PRESERVED WOOD FOUNDATIONS

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Over the past many years I have given a number of talks on Preserved Wood Foundations and have usually introduced the subject by describing them as a new and innovative building system. I don't believe the terms "new" or "innovative" are any longer appropriate, Preserved Wood Foundations have long passed the experimental stage and have become throughout North America a recognized, viable alternative not only for house foundations but for other light frame structures. After all, it is now twenty years since this concept was developed by the Technical Research Committee of HUDAC and the first units were built in the Mark III and Mark IV Research houses in Ottawa.

Following construction of these first units there was a period of four or five years during which the Plywood Manufacturers' Association of B.C. (now a part of COFI) promoted the concept in an effort to get a number of units built in various geographic areas across Canada. Although we offered a financial incentive to builders to encourage the construction of units in selected areas we met with minimal success. In the meantime the concept was taken up in the United States by the National Forest Products Association and the American Plywood Association. As is the case with many Canadian ideas it was only after the system was established elsewhere that Canadians recognized its merits. However, since the early 1970's we have seen a significant growth in the construction of Preserved Wood Foundations in Canada.

As I said earlier the system is now established. Accurate statistics are hard to come by but there is general agreement that to date some 25,000 — 30,000 Preserved Wood Foundations have been built in Canada, and over 100,000 in the United States.

I forecast in a talk to members of the wood products industry about five years ago that it was possible for PWF's to constitute 10% of the single family and low rise multi-family housing starts in Canada by 1985. With current construction of PWF's estimated at 7,000 — 9,000 units a year in Canada in spite of a decrease in total housing starts; the 10% figure looks very realistic and will likely be reached before 1985.

The basic concept developed in 1961 has remained virtually unchanged. The Preserved Wood Foundation is essentially a plywood sheathed stud wall fabricated of pressure treated material with special consideration for drainage, and for fastening systems to handle the lateral soil pressures.

It was recognized at an early stage in development, that proper design and attention to the details of construction were essential to ensure that PWF's were constructed in a manner acceptable to building code authorities.

The Canadian Wood Council assumed the responsibility for providing design and construction information and in 1973 published the "Construction Guide for Preserved Wood Foundations". This publication has been accepted as the "bible" for what is acceptable. It has gone through three or four revisions and now has two supplements providing additional information. While the Construction Guide has been widely accepted by code authorities and is in fact referenced in some Provincial building codes, it is not written as a building regulation. The need for a standard written in mandatory terms and which could be referenced in building codes has become more apparent in recent years.

As a result in 1980, at the request of the Canadian Wood Council, the Canadian Standards Association agreed to publish a CSA Standard on the Design, Fabrication and Installation of Preserved Wood Foundations. The CSA Standards Steering Committee on Structures assigned this undertaking to the CSA Technical Committee on Engineering Design in Wood — the Committee responsible for CSA Standard 086. It formed a subcommittee, which was chaired by Bill McCance and they began drafting the new PWF Standard in August 1980.

The Subcommittee draws its membership from a broad range of people with expertise in all aspects of PWF design and construction. Members include professional structural engineers, builders, designers, wood treaters, building code authorities, enforcement officials, mortgage lenders and insurers, wood products manufacturers, as well as representatives of the steel and concrete industries.

The Subcommittee has met throughout the past year, most recently on September 24-25th, at which time they reviewed Draft No. 5 of the Standard.

It was decided to recommend that it be published in two parts. Part one will be known as CSA Standard S406.1-M, "Design of Preserved Wood Foundations" and part two will be known as CSA S406.2-M, "Construction of Preserved Wood Foundations". The latter will contain both the fabrication and installation requirements.

Without this sort of guideline, some local building officials have decided to draft requirements of their own. These have not always been formed with a knowledge of the PWF system and have tended to introduce excessive restrictions which add to its cost and unnecessarily impede its advancement.

It is therefore in the interests of all suppliers of products used in the PWF system to have regulations in force which are well conceived, take advantage of the latest technology, are not overly conservative and hence represent the latest "State of the Art". This is what CSA Standard S406 is intended to do and I believe it will accomplish this goal.

As far as scheduling is concerned, the Subcommittee will submit the CSA Standard S406 to the technical committee on Engineering Design in Wood prior to their meeting in Winnipeg on November 23-24, 1981. If passed by that Committee, the standard then advances to the CSA Standards Steering Committee on Structures some time early in 1982. Hopefully it will also survive that group and go on to be published by CSA — perhaps by mid-1982.

The CSA Standard is needed, but it will not be the sort of publication which is particularly useful for someone who wants to know what Preserved Wood Foundations are all about, or for the person who wants to build one. To meet this need the Canadian Wood Council is preparing a Datafile as part of their wood construction series of Datafiles.

The Datafile on PWF will become the replacement publication for the Construction Guide. When issued, the latter publication will be discontinued. The Datafile will be much like the present Construction Guide but will be in accordance with all of the regulations of the CSA Standard. It will update the Guide and contain all its present information, in a revised and more organized format. It will be well illustrated with drawings and photographs.

