, and Fig. 13)

Further variety of this construction system is in different ways of spanning between the beams. Planks, joists or prefabricated panels are used to form the floor or the roof.

1. Solid Wood Post-and-beam

The use of solid wood for posts and beams, and of cedar planks for the roof, the outside wall, and partitions is primarily based on economy.

The architectural philosophy of designers using this kind of construction may be summed up in the following quotation of a statement made by a Vancouver architect:

> "Glued-laminated, and other prefabricated products are too sophisticated. What people really like, and are longing for, is a solid chunk of sawn lumber left natural. They do not mind the twisting and checking as long as the desire for the warmth and charm of wood is satisfied."

With regard to the connections between the post and the beam, designers of this group feel that toe-nailing a solid beam to the top of a solid post is all that is required.

In the author's opinion, this kind of construction is rather an anachronous desire to recreate the old-fashioned charm of historical buildings, without the benefit of corresponding craftsmanship and facilities. In the past, the craftsman had the opportunity, and the knowledge, to select the most suitable lumber. He had not only sufficient time to "hand pick" the lumber but also to let it season properly. Above all, he had enough love for his craft to execute the connections with superior skill. Using wood in this manner is impossible now due to the increased speed of building and high cost of labour. In addition, very few contractors and carpenters possess the craftsmanship to treat wood as in "the old days". The practice of seasoning cut lumber for a long period of time and selecting only those pieces of lumber which have not deteriorated in the drying process is hardly possible today. Even if the client is prepared to pay for "kiln dry" lumber, large sections are not easily available.

In houses belonging to this group the beams are usually continued beyond the exterior walls to form an overhang. Very often the ends of the beams are completely exposed to the weather. The end tends to check much more than the rest of the beam because of greater stress due to faster evaporation of water. This can be retarded by coating the end with vapor-resistant material such as paraffin, or hardened oil gloss. There is always the possibility that the exposed beam will warp even if it has been properly seasoned, because of the alternate wet and dry conditions. When examining houses which used this kind of treatment the author usually found at least one beam which was badly warped. Flashing on top of the beam helps a little but it is better to avoid such complete exposure in our climate.

There is of course no cure for discoloration which takes place when the same beam is exposed to three different conditions, i.e., completely exposed, partly exposed under the overhang, and entirely sheltered inside the room.

It is essential to recognize that problems may result from shrinkage especially in designs where the glass extends to the ceiling and the glass panel is terminated on top by the planks and on the sides by the beams and the posts. Distortion of the beam may break the glass and shrinkage may cause cracks between the glass-stop and the beam. It is advisable to avoid this type of construction when using solid beams even in Vancouver where a little unexpected ventilation is not as serious as in a colder climate.

For solid wood connections, old-time devices such as mortise-and-tenon joints are no longer practicable because of the labour involved. As a result metal connectors are usually employed. To get a rigid connection between the post and the beam, strap iron or angle irons with bolts are often used. This is not a very economical method as long as custom-made connectors are used (Fig. 1). The connection used most, therefore, is a metal pin or dowel and toe-nailing. Neither of these is a rigid connection.

The difficulties with the connections and the degrading of comparatively large pieces of solid wood when in place, present difficulties to a conscientious designer, but the economical advantages of this system are indubitable.

2. Vertically Laminated Post-and-beam

The use of vertically laminated members in the post-and-beam system is becoming very popular with architects in Vancouver. The principal reason may be expressed as follows: (a) Continued use of solid lumber for the sake of economy and convenience, (b) Use of smaller pieces of lumber which are easier to handle, easier to get, and easier to season, and (c) Assembling them in such a way that warping is minimized and the connections are rigid.

A rigid connection between the post and the beam is achieved by interlocking the three members of the post and the beam in such a way that a mortise-and-tenon-like connection is formed. The central part of the post forms a tenon, while the mortise is achieved by leaving out a part of the central member of the beam. When 2 in. by 6 in. is used for the central part of the post and two 2 in. by 4 in. for the side members, natural "rabbets" are formed to which windows, wood panels, or other members can be fastened. If the members of the post and those of the beam are adequately spiked or bolted together, if seasoned lumber is used, and if the beams are not fully exposed to the weather, it is an almost faultless system.

Since the parts of a laminated member are relatively small they may be more readily seasoned than the large solid pieces without checking and other seasoning degrading. Furthermore they may be dried to the approximate moisture content of their final use, thus eliminating shrinkage troubles. Correct moisture content and correct spiking are essential to a proper performance of this system. Spiking is usually covered in the specification by the term "well spiked", and when the beam is not cased the specifications call for the spikes to be countersunk and puttied. Because of the labor involved the number of spikes may be fewer than necessary, so it is wise to specify the number of spikes or nails required. The head of the nails or spikes, even when countersunk, puttied, and painted, will begin to show after a time, therefore it may be better practice to use an adequate number of spikes and cover them with casing or to use oval-headed chisel-pointed spikes and expose them in a pattern if this is not objectionable from the design point of view. Spikes with bolts are recommended for beams more than 10 inches in depth. It is good practice, however, to use bolts at the ends of the beam regardless of the depth if nails or spikes are the principal means of fastening elsewhere along the length. The bolts should be placed as near to the corner of the beam as possible to prevent twisting.

By combining various sizes of members, the beam and the post can be designed in differently patterned sections (Figs. 1 to 13). It may be better for the design to stress this multiplicity rather than try to conceal it. If this is objectionable, a cover plate can be applied to the underside of the beam to cover the joints. This combination is very useful when ceiling fixtures are used (Fig. 9). The central part of the beam can be made smaller to form a raceway for the wiring and the ceiling fixtures fastened to the soffit of the beam.

When trying to achieve the appearance of a solid beam there is always the problem of treating the ends that are carried out to support the overhang. A wooden cover plate often used to hide and at the same time protect the ends of the beam is not reliable even when glued on with waterproof glue. The small, relatively thin piece behaves differently to the rest of the beam when exposed to the weather. It may cup or split and it is satisfactory only when it is kept painted.

Belonging to neither this nor to the first group, but related to both of them, is a system of post-and-beam construction which consists of two beams, one on each side of a single post. The connection consists usually of a single bolt and, very often, a ring connector (Fig. 4). The two beams form a spaced beam which is usually carried out to support the overhang. The only advantage of this arrangement against the one piece beam is the employment of two smaller pieces, and the possibility of concealing electrical wiring in the space between the beams. It does not have the merits of the vertically laminated beam, where one piece prevents the other from warping. Because the space is wider than the post the glass panel cannot be ceiling high, unless of course the glass is cut around the beam.

Another variation is possible with a single beam and post made of three pieces. The beam sits on top of the central piece of the post, which has the same thickness as the beam. The outside members of the post continue to the top of the beam and are spiked to the sides of the beam acting as gussets (Fig. 2).

3. Glued-Laminated Post-and-beam

With the exception of the advocates of solid wood, there was general agreement in the building profession that glued-laminated products are ideal for post-and-beam construction, except for the cost.

The advantages of these products are very simple to state. Laminated members must be relatively dry to ensure proper gluing. The individual laminations are dried either to an air-dried condition or to some lower moisture content, depending on their ultimate use. It is desirable to have the material dried to the moisture content expected in its final use. If this is done, a glued-laminated beam will shrink and swell very little when in place, will not degrade, and consequently, will be superior to the green pieces of lumber which are left to dry in the place of their use. Large changes in moisture content induce heavy stresses which may cause delamination, so that even glued-laminated products should be protected to some extent.

A moisture content of 8 to 10 per cent is usually recommended for lumber that is to be used in a continuously dry location, whereas 12 to 15 per cent is recommended for moderately exposed locations. Generally, it is desirable to have the moisture content of glued-laminated products slightly under the final expected moisture content, so that the change in moisture content will cause swelling rather than shrinkage. Dimensional stability of the structural members in post-and-beam construction is very important because they serve a dual purpose, structural and decorative. It is especially important where the beam is surrounded by glass. In such cases, the inside glass stop can be let in, glued either in the factory or on the job, without any future troubles since there is no warping and very little shrinkage of glued-laminated products.

Some of the advantages of glued-laminated products are that they can form curved shapes, rigid frames where post and beam interlace into one bent, and other complicated forms which would otherwise be difficult to achieve.

The architectural possibilities offered by glued-laminated wood products are many but are as yet relatively unexploited.

Unfortunately there is one very serious drawback of glued-laminated products as far as residential work is concerned. This is the matter of cost. If a few standard shapes and sizes could be developed which could be purchased for a standard price without submitting drawings and specifications then much of the extra work involved in dealing with custom-made products would be eliminated and the price lowered.

4. Plywood Box Beams

The evolution from small pieces of wood glued together as in the glued-laminated products to lighter and structurally more efficient cross-sections came about naturally. A good example of this evolution is the plywood box beams which utilize the high shearing strength of plywood in the web and the high tensile and compressive strength of laminated wood in the flanges. The combination is light in weight and economical in the use of materials.

Architecturally, it is a very pliable combination. It can be put together in many different shapes, and may be painted or left in a natural state with a clear finish. The connections between the post and the beam can be detailed easily and allow a greater range of design possibilities than any other system. The only evident drawback is the checking of the plywood surface veneer which occurs when the beam is exposed to the weather as in the house shown on plate 12L. Experience in field performance of this construction in Vancouver is, as yet, too limited to warrant a valid judgement of its potentialities and possibilities.

Joints and Connections

In conventional light-frame construction, the frame, built of small pieces nailed together with sheathing, constitutes a whole unbroken unit. The stucco or siding outside and the plaster or other finish inside, with mouldings, trim, etc., cover every possible joint. Where there is a possibility of cracking, metal lath is applied. When leakage is expected, building paper or flashing is used.

In post-and-beam construction the building components are larger and the treatment of the joint is more important. It is not always possible to use the above-mentioned materials to cover the joints especially when "dry" construction is used. When large solid panels or large windows are used which reach from post to post, the connections must receive special attention. The principal aim is to avoid "through-joints" and allow for shrinkage. The construction should, of course, be tight. Unfortunately, the usual practice in Vancouver is to butt the panel against the post, and then to cover the joint with a wood stop. When a glass panel is fitted against the post, outside and inside wood glass stops are used. After the usual shrinkage of the post occurs (or beam if the glass is taken to the ceiling) cracks sometimes wide enough to see through develop between the post (or beam) and the glass stops. Second caulking has not proved satisfactory as a solution to this problem. A post with a "cross-form" section can be used which will accommodate either panels or glass and which eliminates "through-joints". The "cross-form" can be made up from a single piece of wood or out of three or more pieces. The side projections which act as weatherstops can also be formed by inserting pieces of wood on each side of the post and gluing and screwing them to it. The panel of glass can then be inserted and fixed with a wood glass-stop and caulked.

Much more serious as far as the lifetime of the building is concerned is the connection between the wooden superstructure and the foundation. All old, well preserved, wood structures have one thing in common: the wood sill is raised well above grade on a masonry foundation so that the ground moisture does not reach the wood and which is, therefore, kept dry and well aired. Insufficient clearance of wood from grade seems to be common to a majority of contemporary residences. The wish to step from the indoors to the garden or patio or wheel out the tea-wagon or baby carriage without the inconvenience of steps has drawn the wood undesirably close to the moist ground.

In this respect an advantage of post-and-beam construction with the load concentrated on fewer points (the posts) is the possibility of carrying the whole house on steel pins and avoiding any contact between the wood and the foundation. Actually this advantage may be realized only in cases where the whole house is raised well above the ground, and where the so-called "pier construction" is employed, i.e., where there is no continuous concrete foundation but where isolated concrete piers carry the load transferred to them by the posts. In the majority of contemporary houses the floor level is so close to the ground that it is impossible to utilize this advantage. There is really no fundamental difference between the sill in post-and-beam construction and the sill in light-frame conventional construction.

ADVANTAGES AND DISADVANTAGES OF POST-AND-BEAM CONSTRUCTION

Advantages of the Post-and-beam System

The post-and-beam system is a logical method of construction. The roof must be supported from below in some way since a hanging roof is too costly. A dome form, which would make the roof and hall merge, can be constructed in reinforced concrete or in plastic, but technology so far has not found a way of producing such a shape in wood at a reasonable cost. Post and beam construction seems, therefore, very logical and economical as it supports the roof from below by a few isolated columns. Because the rest of the house is non-load-bearing it can be assembled and prefinished in the shop and then inserted into the structural frame. This applies to walls and partitions that can be moved in any way so that adjacent rooms can be made to flow together to form "open plans", without impairing the structural safety.

The skeleton frame forms a large three-dimensional module which is orderly and expressive. It shows clearly and simply the elements that structurally constitute the house. This structural honesty is in accord with the principles of good architecture. Exposed structural members not only may result in saving of money, but a pleasant intimate appearance as well. Large glass areas can be installed without the use of heavy lintels. The post-and-beam system is ideal for the use of panels, one of modern architecture's most characteristic devices, because the regular spacing of the post and beams forms a natural frame for the panels. It also forms a natural frame for decorative features such as grilles, sculpture and mosaic and lends itself well to the ornamental use of materials. Architects like the rhythm that this construction gives the façade of the house along with the convenience and the possible economy through modular co-ordination in the design, the working drawings, and the construction. They like the freedom possible in the use of different materials, textures, colors and forms and the interesting variety of pleasant solutions in the design of lower cost houses when working with this form of construction. They like this system because it is flexible enough to be used for a $10,000 as well as a $100,000 house, for rustic as well as for sophisticated architecture.

