INVESTIGATION OF SUBSTITUTES FOR TRADITIONAL WOOD HOUSING PRODUCTS

May, 1993

Prepared for

CANADA MORTGAGE AND HOUSING CORPORATION

Prepared by

CLAYTON RESEARCH ASSOCIATES LTD.

NOTE: **DISPONIBLE AUSSI EN FRANÇAIS SOUS LE TITRE:**

INVESTIGATION DES SUBSTITUTS DES PRODUITS DU BOIS UTILISÉS COURAMMENT EN CONSTRUCTION DOMICILIAIRE

Canada Mortgage and Housing Corporation (CMHC), the Federal Government's housing agency, is responsible for administering the National Housing Act.

This legislation is designed to aid in the improvement of housing and living conditions in Canada. As a result, CMHC has interests in all aspects of housing and urban growth and development.

Under Part IX of this Act, the Government of Canada provides funds to CMHC to conduct research into the social, economic and technical aspects of housing and related fields, and to undertake the publishing and distribution of the results of this research. CMHC therefore has a statutory responsibility to make widely available, information which may be useful in the improvement of housing and living conditions.

This publication is one of the many items of information published by CMHC with the assistance of federal funds. The views expressed are those of the author(s) and do not necessarily represent the official views of Canada Mortgage and Housing Corporation.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

In late 1992 and early 1993, prices of various wood products increased significantly and rapidly in Canada and United States. This has raised interest in possible substitutes for high priced wood products. In response, CMHC commissioned a study to identify potential substitutes for those traditional wood products used in housing whose prices rose dramatically and to compare the costs of identified substitutes with those of traditional products. The study also reviewed the price of wood over time and wood price forecasts. This report documents the results of the study.

The study reached the following conclusions:

1. Wood prices increased dramatically from September 1992 to March 1993. Since then they have fallen rapidly. The rapid increase in and volatility of wood prices have caused difficulty for builders, suppliers and consumers. Many builders and suppliers have been forced to deliver product at prices below its cost to them. Where the cost increases have been passed onto consumers, the affordability of their homes has decreased.

2. A number of builders have adopted or are exploring substitutes for traditional wood products because of the high price of those wood products. Ten possible substitutes were identified in this study. Nine are available now or may be available in the near future in some markets. The substitutes are summarized in the table below. These substitutes may only be perceived as appropriate in some markets and the estimated potential savings are a function of the timing of this study,(i.e., May 1993) and the market locations to which the prices apply.

Review of Potential Substitutes for Traditional Wood Housing Products

Traditional Wood Product	Substitute	Estimated Potential Saving	Comment
- Dimensional Lumber for Floor Joists	Wood-I Beams	Up to $.20 per sq.ft. of floor	Well known product; easy to incorporate
- Plywood or other common underlayment	Fibre-reinforced gypsum underlayment	Cost competitive with some underlayments	Easy to incorporate

- 5/16" or 3/8" OSB or plywood sheathing	Buffalo board with wall bracing	About $.30 per lin. ft. of wall	Easy to incorporate
- 5/16" or 3/8" OSB or plywood	Exterior gypsum board	Up to $1.40 per lin. ft. of wall	Easy to incorporate
- 5/16" or 3/8" OSB or plywood on 2"x6" studs	Insulated sheathing with strapping on 2"x4" studs	No savings	Estimate does not include performance factors
- 3/8" OSB sheathing on 2"x6" studs; batt insulation	Panelized insulated wall system	No savings	Estimate does not include performance factors
- 2"x4" wood studs in basement frost walls	2 1/2" steel studs in basement frost walls	About $.09 per lin. ft. of wall	Easy to incorporate
- Wood frame construction	Steel frame construction	Potentially competitive	New system. Can not be easily used with wood frame construction
- Wood frame construction	Steel post and beam construction	Unknown	System is at concept stage only
- New materials	Recycled materials	Often 30% to 50% of new material cost	The main market is for renovation contractors

3. Wood prices are forecast to increase from about $300 per MBF (U.S.) in early May 1993 to about $325 per MBF (U.S.) during the remainder of 1993 and about $375 per MBF (U.S.) in 1994. If prices increase as forecast, they will give impetus to the development and use of substitutes for traditionally used wood materials. Some interesting and quite different housing construction concepts are being examined, and CMHC and CHBA should maintain an awareness of them.