The Datafile, like the present Construction Guide, will contain numerous tables for easy selection of footing plates and stud sizes, without the necessity to design them from criteria in the first part of the Standard. Where unusual design situations do occur, or where buildings other than the ones for which the tables apply are encountered, an engineer or designer may refer to the design criteria of CSA Standard S406.1-M, "Design of Preserved Wood Foundations" in order to work out his own design. There will be no reason to restrict preserved wood foundations to a few recognized common shapes and sizes, since all varieties can be worked out from the data in the part one portion of the new Standard.

In addition to the CWC datafile which will be published soon after CSA S406, the Canadian Wood Council has just issued a publication providing "Detailed Drawings for Preserved Wood Foundations". These drawings, showing alternate systems and construction details, supplement the Construction Guide and while they are not standards, are a guide to acceptable practice. From my own experience I believe that they will answer many of the questions frequently asked about PWF systems.

The new CSA Standards and the CWC Datafile will give better coverage to several items which should facilitate both the construction and promotion of Preserved Wood Foundations as an economical and trouble free building system. In the CWC Construction Guide, only one method of supporting brick veneer is shown. This assumes that it will be carried on the top of the foundation

wall. The new Standard and the Datafile will offer an alternative method of carrying masonry veneer. It is a preserved wood knee-wall, placed outside the regular foundation and attached to it. It will have a footing at the same level as the main footing. This probably will have to be a composite type consisting of two preserved wood members placed side by side and reinforced by plywood attached to the under side, with the face grain perpendicular to the wall. The advantage of the knee-wall is that its height may be varied around the perimeter of the building to suit the height of the backfill. On sloping sites particularly, this is an asset since the minimum height above grade of 200 mm permits the masonry veneer to commence close to grade, thus presenting a more attractive appearance. The knee-wall can be stepped up (or down) as it proceeds around the building.

Building codes generally have not permitted the carrying of masonry veneer on preserved or other types of wood. The HUDAC Technical Research Committee commissioned a study by Scanada Consultants Limited into the field performance of masonry veneer cladding on Preserved Wood Foundations. Houses, in both Canada and the United States were examined. Scanada concluded that all examples observed had performed exceptionally well throughout their lifetimes. No cracking, sagging, settling, or other forms of unsatisfactory performance could be observed. The report seems to support the belief that preserved wood is in fact a suitable support medium for masonry veneer. Accordingly it is being included in both the new Standard and the DATAFILE which hopefully will bring it into greater acceptability in the building codes and in practice. This is particularly significant for the greater use and acceptability of preserved wood foundations in Ontario and Eastern Canada where brick veneer is a preferred form of exterior cladding.

Another departure being made in the New Standard is the emphasis on using preserved wood footing plates, rather than concrete footings. This recommendation has come about through another study sponsored by HUDAC. The Technical Research Committee commissioned Scanada Consultants Limited to study the field performance of gravel pad drainage installations under basements. Scanada's report concluded, "In all areas the gravel pad is markedly superior in maintaining a dry basement than is the perimeter tile approach". This conclusion is based on the ability of water from the surrounding soil to find its way down the outside of the foundation wall and into the granular drainage layer beneath the footing and foundation wall. From there it may pass freely through the gravel and into a drainage sump. This works well with a wood footing plate but a concrete footing acts as a dam to prevent the passage of water under the wall. To overcome this difficulty the concrete footing must either be raised up and placed on top of the granular drainage layer, in which case additional gravel is needed to establish the level for the basement floor, or water passages must be formed laterally through the footing to permit the water to pass from the outside to the inside.

The CSA Standard will therefore call for a well-formed granular drainage layer and prohibit the use of perimeter drainage tile since Scanada concluded that such tile did more harm than good.

Most of the structural problems encountered in the field have been due to builders and designers not following the established forms of good practice. Preserved Wood Foundations can be as satisfactory a form of wood-frame construction as above-ground structures, provided that the effects of soil pressure are recognized and provided for. From the beginning, the Preserved Wood Foundation Construction Guide has included provisions for supporting the exterior walls against the pressure of backfill. Unfortunately these have not always been observed. In particular, walls parallel to the floor joists must be supported by adding extra blocking and extra joists next to the wall. The subfloor requires extra nailing to transmit the lateral loads into the floor diaphragm. If this is not done properly, the result can be a badly bowed-in wall.

It has been found that the end joist space is a favorite place for the location of hot air heating pipes. The builder either doesn't install the required blocking here, or it is removed during installation of the hot air heating pipes. The new Standard explicity prohibits this practice and requires that all such pipes be installed beneath the basement ceiling.

Another major change has been to delete all reference to wood sleeper floors. The Subcommittee did so in the belief that this has been an infrequent form of PWF construction in any event. It presents a potentially unsatisfactory system in as much as it is difficult and time consuming to install

and properly level the wood sleepers on the granular drainage layer. Since they are not always placed on fully compacted gravel, they tend to settle at a later stage and hence offer unequal support for all portions of the floor. Furthermore, they offer an opportunity for moisture to accumulate beneath the floor and no opportunity for the air spaces beneath the floor to breathe.