The connections of the structural members, the exposed jointing and the simplicity in design, express the technology of the time better than the conventional light-frame construction. To form a roof overhang in post-and-beam construction, for instance, the beams are cantilevered at the side walls and the planks, (joists or panels) are cantilevered at the end walls. If planks or prefabricated panels are used they can be left exposed, and no other members are necessary.

Protection of the wood superstructure from ground moisture can be made easier with post-and-beam system than with conventional methods. A complete "post-and-beam house" is supported at few points - the posts - which in turn may rest on metal pins imbedded in the concrete foundation and so stand free from any moisture action.

The slow burning rate of wood is another advantage of the post-and-beam system. The rate of burning in timber depends on the ratio of surface to volume. Wood does not lose all its strength when its surface is charred. The charring protects the wood and slows down the burning. The use of fewer but heavier pieces makes the construction slow-burning similar to mill construction. In additon, the fire is more easily detected and controlled since there are no concealed spaces through which it can spread unnoticed.

The advantages of the plank and beam system for roof and floor construction are thoroughly stated in the booklet published by the National Lumber Manufacturers Association of America:

"1. The number of pieces which the carpenter must handle, saw, align and nail are reduced, e.g., for a floor with 6 ft. plank spans only about one-fourth as many beams (joists) are set.

2. There are fewer points at which the floor must be nailed through supporting beams.

3. No bridging is required because the ratio of width to depth is low, and the planking provides stiff lateral support to the beams.

4. Less lumber is required for the beams because ordinarily a more efficient design is possible, i.e., the lumber can be stressed more, nearly up to its safe working stress. Since with beams spaced at 6 ft. or 7 ft. instead of 16 in. intervals greater loads are concentrated at fewer beams, adequate beam sizes may be chosen from a greater number of commercial sizes and therefore with less excess of material.

5. A large percentage of lower grades of lumber can be used, and therefore natural lumber resources are more fully utilized.

6. Increased insulation is provided without extra cost.

7. Waste of material is reduced by the use of multiples of standard lumber lengths.

8. Fewer different lengths and sizes of lumber are handled and placed.

9. Construction details of the framework are in general simpler.

10. Shorter exterior studs are required. For example, a ceiling height of 8 ft. can be maintained with stud lengths of only 7 ft. instead of 7 ft. and 8 5/8 in. This also permits the floor beams and headers at the walls to serve as headers over doors and windows eliminating the usual cut-in headers and crippled studs.

11. The exterior wall height and over-all height of building for the same ceiling heights are reduced as the ceiling height is taken from floor to the exposed ceiling surface between beams. This means there is more usable cubage in a house of the same size or the same usable cubage in a house of smaller size. The reduced building height and reduced distances from the floors to the ground afford savings in paint, siding, sheathing, framing, stairs, chimney, downspouting, stops and exterior steps.

12. In localities where pier construction is used less under-framing is needed.

13. The layer of finish ceiling material such as lath and plaster may be eliminated because the underside of the planks will serve as a finished ceiling. This saving alone will justify considerable expense in obtaining a high degree of decorative finish for the wood ceiling.

14. Although additional ceiling material is unnecessary to provide a suitable finish, if some other type of ceiling finish is desired, the plank while leaving the beams exposed provides a solid backing in place of spaced narrow faced nailing members for the application of any materials to give any desired aesthetic effect.

15. In buildings with basements, window areaways may be eliminated and high foundations avoided because the thin floor construction permits placement of the basement window between beams on two opposite sides of the building.

It should be also noted that the plank provides a thicker nailing base for the finish floor and the system permits speedy dry-built construction."

The ease with which the planks can be nailed to the top of the beams compared with toe-nailing of the joists should be added as an advantage of the plank and beam floor and roof system.

Disadvantages of Post-and-beam Construction

The post-and-beam system presents several problems. For instance, the spacing of the beams has many conflicting aspects. To use a 2-in. plank efficiently a 7-ft. spacing may be the best. However, 7-ft. spacing frequently may not be satisfactory for plan requirements. The beam spacing which is aesthetically satisfactory in a living room may perhaps be very unsatisfactory in a small room such as a bedroom or a dining room. Sometimes the width of the exterior door influences the spacing of the posts upon which the spacing of the beams depends. The structure must be in perfect harmony with the plan which must be designed with the beam spacing borne in mind. In other words, the building must be conceived three-dimensionally as a whole.

In post-and-beam construction the "rough carpentry" is very often exposed and serves as "finish carpentry" as well. It is difficult for workmen who are used to conventional frame construction to become accustomed to the idea that practically all the carpentry work is in fact "finish work". For this reason there may be many heel marks on living room ceilings constructed of planks.

Many of the economical advantages of simpler framing details in post-and-beam construction are lost in the expense of heavier timber, more expensive "finishing lumber", and the protection of beams, posts and planks (if used) during the construction. Since the structural frame of the posts and the beams is largely exposed, those members must be made of specially selected lumber custom dressed.

More attention must be given to wind bracing for a "post-and-beam house". This may be provided in the form of solid partitions and solid exterior walls in at least two perpendicular planes. Additional stiffness may be developed by using rigid beam-to-post connections.

The advantages of a reduced building height and increased usable cubage, when planks are used for roof and floor, becomes a disadvantage when mechanical services are considered. The lack of unused space also means a lack of space in which to conceal conduits, pipes, and ducts. The mechanical services must be considered during the design stage. An electrical layout should indicate the actual location of runs and details of installation. The exact location of vent stacks should be located on the drawings. If ceiling fixtures are to be used, the methods of wiring must be determined before construction starts. All these are disadvantages when compared with the great ease with which the conventional system absorbs these mechanical services. However, since today's house uses many more base outlets than ceiling fixtures, wires can be run at the baseboard level with occasional extensions to the ceiling, wherever necessary and eventually concealed in the beam. With modern heating methods there is usually no reason for any ductwork in the ceiling.

There are several methods of concealing the electrical wiring when planks are used for roofs. But no one of them is perfect. The usual practice is to lay the conduits on top of the rigid insulation and then, by stepping on them, to force them into the insulation laid above the planks. This, however, is not good practice considering the possible damage to the insulation and the conduits. It is preferable to put another layer of insulation to a depth of ½ in. on top of the conduits and then lay the roofing over it. Better practice still is to put a strapping on top of the planks thick enough to accommodate the conduits and to place the insulation on top. The space between the planks and the insulation should be ventilated. Another way to conceal the electrical wiring is to locate the wire in a groove in a plank and then try to conceal the wires by painting. Also they may be concealed in the beams as described earlier.

It is harder to get a clear stock of lumber without blemishes in 2-in. stock than in 1-in. stock.

If the planks are not protected against rain, snow, and mechanical damages construction discoloration results which is difficult to remove. Any leakage which may develop during the construction around the chimneys, fireplaces or the eaves, results again in a discoloration of the finished ceiling which then has to be painted to conceal the damage.

The limited span of planks is another drawback of their use for roof and floor construction.

The rather rough texture of planks may or may not be a disadvantage depending on the architectural effect the designer is trying to achieve.

The noise problem in the plank and beam roof construction must be counted among the disadvantages of this system even though the majority of people seem rather to enjoy the sound of rain on their roofs. In a two-story house, the easy transfer of impact noises through plank floors might be serious. Another kind of noise that may occur is the cracking caused by the shrinkage and swelling of the planks due to seasonal changes in humidity.

When the exposed planks form a roof overhang the "V" joint of the planks provides a small triangular opening at the wall which, if not caulked, provides an ideal place for nesting of insects. When excess shrinkage occurs, comparatively large openings may develop.

Common errors committed in the use of planks are:

1. The use of green planks
2. The use of planks which are too wide
3. The use of insufficient number of nails
4. Improper handling (no protection against weather during construction, walking on the finish surface, no attempt to match the planks)
5. Too wide to overhang.

Some Vancouver architects who used planks extensively for the roof are now using joists with post-and-beam construction because they have found the planks unsatisfactory. The main reasons are the limited choice of finishes for planks and the difficulties with the concealment of electrical wiring. Other complaints on their part are bad workmanship, inadequate nailing, mechanical damages, inadequate care in protecting dry planks against weather and, finally, no attempt to match the planks together.

Difficulties in all junctions and jointing also provide a continuous source of worry which has not been economically resolved.

The use of joists instead of planks offers many practical advantages. Firstly, it provides a possibility of obtaining a better and more varied finish for the ceiling. The underside of the planks may be finished with plaster or other material but, naturally, this is more expensive and thus the cost does not compare favorably with the ordinary joisted construction. Secondly, the space between the joists provides room for mechanical services and the wiring does not need to be considered in the working drawing stage as in the case of planks. Concealed lighting fixtures can be well used with the joists. Thirdly, the batt insulation which may be used between the joists is cheaper compared to rigid insulation which must be used on top of the planks.

The bulkier construction and the need for ventilation of the space between the joists, above the insulation, must be listed as a disadvantage of this method.

The need for some construction method or material which would combine the advantages of both types is evident. The joists even though practical in some ways, belong to a different building technique. Prefabricated panels with built-in insulation and with some provision made for accommodating electrical wiring seem to be the answer.

Summary

Summing up all the aspects of the post-and-beam system, its versatility and flexibility should be first mentioned. It offers the designer a variety in beam spacing, in different sizes, shapes, directions and slopes of beams, variety of post locations and their treatment, and different ways of spanning between the beams. The system is flexible because it frees the plan from inflexible bearing walls and partitions. When large glass areas are being used it attains great openness without cluttering the structure.

The innate rhythm of post-and-beam construction gives character and modular quality to the system. Apart from the aesthetic appeal it has economic value. The economical benefits derive from a more natural use of modular co-ordination than is possible with the conventional system.

By using fewer and heavier pieces, simplicity of construction is achieved which in turn means speedy erection and efficiency in use of wood compared to the over-built conventional framing.

The structural honesty with which the structure and the connections are treated, i.e., exposed and not concealed as in conventional frame, makes good workmanship essential and good workmanship makes for better building.

Even though there are ways of concealing the beams, the exposed beam is characteristic of post-and-beam construction. This may not always be acceptable, however, to either the designer or the client.

The reduced volume of the house, so important economically, (when planks are used for floor and roof construction), also means lack of space in which to conceal the mechanical services. Therefore the placement of these must be carefully planned in the design stage.

A longer design period is essential not only for the layout of mechanical services but for the whole building. Post-and-beam construction is really rewarding when the whole house is thoroughly "engineered", and all the details worked out to a higher degree than in the conventional construction.

Post-and-beam construction is not a system which can be used economically for every type of house. It is economical when the circumstances are right: when the area of the house is approximately between 1,000 and 2,000 sq. ft., when large windows are used, when wide overhangs are planned, when an "open plan" is considered and exposed beams are not objectionable, and when a crew experienced in post-and-beam construction is available.

POSSIBLE ECONOMIES IN POST AND BEAM CONSTRUCTION

As far as the author knows, the only comprehensive study concerning the plank and beam floor and roof system was conducted and published in 1940 by the National Lumber Manufacturers Association of America in their booklet: "Plank and Beam Floor and Roof System for Residential Construction". The following are excerpts from that booklet.

> "In 1939 the plank-and-beam system of construction with 7 ft. plank spans was applied and observed in the first floor, the ceiling over the first floor, and the roof construction of a one-story demonstration house built at the New York World's Fair. Under the unusual abuse of approximately a million visitors within a period of a few months this floor system proved entirely satisfactory.
>
> In 1938 the National Lumber Manufacturers Association made a detailed study of the relative cost of plank-and-beam construction with 6 ft. plank spans compared with a standard joisted floor construction from data collected in the building of the Fairway Hills "Laboratory

Community". The two types of first floors were built by the same workmen, under identical conditions in this suburb of Washington, D. C. The study covering the portion of the structure from the foundation top to the top of the rough floor, including sills, headers, beams, sheathing, siding, bridging and man-time, indicates the following:

1. The plank floor required 26.3 per cent less labor time than the joisted floor.

2. The plank floor required 13.6 per cent less labor time per thousand board feet of lumber than the joisted floor.

3. The plank floor required 14.7 per cent less lumber per square foot of floor area than the joisted floor.

4. The plank floor cost 22.6 per cent less per square foot of floor area than the joisted floor.

5. The plank floor was 24.8 per cent more efficient than the joisted floor from the standpoint of insulation. This is of particular importance in a house having no basement.

The comparative values are tabulated below:

Per square Foot of Floor Construction			
Item	Plank Floor	Average of Two	Savings
Labor time	2.35 minutes	3.165 minutes	26.3 %
Lbr. required	2.88 bd. ft.	3.375 bd. ft.	14.7 %
Lumber cost	$.0828	$.1102	24.8 %
Total cost	$.12	$.1550	22.6 %
Heat loss	0.236 B.T.U.	0.314 B.T.U.	24.8 %

Per Thousand Board Feet of Lumber			
Item	Plank Floor	Joisted Floor	Savings
Labor time	810 minutes (13.5 hrs.)	938 minutes (15.625 hrs.)	13.6 %

In view of the fact that the plank-and-beam floor in the Fairway Hills experiment was the first one which the carpenters had built, whereas they had built many standard joisted floors, the savings are even more remarkable than the data indicate. To make the joisted floor equivalent to the plank floor in insulation value would further increase the cost and make the comparison still more favorable to the plank-and-beam construction. The 7 ft. plank spans, which are acceptable for loans guaranteed by the Federal Housing Administration, should show even greater savings than are indicated by these data which pertain to 6 ft. plank spans."

It is impossible to evaluate precisely the economies in post and beam construction without making a comparable study of the system as it is used now, 20 years later.

Some architects think that post-and-beam construction is definitely cheaper, some think that its cost is equal to a conventional light-frame construction, and still others consider it more expensive than any other wood construction. It is easy to understand the variation in opinions when we consider the variation in costs between houses of the same construction type or, for that matter, in the competitive costs received for the same house. Those who think the "post-and-beam house" is cheaper have one specific type of post-and-beam system in mind. There is no doubt that plank-post-and-beam construction with planks used for roofs, floors, and partitions is more economical than the conventional system. However, any deviation from this special construction may result in upsetting the cost advantage. When glued-laminated posts and beams are used as well as good finish for walls and ceiling, with weathertight joints, the author believes that the price of post-and-beam construction may, under present conditions, be even higher than in conventional light frame construction.

In order to realize any potential savings, the designer, builder, and the building crew must all be experienced in dealing with post-and-beam construction, and the details have to be carefully worked out.

The San Francisco builder, Joseph Eichler, who has won many awards for the outstanding qualities of his post-and-beam houses, is quoted in the June 1954 issue of "House and Home" magazine:

"Last year we built some houses using a truss system. While this figured out cheaper on paper it was actually more costly because of the many more operations that were required... those extra operations made the over-all operation more costly."

In the same issue Joseph Eichler is quoted again as stressing the importance of an experienced crew. The savings in the first twenty houses he built were only 10 per cent. But his savings rose to almost 25 per cent after the first eighty houses were built and his carpenters had become familiar with the construction.

DIGEST OF AVAILABLE LITERATURE

The following are excerpts from two publications available in this field.

The first publication dealing with post-and-beam construction for residential use is a 16-page booklet, "Plank and Beam Floor and Roof System for Residential Construction", published in 1940 by the National Lumber Manufacturers Association of America, and prepared by Richard G. Kimbell, Frank J. Hanrahan, Lawrence M. Stevens and John G. Shope.

The purpose of this publication is:

> "To present detailed, technical data which will be helpful to the designer, specification writer and builder. It contains information pertaining to adoption, advantages and economy, architectural and construction details, and structural requirements of the plank and beam system for residential construction."

A definition of plank and beam system of construction is given as:

> "The use of plank subfloor or roof decking with supporting beams spaced up to 7 ft. apart, instead of the usual boards for subfloor or roof decking with joists or rafters spaced the customary 12 in. to 24 in."

Under the heading "Advantages and Economies" are data and studies made by the National Lumber Manufacturers Association from observation of a demonstration house built in 1939 at the New York World's Fair, and from the building of the Fairway Hills "Laboratory Community" in 1938.

The section "Architectural and Construction Details" stresses the importance of well designed and adequately constructed architectural and construction details, particularly of finished flooring and ceiling.

The section on "Planks" deals with different joint treatments, moisture content, grade of lumber used for planks, methods of obtaining added stiffness and strength through continuity of planks over two spans, and the use of patterned material to provide decorative effects.

The section on "Beams" discusses the stock to be chosen when beams are to be exposed and finished naturally, or when painted. Different methods of forming beams, i.e., cased, spaced, built up from two or more laminations, and spiked together, are also discussed.

Sections on "Exterior Wall Framing", "Interior Columns and Partitions", and "Other Parts of the Structure" explain and discuss framing details.

Isometric sketches are provided of plank structural roofs and floors and of two-story house framing together with various details of beam bearings.

The rest of the booklet (five pages) deals with structural requirements and is intended to:

> "indicate how to select plank and beam material to obtain adequate strength and stiffness of floor and roof and calls attention to other important structural details".

The second publication dealing with plank and beam construction is an 80-page brochure published in November 1953, by the Housing and Home Finance Agency, Washington, D. C. entitled "Plank and Beam System for Residential Construction". The pamphlet is presented as "Construction Aid No. 4" and is part of a series of brochures initiated by the Division of Housing Research, Washington, D. C. It contains information on:

> "Site planning and engineering, design principles, installation assembly and construction methods and the use of alternate materials, which will combine

efficiency and satisfactory performance with the conservation of labor and material."

The purpose and the general content is stated as follows:

"This publication has been prepared as the result of expressions of extreme interest in the plank and beam system for residential construction and because the system has potentialities for the conservation of materials and labor in the home building industry.

The first part of this publication discusses the background, the advantages, and the disadvantages of the system, The second part is an engineering manual outlining the principles involved, together with tables and graphs for the design and selection of members, and a discussion of condensation control.

This publication was prepared as a staff project of the Division of Housing Research. Alan L. Winthrop was the project engineer. Illustrations are by William W. McMaster."

Under the heading "General Characteristics and Basic Principles" the advantages of this system are discussed, with particular reference to its adaptability to modern trends in design and the dual function of material.

The chapter "Potential Cost Savings" deal with the higher efficiency of this system particularly in terms of saving of material and labor.

In the chapter "Conventional Framing vs. Plank and Beam" a comparison of the two systems is made; the conventional wall of 2- by 4-in. studs, 16 inches on centers, and plank and beam where the studs are 2 feet on centers. Notice is made of the large savings in the number of pieces, of the need of better craftsmanship in plank and beam construction, and quotes from the studies made in 1938 by the National Lumber Manufacturers Association. The conclusion is made that the economic advantages of the plank and beam system are great but that the realization depends on many factors.

The "Limitations of Plank and Beam System" discusses the need for rigid insulation which must maintain its performance even when slightly wet, and the possibility that in some climates the need for a greater amount of insulation might render the system uneconomical. The limited freedom of locating interior partitions as compared with trussed-roof houses, the need for additional support for concentrated loads such as bathtubs, and the problem of electrical distribution, is discussed.

"Designing the Planking" thoroughly discusses this subject. The merits of continuity of planks over two or three spans, the need for plank layout drawings, and the recommended requirements for planks are dealt with here. These requirements are:

1. All planks for either roof or floor must be 2 by 6 in. or 2 by 8 in. tongued and grooved or splined.

2. All planks must be blind and face nailed.

3. The minimum floor live load is 40 p.s.f., and the floor planks must not deflect more than 1/360 of the floor plank span under this live load.

The deflection limit is further discussed with the different spacing and differnt plank length. The conclusion is that there is apparently no single answer to the question on best spans and best planks. They state:

> "You can only arrive at the answer by analysing the importance and relationship of all the factors - the availablity of the material, the floor plan, the design load and deflection limit, the cost of material and labor, the requirements of modular design, the aesthetic value of the lumber, public taste, etc."

The chapter "Handling the Planks on the Job" deals very briefly with the problem of keeping the planks dry before and during the construction, and with that of prepainting them on the ground.

"Designing the Beams" is another section dealing with the structural aspects of the system in connection with beams. The following requirements are recommended for adequate roof and floor beams:

1. Single member beam shall not be less than 3 in. thick. Built-up beams can be made up of thinner members.

2. Columns must be designed to adequately support the beams. No column shall be less than 4 by 4 in.

3. Beams and columns shall not be notched unless additional section is provided.

4. The minimum floor live load is 40 p.s.f., and the floor beams must not deflect more than 1/360 of the floor span under this live load.

"Insulation and Condensation Control" generally discusses condensation, the use of proper vapor barriers and insulation, condensation in connection with planks and rigid insulation, precautions in selecting insulation for plank and beam roof, and methods of determining the amount of insulation needed, with five charts of dew point and insulation values.

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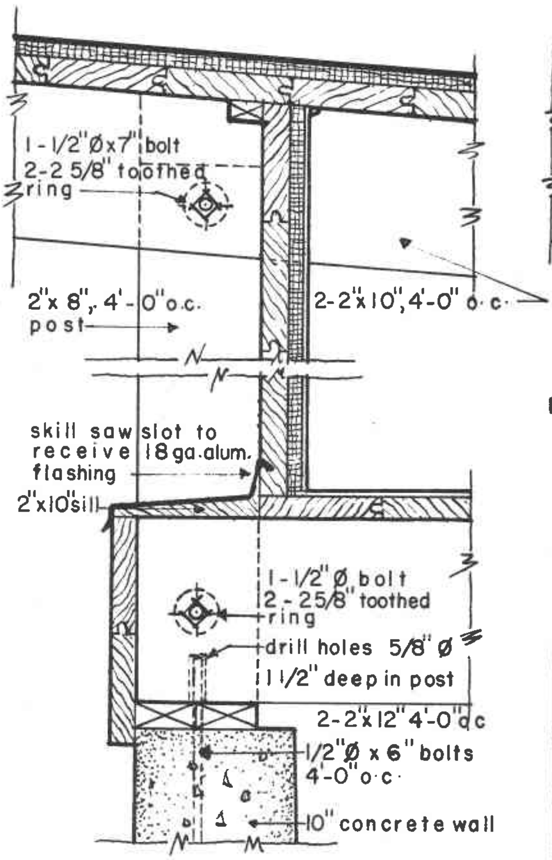
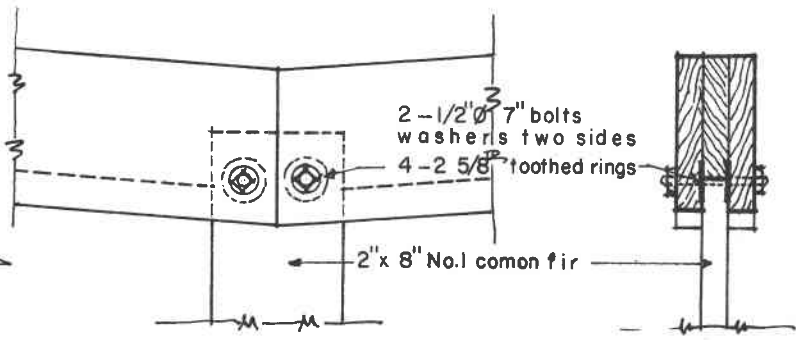
ARCHITECT THOMPSON, BERWICK & PRATT - 1553 ROBSON VAN·B·C·
OWNER ALEXANDER MASLOW
LOCATION 1684 ACADIA VANCOUVER 8 B·C·

I A

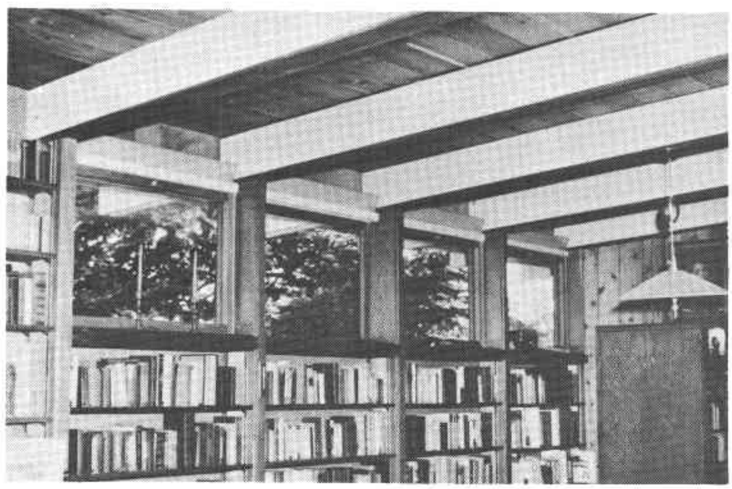


TYPICAL WALL SECTION

scale 1" = 1'-0"