It was considered by the Subcommittee that the suspended wood floor (although unfortunately for the treating industry it may be untreated) is a more acceptable alternative. The other type of floor allowed in preserved wood foundations is the concrete slab floor, the production of which does not involve the treating industry.

And finally to conclude our discussion on CSA S406, the new standard will address the problem which has occasionally been observed of corrosion of nails, fasteners, electric junction boxes and wiring in exterior walls. These corrosion problems will be overcome by discouraging the placing of electric and other services in PWF walls and by calling up new requirements for corrosion resistant nails and other fasteners.

The treating industry is doing a splendid job of educating the public on the advantages of treated lumber and plywood for use in outdoor applications. The slogans of "Outdoor Wood" and "All Weather Wood" have become well known. Unfortunately, the average person and even people in the building supply business do not fully appreciate the fact that materials treated for ordinary outdoor use are not satisfactory for use in preserved wood foundations. I believe there should be more emphasis on the fact that only materials treated to the level set forth in CSA Standard 080-15 are acceptable for PWF construction. This will be covered in CSA Standard S406.2-M as a mandatory condition. Once the new PWF standard is passed and adopted, it will no longer be satisfactory simply to have a certificate covering a shipment of lumber or plywood. Instead individual pieces will require certifying stamps from an accredited certifying agency.

Those responsible for field inspection insist that it is necessary to introduce this action in order to insure that only properly treated materials find their way into PWF foundations. I think we must all agree that the success of the system depends on its permanence. We would all suffer ultimately if foundations developed serious deterioration through improper initial treatment.

A certification program for pressure treatment of lumber and plywood for PWF's is now operating under the Canadian Standards Association Certification Division. Some nine treating plants have been certified to date as meeting the requirements of CSA 0322 "Procedure for Certification of Pressure-Treated Materials for use in Preserved Wood Foundations" and are licensed to use the CSA stamp on PWF material. I strongly recommend that all parties involved with the supply of materials and the promotion of PWF's deal only with material certified as meeting the requirements of CSA 080.15.

Until two years ago, the only plywood accepted for use in PWF's in Canada was Douglas-fir plywood. As a result of a contract research program carried out at the Western Forest Products Laboratory (now Forintek) on the treatability of plywood manufactured from various softwood species, and a strength testing program at COFI's research lab. on the strength of softwood plywoods other than Douglas-fir it was determined that HEM-FIR plywood would be a suitable alternative to Douglas-fir. The acceptance of HEM-FIR plywood is covered in Supplement No. 1 to the CWC Construction Guide. The acceptance of HEM-FIR plywood has broadened the supply base and reduced the problems previously encountered in treating Douglas-fir plywood since the latter is allowed to contain inner ply species that may be difficult to treat to the required retentions. Both Douglas-fir plywood and HEM-FIR plywood (with certain restrictions on inner ply species) are now accepted for PWF's and are covered by the same table for span/thickness requirements in the Construction Guide.

I have covered at some length the current status regarding changes in codes and standards and availability of technical literature relating to the preserved wood foundation system. I would like to conclude by dealing briefly with the promotion, or perhaps a better term, the further "market development" of PWF's.

I think it is fair to say that considering the number of units built to date and the dollar value of the

treated materials the total amount spent on advertising and promotion has been minimal. We have collectively introduced a new building system and developed a new market for wood products in spite of the low level of advertising and publicity. I acknowledge that individual companies, CITC and COFI have all done some advertising, publicity, or have participated in a few home shows etc., but the total promotional outlay is still not impressive. Part of the problem has been that there is no one organization that brings together the plywood and lumber manufacturers; the treaters; the wholesale and retail building supply dealers; and the builders; all of whom stand to benefit from an expanded market. The activities of the Canadian Wood Council, by its terms of reference, are restricted to the areas dealing wih codes, standards and technical subject matter.

The need for a co-ordinated promotional program was recognized last year by a number of interested parties, and I am pleased to report that a modest advertising-publicity-direct mail program is currently getting under way sponsored by CITC, COFI plywood and seven of the regional lumber manufacturers' associations. The program is being supported financially by the participants and managed by the COFI Advertising and Publicity Department; all under the direction of a loosely knit committee whose members represent the sponsoring organizations. So if you see advertisements or direct mail pieces carrying the logo "Preserved Wood Foundations Coordinating Committee", you will know who the logo refers to. The program is not big as advertising programs go, but it is a step in the right direction.

And that, from my point of view, is where we're at with Preserved Wood Foundations in Canada.

I firmly believe that the PWF system will continue to gain acceptance and popularity. Although it has not penetrated Eastern Canada to the same extent as it has in the west this should change with the new standards and greater code acceptance.

I have been associated with PWF development for the past twenty years. The first ten years saw more problems than progress, not problems wih the systems, so much as problems with code acceptance, builder acceptance and home buyer acceptance. The last ten years have been much more rewarding. Preserved Wood Foundations are a recognized viable building system with many advantages. I look forward with a good deal of enthusiasm to the next ten years. Preserved Wood Foundations have come of age and the future looks very promising indeed.