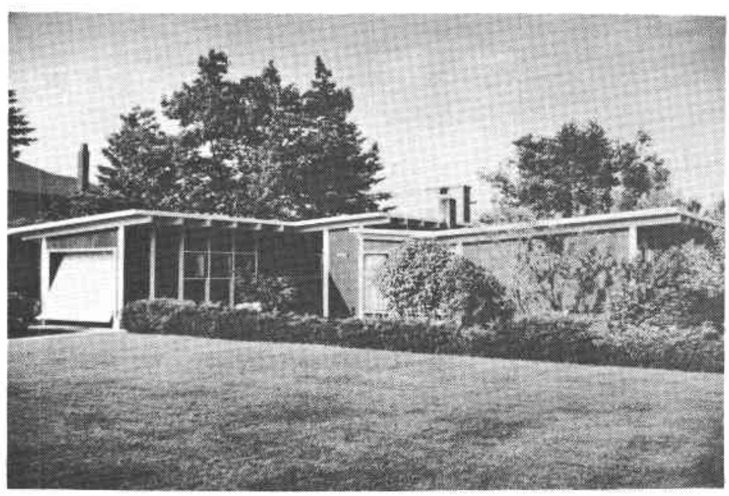


POST & BEAM CONNECTION AT VALLEY



NORTH WALL IN LIVING ROOM

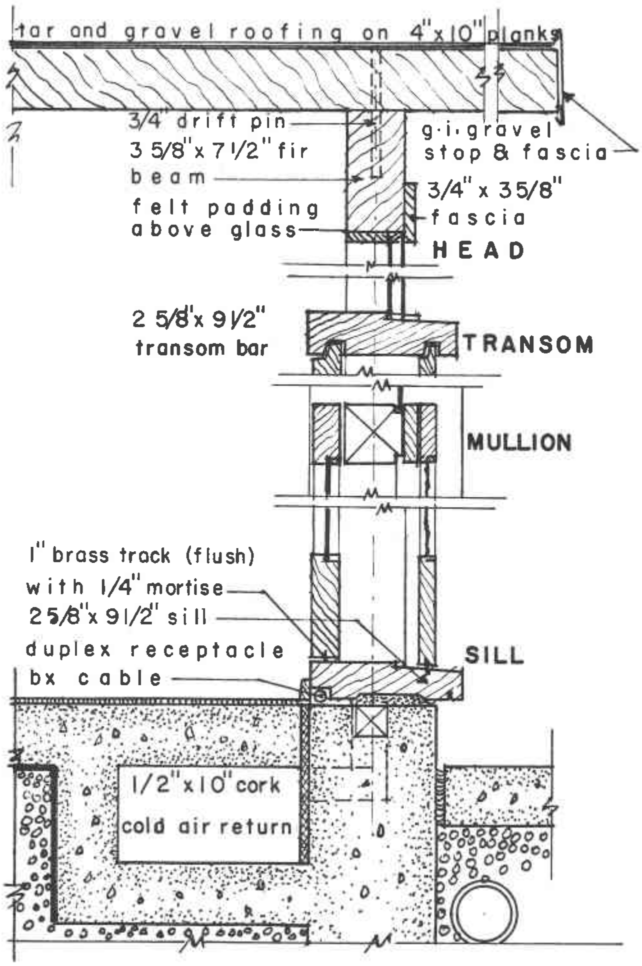
CONSTRUCTION DATA:
10" CONCRETE FOUNDATION WALL
4" CONC· SLAB ON GRAVEL IN BASEMENT
2"x 8" T & G CEDAR PLANKS ON 2-2"x12"
4'-0" O·C· AT GROUND FLOOR
2"x 8" T & G CEDAR PLANKS ON 2-2"-10"
4'-0" O·C· AT ROOF, 1" RIGID INSULATION
BUILT-UP TAR & GRAVEL ROOFING
2"- 8", 4'-0" O·C· POSTS
2"x 8" T & G VERTICAL CEDAR PLANK PARTITIONS
2"x 8" T & G CEDAR PLANKS OUTSIDE WALLS WITH 1" RIGID INSULATION INSIDE· 1/4" CEDAR PLYWOOD INSIDE FINISH FOR OUTSIDE WALLS
ANOTHER LAYER OF CEDAR PLANKS WAS LATER ADDED TO THE OUTSIDE WALLS·



WEST ELEVATION

ARCHITECT JOHN C·H· PORTER - 1509 W 7TH VANCOUVER B·C·
OWNER JOHN C·H· PORTER
LOCATION 1560 OTTAWA WEST VANCOUVER B·C·

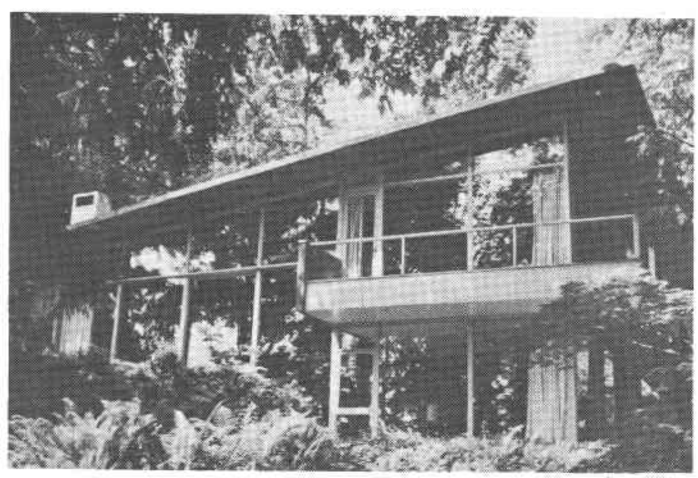
2 B



SECTION - SOUTH WALL OF STUDY

MAIN ENTRANCE

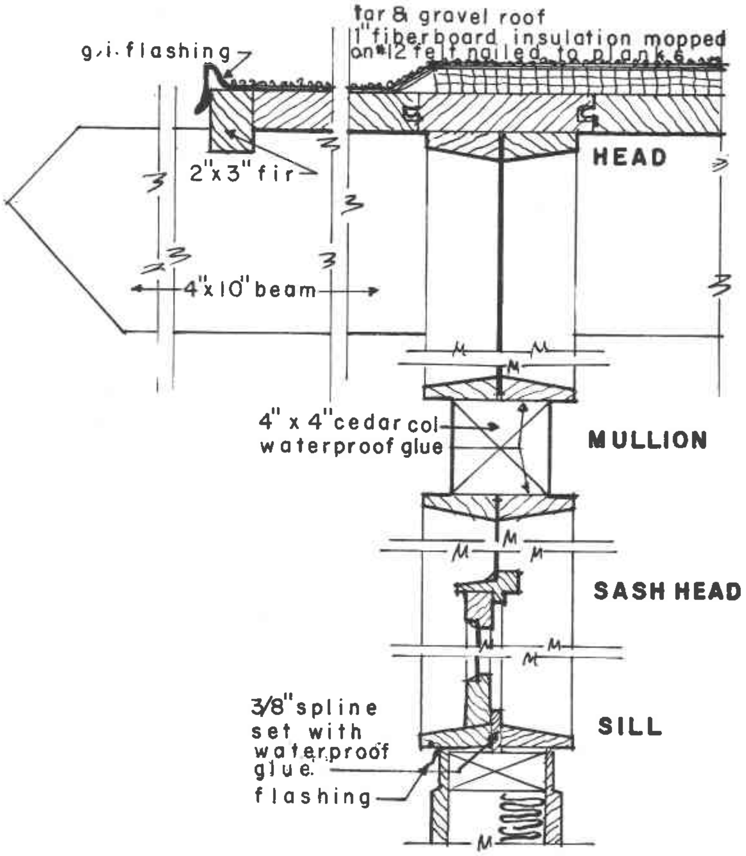
CONSTRUCTION DATA:
FOUNDATION: 8" CONC·WALL
FLOOR: 4" CONC·-WATERPROOFING ON GRAVEL; FINISH VARIES
ROOF: BUILT-UP TAR & GRAVEL ROOFING DIRECTLY ON 4"x 10" T & G CEDAR PLANKS, ON 6"x 12" AND 6"x 14", 12'-0" o·c· BEAMS
POSTS: 4"x 4" & 4"x 6"
WALLS: 7/8" x 8" CEDAR WITH 7/8"x 2" BLOCKING STRIPS ON 3/8" PLYWOOD, 2"x 4", 16" o·c BATT INSULATION - GYPROC LATH AND PLASTER



SOUTH ELEVATION

3 C

ARCHITECT	JOHN ROBERTS	2495 HAYWOOD, WEST VANCOUVER B.C.
OWNER	J·I·KYLE	
LOCATION	ST· JAMES CRESCENT WEST VANCOUVER B·C·	



EAVES AND WINDOW DETAILS

scale 1/8 f·s·

WINDOWS AT SOUTH ELEVATION

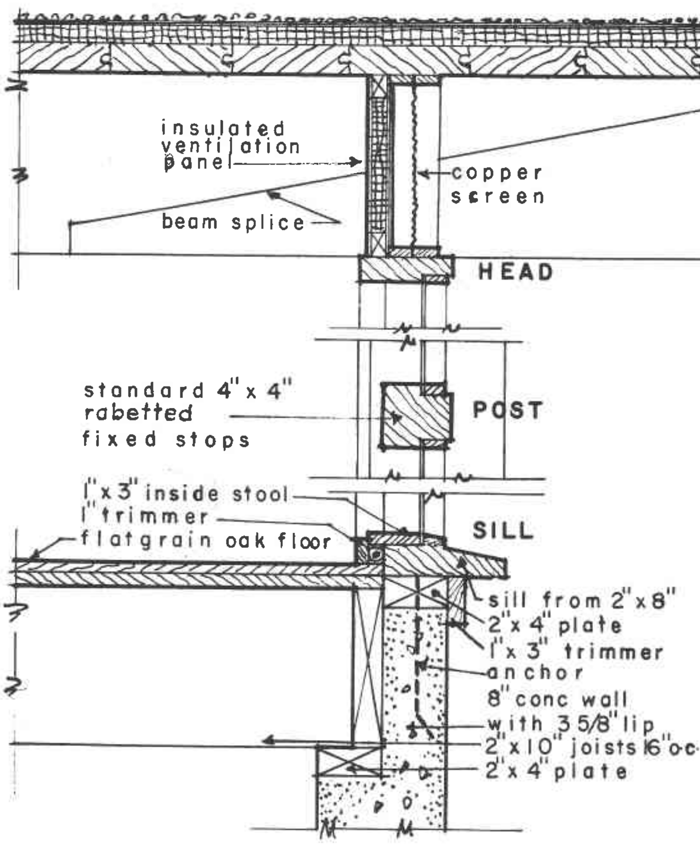
CONSTRUCTION DATA :

FOUNDATION : 4" CONC· SLAB ON GRAVEL WATERPROOFING OVER· - GROUND FLOOR: 13/16" FLAT GRAIN OAK FLOORING ON 2"x 6" 16" o·c· TREATED WITH "CUPRINOL" & WIRED TO CONC· - FIRST FLOOR: 1/4" HARD-BOARD ON 2"x 8" YELLOW CEDAR PLANKS T & G, "V" JOINT ON 4"x 10", 3'-6" o·c· ROOF: BUILT-UP TAR & GRAVEL ROOFING, 1" RIGID INSULATION ON 2" x 8" YELLOW CEDAR PLANKS ON 4"x10" 3'-6" o·c· — POSTS: 4" x 4" CEDAR WALLS: INSIDE HORIZONTAL CEDAR LAP JOINT, 2"x4", 16" o·c·, 2" BATT INSUL· SIDING SAME AS INSIDE

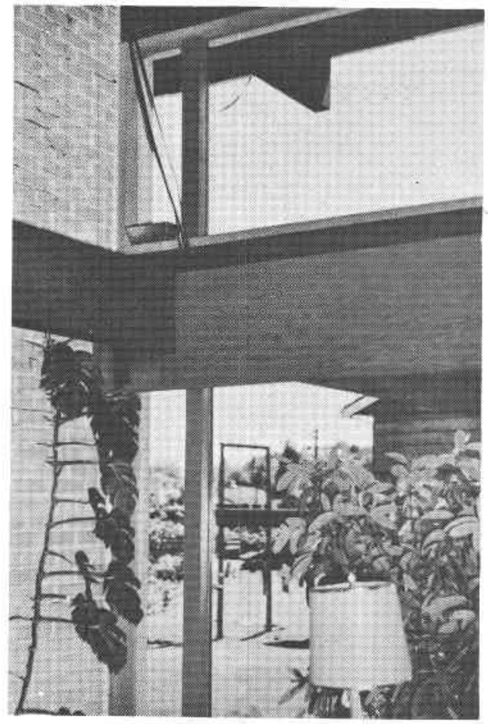
NORTH– WEST ELEVATION

ARCHITECT	THOMPSON, BERWICK & PRATT - 1553 ROBSON VAN·B·C·
OWNER	JOHN DEUTSCH
LOCATION	5512 COLLEGE HIGH RD· VANCOUVER B·C·

4 D



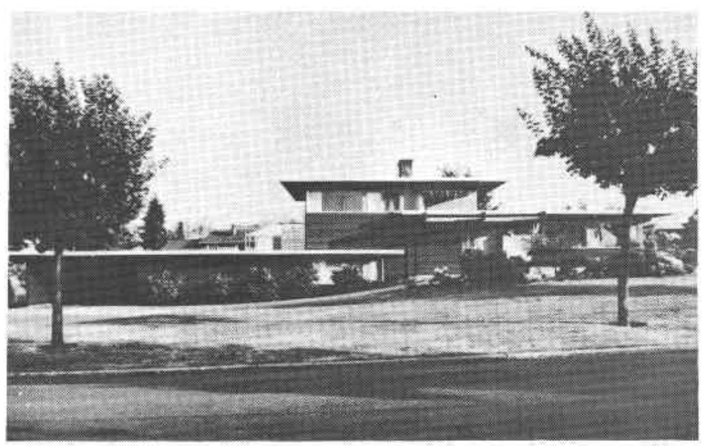
WALL AND WINDOW DETAILS
scale 1"=1'-0"



FIREPLACE AND CLEAR-STORY WINDOW IN LIVING ROOM

CONSTRUCTION DATA:

8" CONCRETE FOUNDATION WALL
FLOOR: PARTLY 4" CONC· SLAB ON GRAVEL, PARTLY 2"x10", 16" o.c.·OVER CRAWL SPACE - 2x10", 16" o.c. AT 2nd FL· IN THE TWO STOREY PART
ROOF: 2" T & G CEDAR PLANKS, 1" RIGID INSULATION, BUILT-UP TAR & GRAVEL ROOFING ON 4" x 12" AND 4" x 14", 8'-0" o.c·BEAMS
POSTS: 4" x 4"
WALLS: 1" FOREST SIDING, BLDG· PAPER, 1" SHIPLAP, 2"x 4", 16" o·c· STUDS - BATT INSULATION
GYPROC LATH AND PLASTER

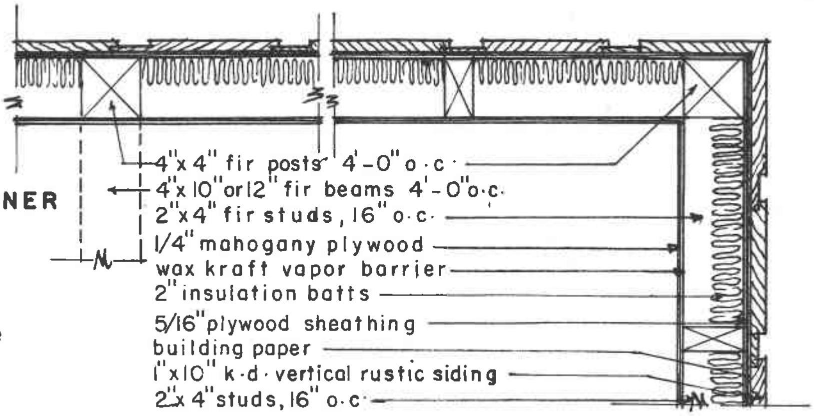


WEST ELEVATION

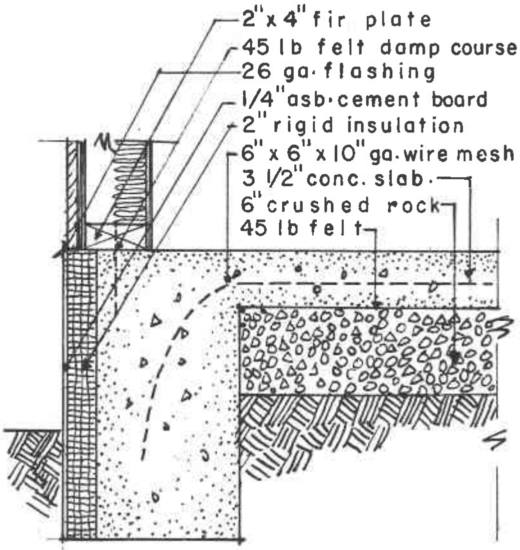
ARCHITECT BOB LEWIS, CONTRACTOR, 2755 SKI-LIFT PLACE, WEST VANCOUVER B.C.

OWNER OTTO BRAUN

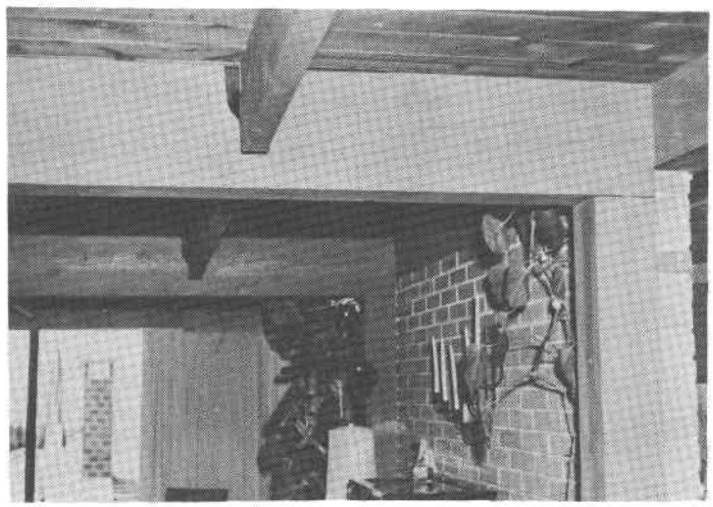
LOCATION 93 BONNYMUIR DRIVE GLENMORE WEST VANCOUVER B.C.



PARTIAL PLAN OF TYPICAL CORNER
scale 1" = 1'-0"



FOUNDATION DETAIL
scale 1" = 1'-0"



LIVING ROOM

CONSTRUCTION DATA:

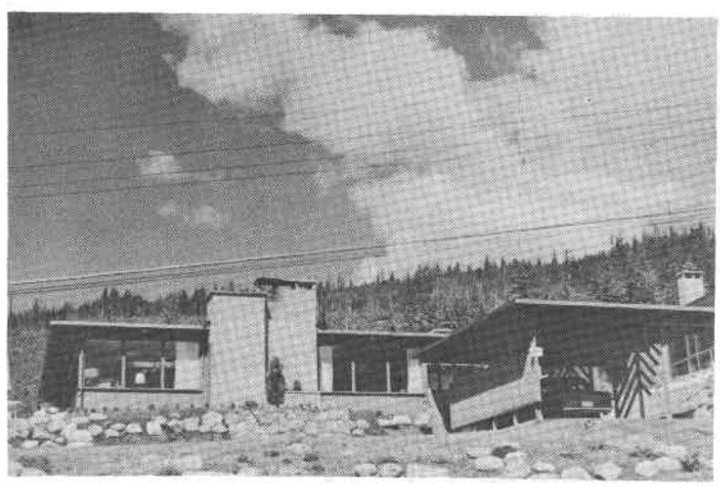
FOUNDATION: 3 1/2" CONCRETE SLAB WITH 9" CONC· FOUNDATION WALL·

FLOOR: CONCRETE SLAB.

ROOF: 2"x 8", T & G CEDAR PLANKS ON 4"x 10", 12", 4'-0" o·c· FIR BEAMS·

POSTS: 4"x 4" FIR 4'-0" o·c·

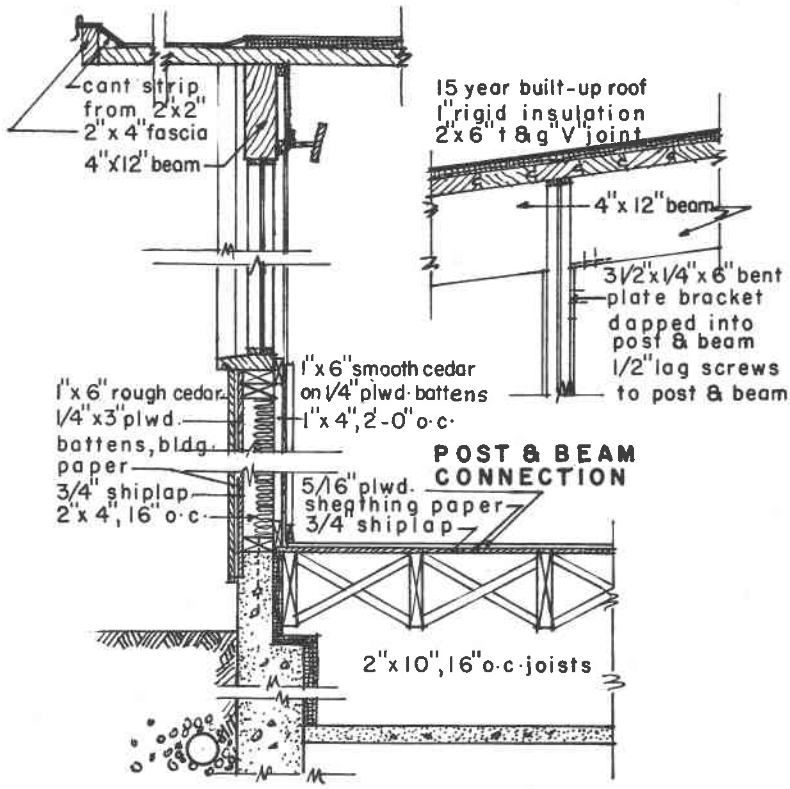
WALLS: 2"x 4", 16", o·c· INSULATION BETWEEN· 1"x 10" K·D·VERTICAL RUSTIC CEDAR ON 5/16" PLYWOOD SHEATHING, 1/4" PLYWOOD INSIDE.



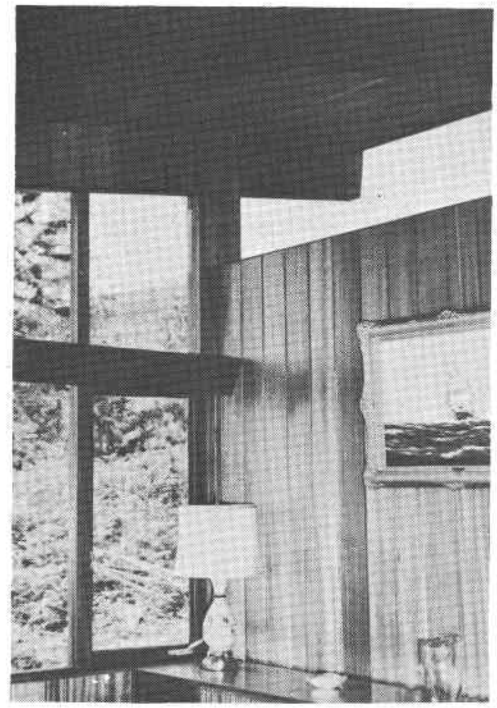
SOUTH ELEVATION

ARCHITECT TOBY & RUSSELL 2256 W 12TH VANCOUVER B·C·
OWNER N·M·FLEISHMAN
LOCATION 1119 HILLSIDE WEST VANCOUVER B·C·

6
F



TYPICAL WALL DETAILS
scale 1/2" = 1'-0"



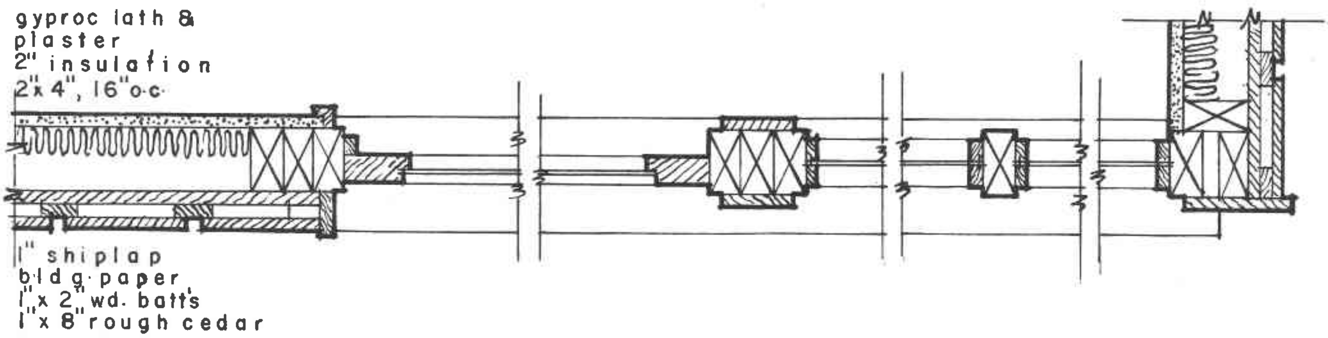
LIVING ROOM - NORTH WEST

CONSTRUCTION DATA:
FOUNDATION: 8" CONC·WALL-CRAWL SPACE — FLOOR: 2"x10", 16" o·c· JOISTS 3/4" SHIPLAP, 5/16" PLWD., FINISH VARIES
ROOF: BUILT-UP TAR & GRAVEL 1" RIGID INSULATION ON 2" x 6" T & G "V" JOINT ON 4" x 12", 6'-0" BEAMS
POSTS: 4" x 4"
WALLS: 1" x 6" ROUGH CEDAR ON 1/4" x 3" PLWD. BATTENS ON BLDG. PAPER, 3/4" SHIPLAP ON 2" x 4", 16" o.c. 2" BATTS— INSIDE 1" x 6" SMOOTH CEDAR ON 1/4" x 3" BATTENS 1" x 4", 2'-0" o.c. ON STUDS

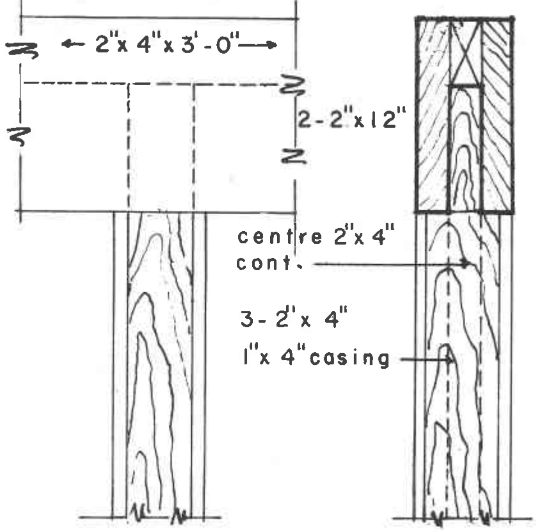
SOUTH ELEVATION

7
G

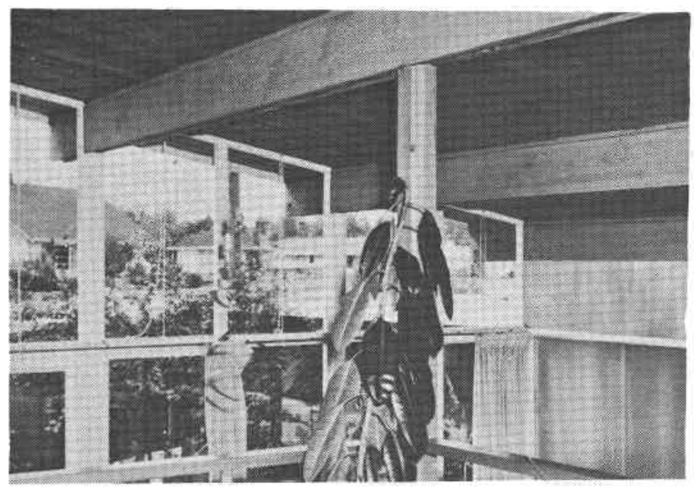
ARCHITECT	F · LASSERRE - DIRECTOR - SCHOOL OF ARCHITECTURE U·B·C·
OWNER	DR· SYDNEY M· FRIEDMAN
LOCATION	4916 CHANCELLOR BLVD· VANCOUVER 8 B·C·



TYPICAL DOOR AND WINDOW DETAIL



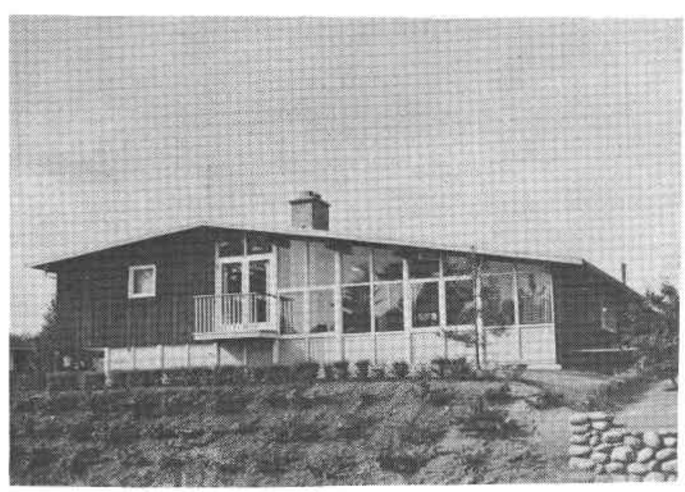
BEAM CONNECTION TO 3-2"x4" COL.
scale 1"=1'-0"



DINING ROOM - SOUTHWEST CORNER

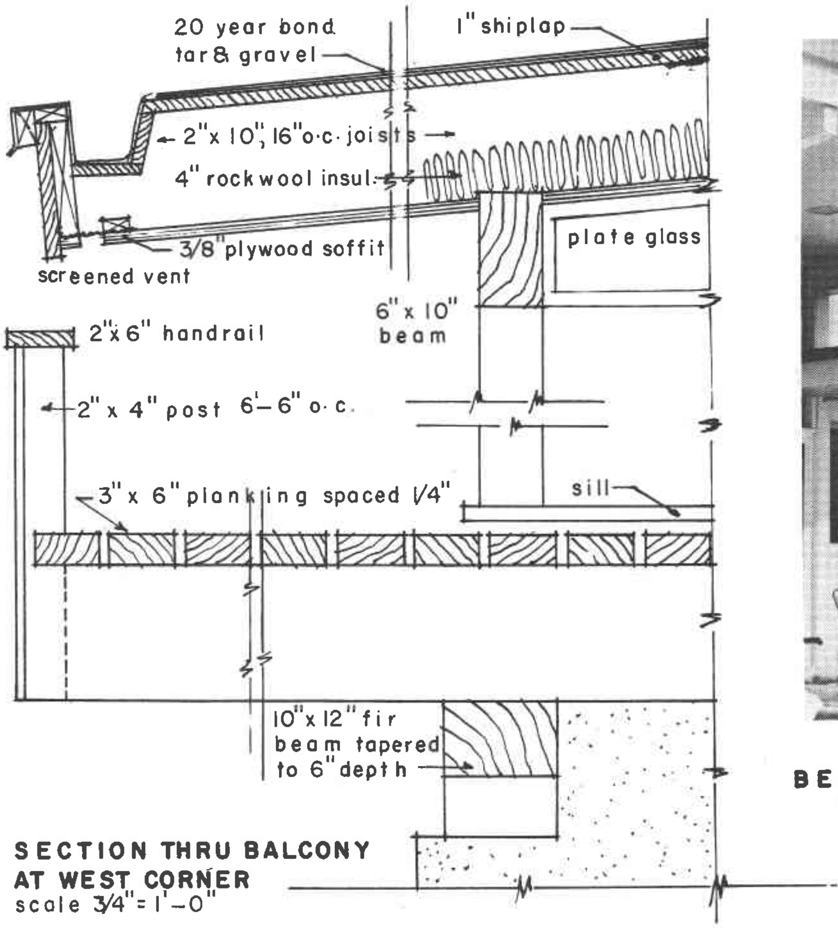
CONSTRUCTION DATA:

FOUNDATION: PARTLY 4" CONC· SLAB, PARTLY 8" CONC· WALL WITH CRAWL SPACE
FLOOR: 2" x 8", 16" o·c· AND 2" x 8", 12" o·c· JOISTS OVER CRAWL SPACE AND BASEMENT
ROOF: 2" T&G CEDAR PLANKS ON 2-2"x 12", 6'-0" o·c· - VAPOR BARRIER 3/4" RIGID INSULATION - BUILT-UP TAR AND GRAVEL ROOFING. POSTS: 3-2" x 4"
WALLS: 2" x 4", 16" o·c· ROUGH CEDAR SIDING ON STRIPS AND 3/4" PLWD· PANELS - GYPROC LATH & PLASTER BATT INSULATION.

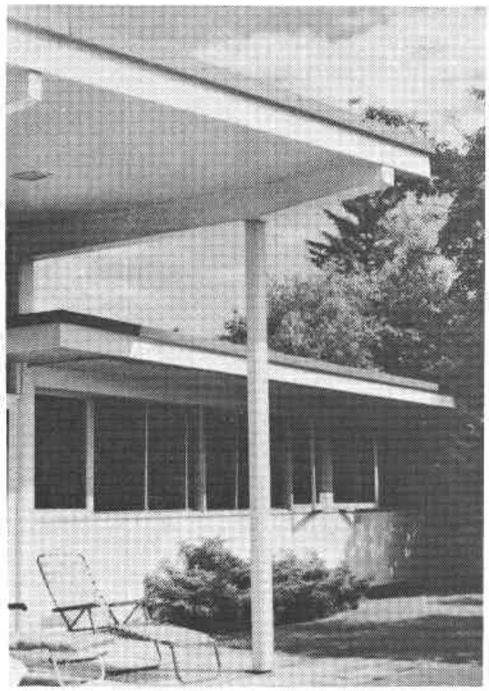


NORTH ELEVATION

ARCHITECT JOHN C·H· PORTER - 1509 W 7TH VANCOUVER B·C·
OWNER NATHAN T· NEMETZ Q·C·
LOCATION 5688 NEWTON WYND VANCOUVER 8 B·C·

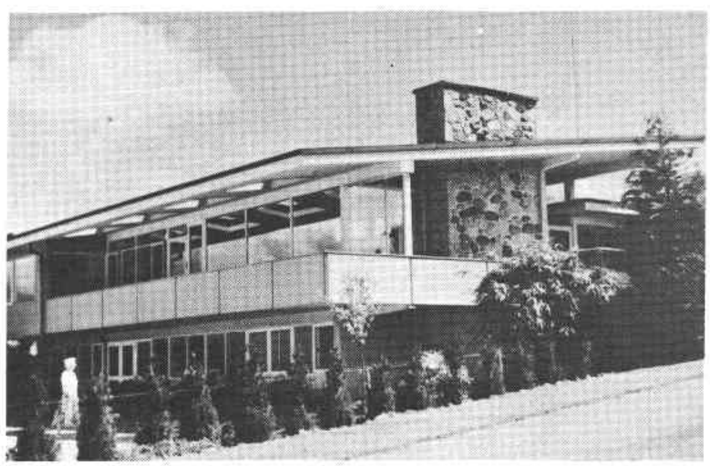


SECTION THRU BALCONY AT WEST CORNER
scale 3/4" = 1'-0"



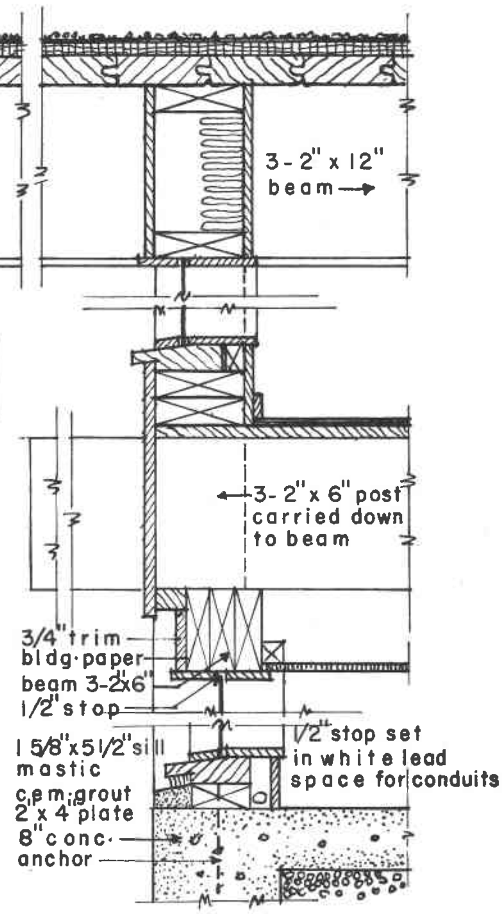
BEDROOM WING

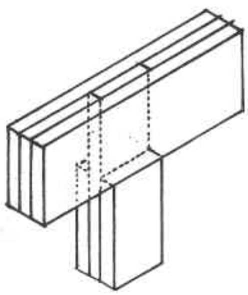
CONSTRUCTION DATA:
FOUNDATION: 10" REINFORCED CONCRETE WALL.
FLOOR: 4" CONC· SLAB IN BASEMENT, 3"x 6" PLANKS ON 2-2"x 12" BEAMS 6'-6" o·c· FIRST FLOOR.
ROOF: BUILT-UP TAR & GRAVEL ON SHIPLAP ON 2"x 10", 16" o·c· BATT INSULATION BETWEEN, ON 6"x 10" AND 8"x 12" BEAMS.
POSTS: 2"x 6", 4" x 4".
WALLS: PLYWOOD ON SHIPLAP ON 2"x 4", 16" o·c· INSUL BETWEEN GYPROC-LATH & PLASTER INSIDE.



NORTH-WEST ELEVATION

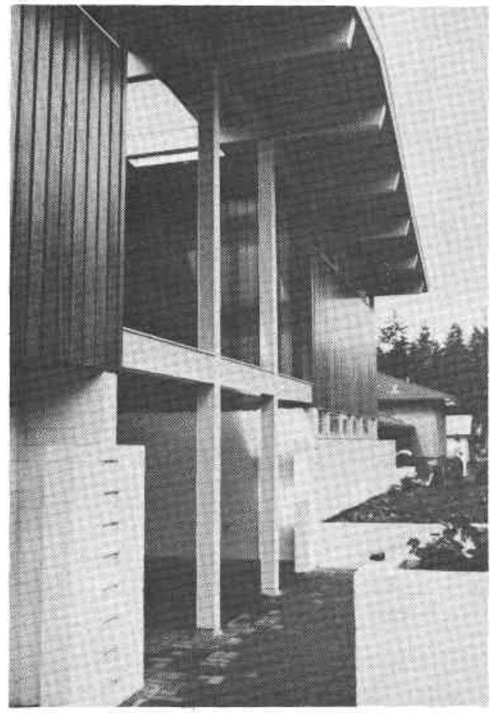
ARCHITECT DUNCAN S. McNAB 1847 W BROADWAY-VANCOUVER B.C.
OWNER DUNCAN S. McNAB
LOCATION 3290 WESTMOUNT RD. WEST VANCOUVER B.C.





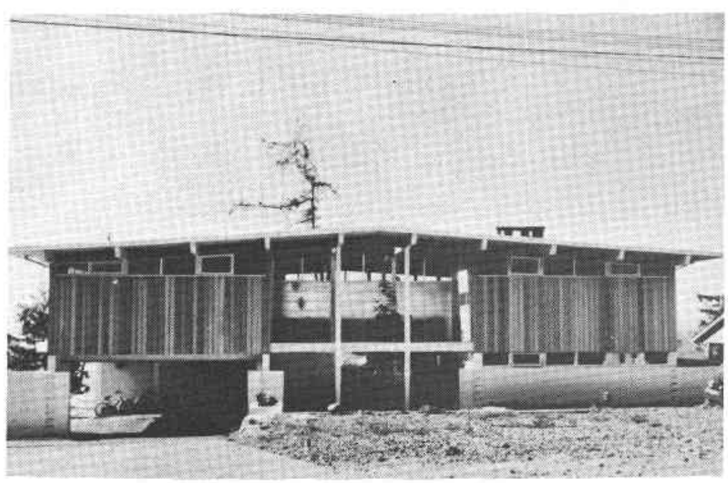
POST & BEAM CONNECTION

WALL SECTION
scale 1"=1'-0"



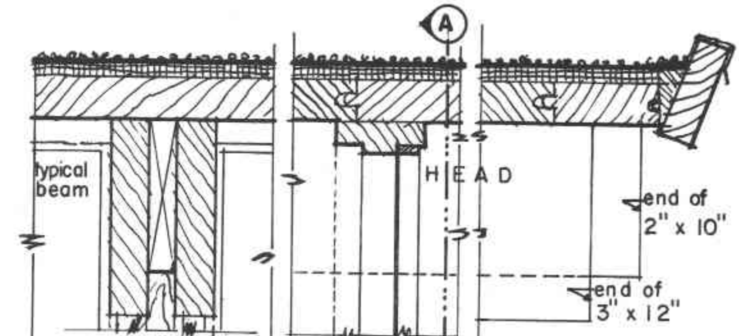
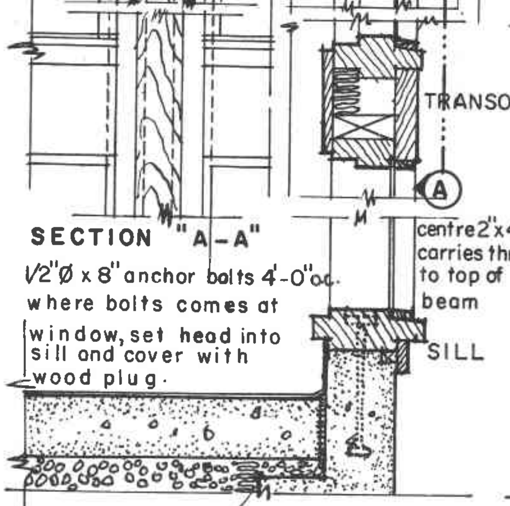
MAIN ENTRANCE

CONSTRUCTION DATA:
FOUNDATION: 8" CONC. OR BRICK
WALL—FLOOR: 4" CONC. SLAB IN BASEMENT-2"x10", 16" AT 1st FLOOR (EXCEPT AROUND COLS)
ROOF: BUILT-UP TAR & GRAVEL
1" RIGID INSULATION ON 3-2"x12" 6'-8" o.c. BEAMS
POSTS: 3—2" x 6"
WALLS: 3/4" MAHOGANY SIDING ON BLDG. PAPER ON SHIPLAP ON 2"x4", 16" o.c., 2" BATT INSULATION
MAHOGANY SIDING INSIDE

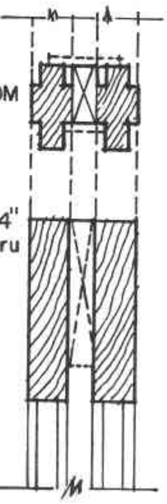


NORTH ELEVATION

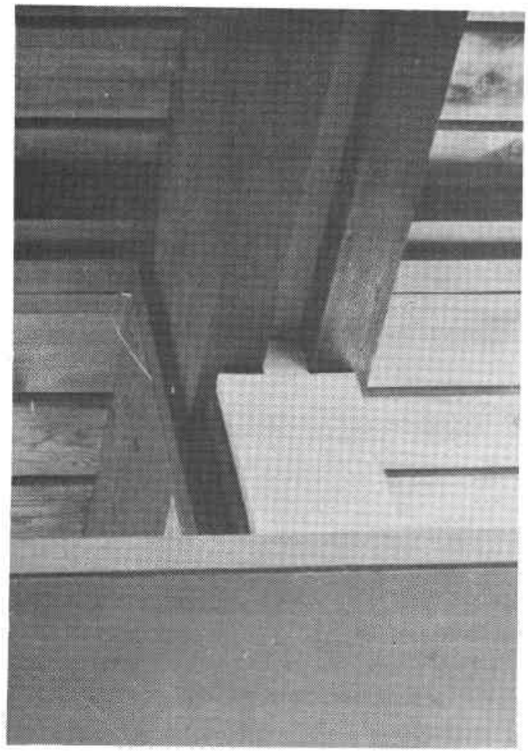
ARCHITECT McCARTER, NAIRNE & PARTNERS - 355 BURRARD VANCOUVER B.C.
OWNER RONALD S. NAIRNE
LOCATION 2517 EDGEMONT BLVD NORTH VANCOUVER B.C.

TYPICAL VERTICAL SECTIONS
scale 1"=1'-0"



POST & BEAM SECTION



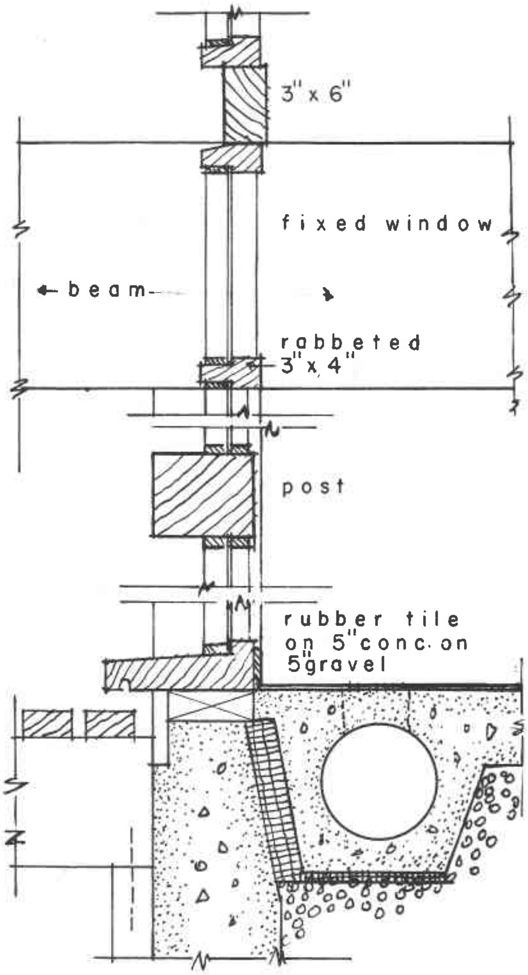
POST & BEAM CONNECTION INSIDE VIEW

CONSTRUCTION DATA:
FOUNDATION: 8" CONC. WALL
FLOOR: 4" CONC. SLAB ON GRAVEL
ROOF: BUILT-UP TAR & GRAVEL
1" RIGID INSULATION ON 3"x6" T & G
CEDAR PLANKS ON 2-3"x12" (2"x10"
BETWEEN BEAMS 8'-0" o.c.
POSTS: 2-3"x 6", RABETTED 2" x 4"
BETWEEN — WALLS: 3/8" "WELDTEX"
STRIATED PLYWOOD EXTERIOR GRADE
BLDG. PAPER, 5/16" PLYWOOD
SHEATHING, 2"x4", 16" o.c. STUDS
2" BATT INSUL., GYPROC LATH & PLASTER
OR 10" BRICK CAVITY WALL

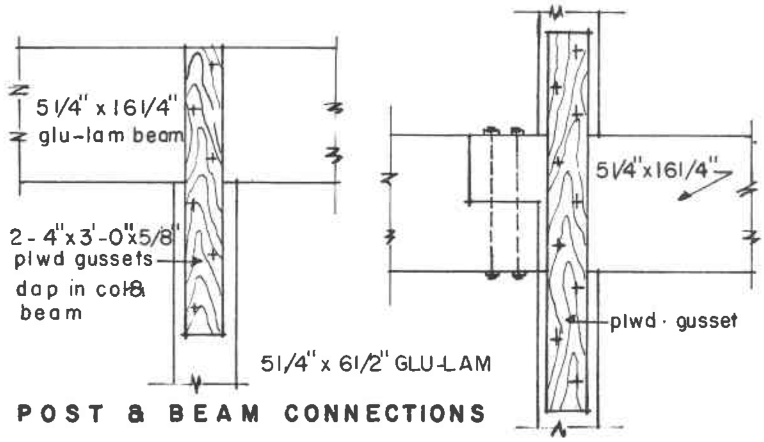
SOUTH ELEVATION

ARCHITECT THOMPSON, BERWICK & PRATT (JESSIMAN) 1553 ROBSON VAN· B·C·
OWNER JOHN S· KENNEDY
LOCATION 3351 CRAIGEND WEST VANCOUVER B·C·

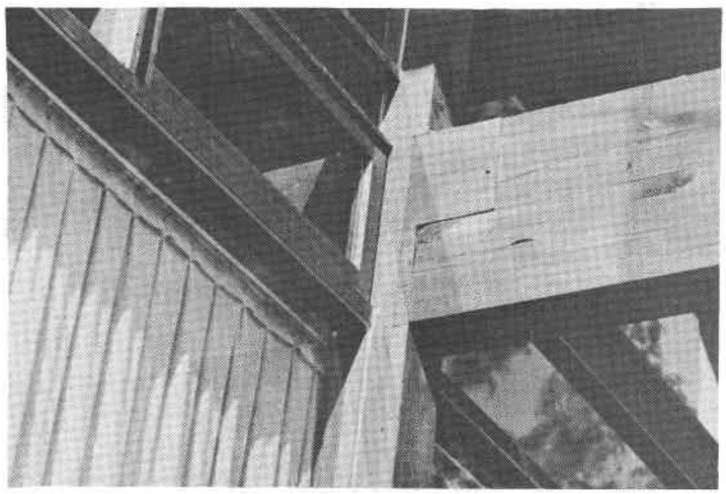
11 K



WALL SECTION
scale 1" = 1-0"



POST & BEAM CONNECTIONS



BEAM CONNECTION-SOUTH SIDE

CONSTRUCTION DATA:

FOUNDATION: 8" CONC· WALL, 5" CONC·SLAB
FLOOR: CONC· AT GROUND FL·, 2"x6", 16" o.c. JOISTS ON 5 1/4" x 16 1/4" GLU-LAM BEAMS AT FIRST FL· — ROOF: BUILT-UP T & G ON 1" RIGID INSULATION ON 2"x6" T & G FIR "V" JOINT PLANKS ON 5 1/4"x16 1/4" GLU-LAM BEAMS.
POSTS: 5 1/4" x 6 1/2" GLU-LAM
WALLS: 2"x6" T & G CEDAR "V" JOINT PLANKS, 2"x2" STRAPPING INSULATION BETWEEN, HARDBOARD FIN· INSIDE, OR PLWD ON 2"x 4", 16" o·c· STUDS

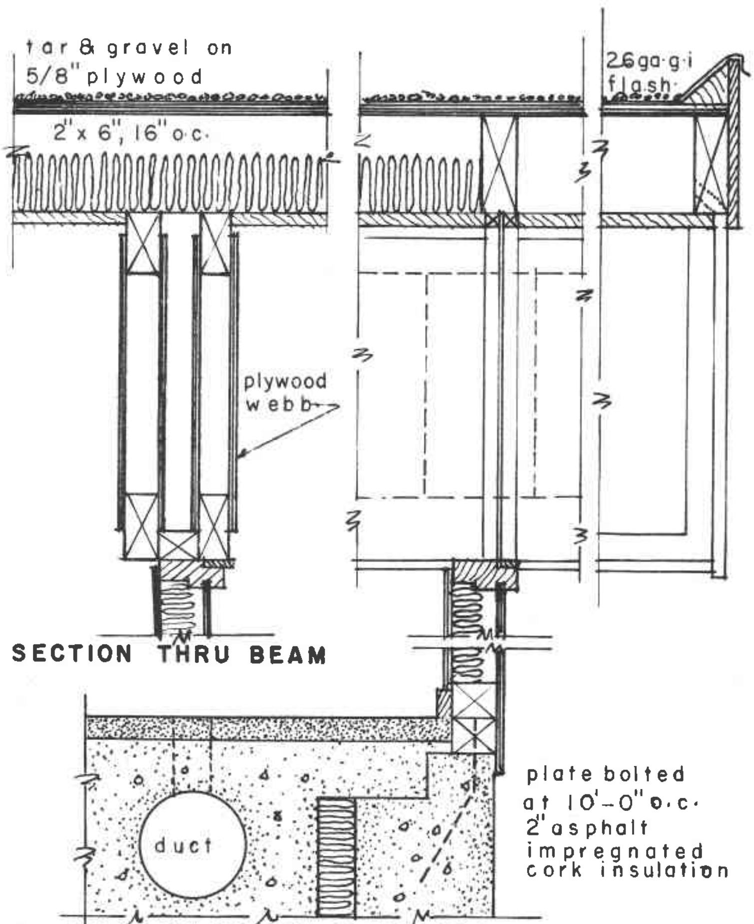
SOUTH ELEVATION

ARCHITECT R.J. THOM 1646 LYNN VALLEY RD. NORTH VANCOUVER B.C.

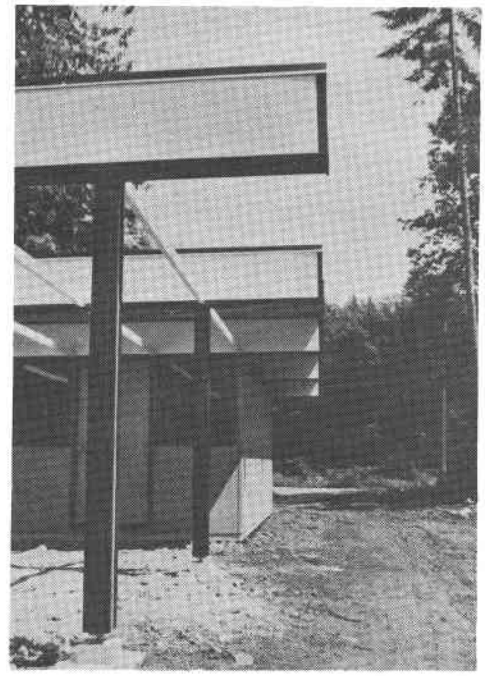
OWNER H. NORMAN

LOCATION 4217 CAPILANO ROAD NORTH VANCOUVER B.C.

12 L



EAVES & WINDOW DETAILS



BEAM ENDS AT SOUTH ELEV.

CONSTRUCTION DATA:

FOUNDATION: 8" CONC. WALL 2" CORK PERIMETER INSULATION—FLOOR: 4" CONC. SLAB—PERIMETER HEATING DUCT INTEGRALLY CAST — ROOF: 2"x 6", 16" o.c. JOISTS, 5/8" SHEATHING 3" BATT INSULATION BETWEEN JOISTS 1" CEDAR "V" JOINT CEILING ON BUILT-UP PLYWOOD BEAMS 10'-0" o.c. BUILT-UP TAR & GRAVEL ROOFING POSTS: 3"x3"—WALLS: PREFABRICATED PLYWOOD PANELS WITH BUILT-IN INSULATION

SOUTH—WEST CORNER

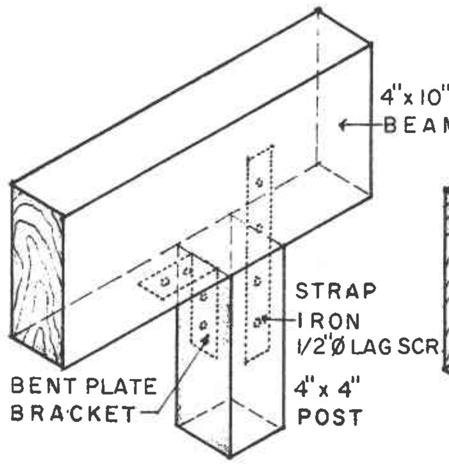


FIG. 1

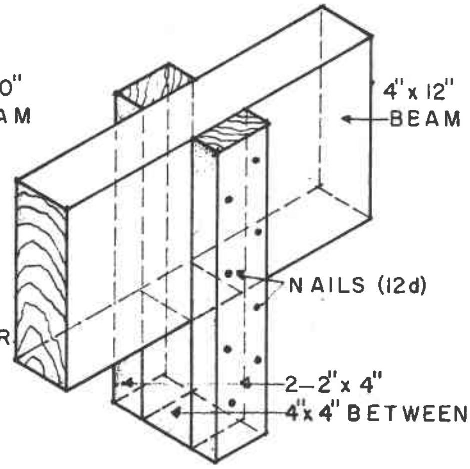


FIG. 2

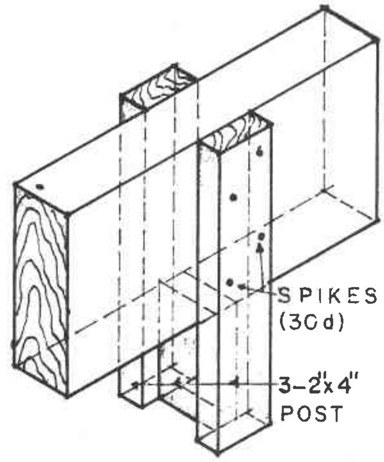


FIG. 3

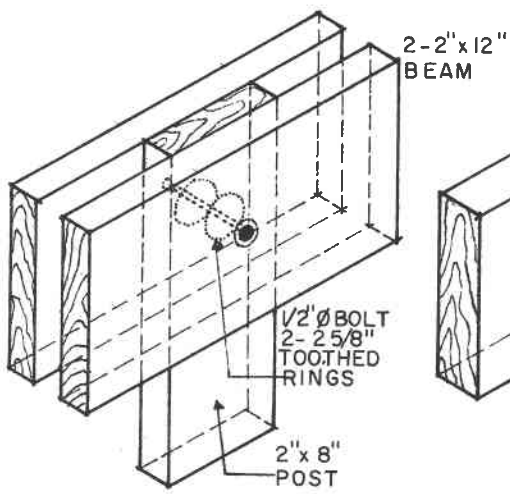


FIG. 4

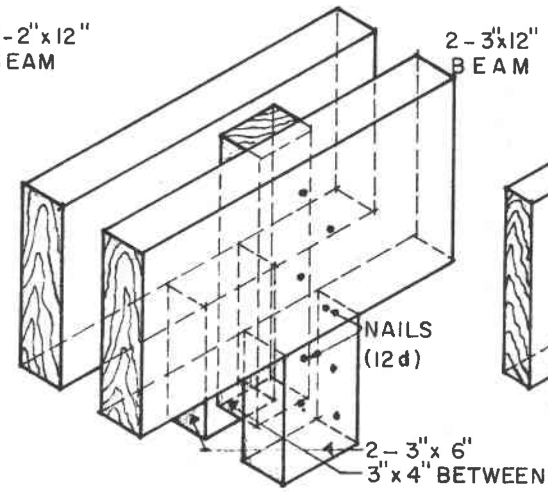


FIG. 5

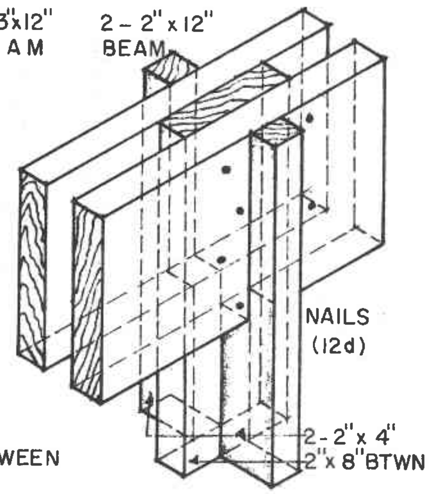


FIG. 6

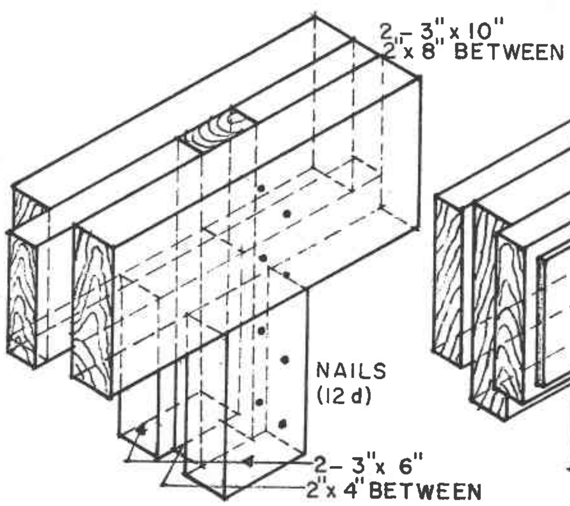


FIG. 7

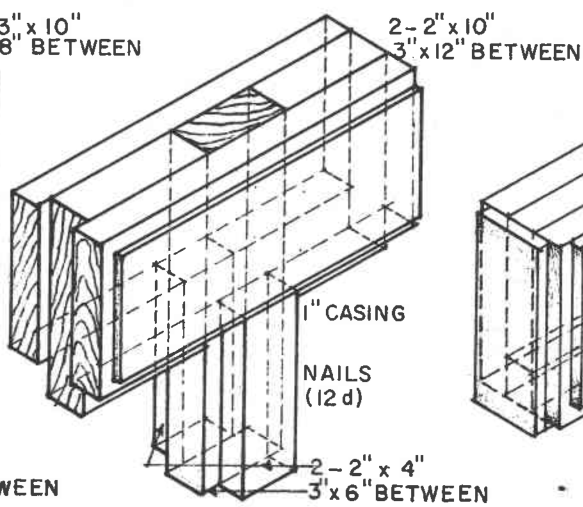


FIG. 8

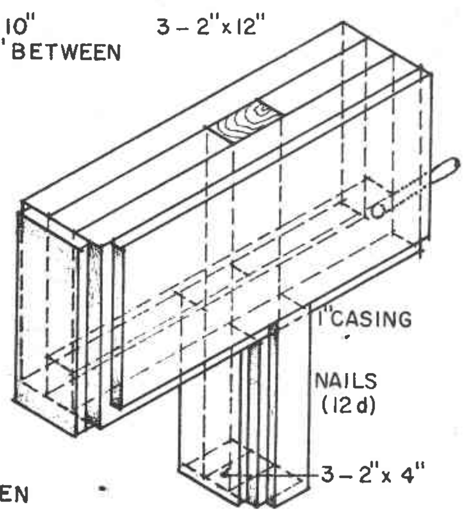


FIG. 9

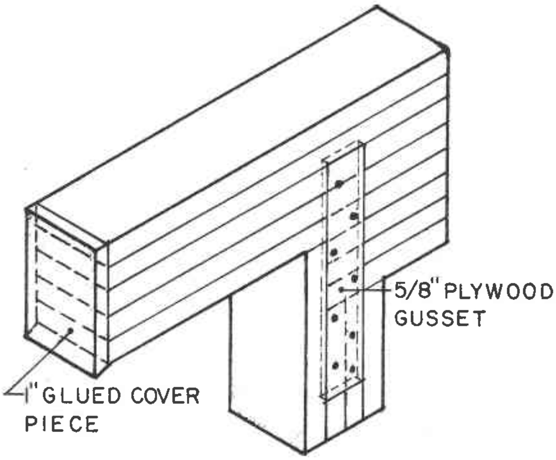


FIG. 10

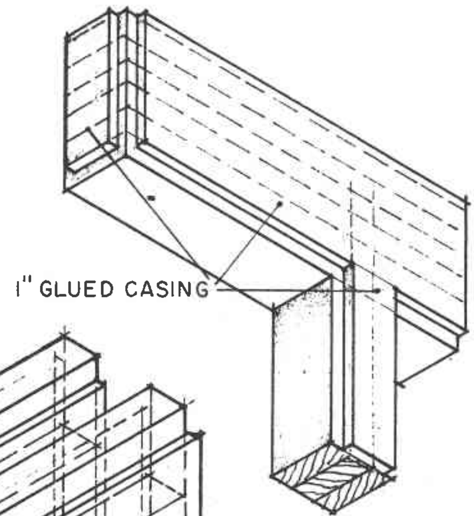


FIG. 11

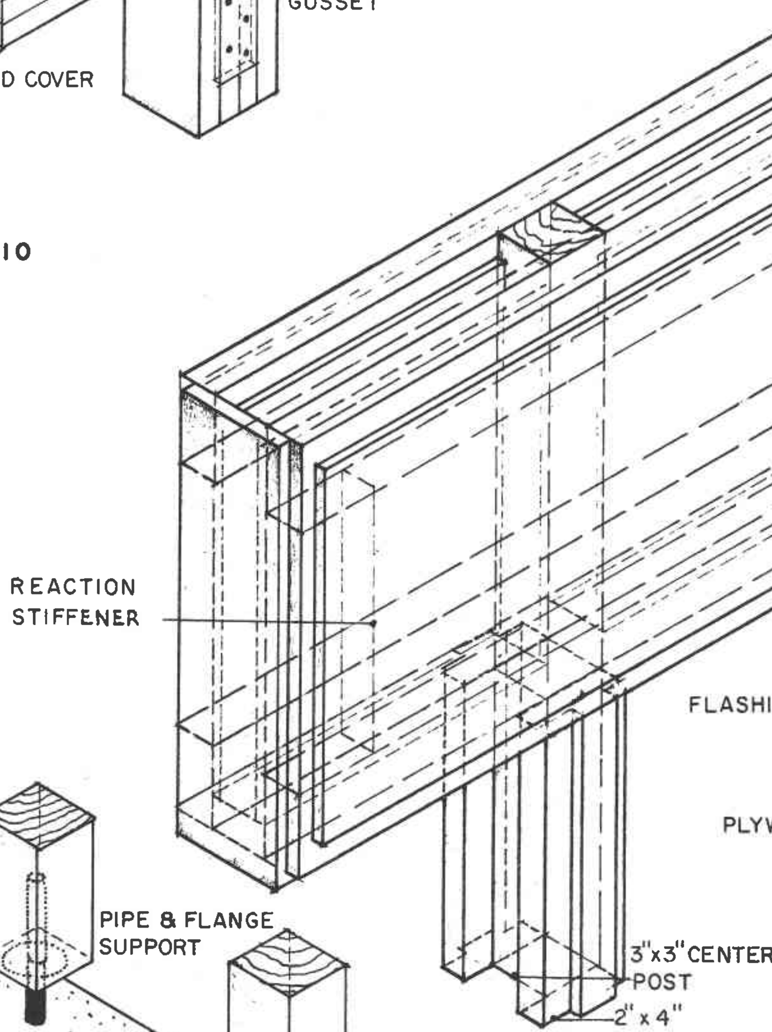


FIG. 13 PLYWEB BEAM

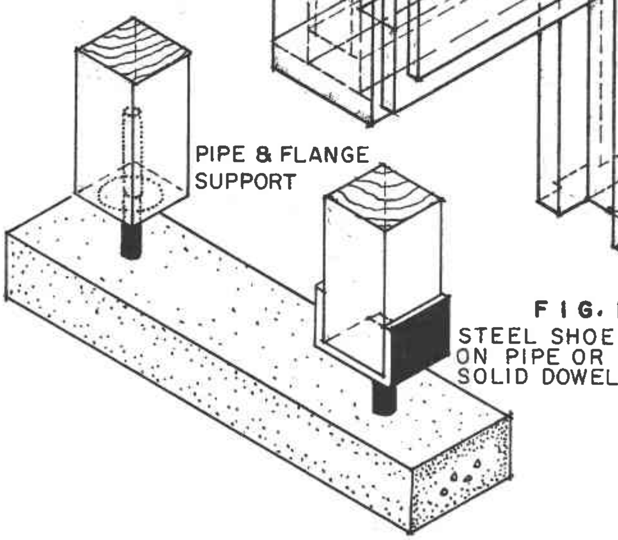


FIG. 12

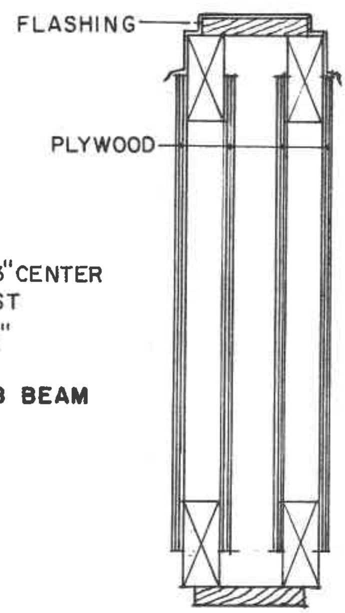


FIG. 13 CROSSECTION
EXTERIOR BEAM