1.0 INTRODUCTION

1.1 Background

In late 1992 and early 1993, prices of various wood products used in housing increased significantly and rapidly in Canada and United States. This has affected the housing industry negatively in various ways. In April 1993, the Canadian Home Builders' Association (CHBA) asked Canada Mortgage and Housing Corporation (CMHC) to carry out a study of alternatives to the high priced wood products. In May, CMHC engaged Clayton Research Associates Ltd. to carry out the study and present the results at CHBA's Technical Research Committee (TRC) meeting on May 29, 1993. This report documents the results of the study.

1.2 Objectives

The main objectives of the study were as follows:

1. To identify potential substitutes for those traditional wood products used in housing whose prices rose dramatically in late 1992 and early 1993.

2. To compare the costs of identified substitutes with those of traditional products.

To make the results of these investigations more meaningful, the following ancillary objectives were added:

3. To track and document the prices of wood products whose prices have risen in the period of interest.

4. To identify factors other than price which affect the viability of using substitutes for materials traditionally used in housing.

5. To discuss likely future cost trends of the affected wood products

6. To identify issues which should be investigated further.

1.3 Scope and Focus

1. The scope of the study was low rise housing because this form of housing uses most wood. The focus of the study was those materials whose prices increased the most.

2. In this study, substitutes were defined as any material or product which builders in a particular market area had started to use, were considering using or could likely use as a substitute for the materials which they were using because of price increases in the traditional material. This means that substitutes could still be wood products.

1.4 Approach

The study was carried out in the following steps:

1. A brief review of various newspapers was conducted to obtain background information about the wood price rise. The newspapers reviewed are listed in the bibliography.

2. Prices for various wood products were obtained for four market areas across Canada for the period starting when wood prices began to increase and up to early May 1993, which was the latest date of price information. The market areas covered were Vancouver, Edmonton, Toronto and Halifax. Prices were generally obtained from lumber yards for the period September 1992 to May 1993 at monthly intervals and represent typical prices to builders. This information was analyzed to identify price patterns over time for various products and by market area.

3. Some building scientists were interviewed to obtain a broad range of ideas on possible and prospective substitutes for wood products. A list of these interviewees is contained in Appendix 1.

4. Selected builders from each of the market areas noted above plus Calgary, Toronto and Ottawa, as well as representatives from various suppliers, the forest industry and the recycling industry were interviewed to identify substitutes which builders in their market area had adopted or were considering adopting due to wood price increases. They were also asked to identify other potential ideas applicable in their market and, in some cases, to comment on innovative ideas mentioned by the buildings scientists. A list of these interviewees is also contained in Appendix 1.

5. Actual and potential substitutes were identified. Their costs were estimated on the basis of information provided by the proponent of the

substitute and compared with the cost of traditional products on the basis of cost information derived from the 1992 Alberta House Cost Comparison Study, some industry cost estimators and a cost consultant. They were also assessed in terms of their perceived fit with current building practices (in specific market areas).

6. Newspaper articles, wood futures markets and investment advisers were consulted about the likely future wood cost trends.

2.0 REVIEW OF WOOD PRICES

2.1 Selection of Materials and Period for Detailed Price Tracking

Information on prices over a time period of some years for a variety of wood materials were gathered initially for one market (the Edmonton market). Three criteria were used to select the materials and time period for detailed tracking:

1. the time of the biggest price increases and decreases,

2. the proportional price rise of the various materials, and

3. the amount of various materials used in housing.

Data generated from each criterion are shown in Figure 1, and Tables 1 and 2. Figure 1 illustrates the price pattern of a typical wood material - plywood subfloor - since January 1990 and shows that the biggest price increases started in September 1992. Table 1 shows that dimensional lumber and sheathing rose substantially in price. Other selected wood items did not. Table 2 shows that dimensional lumber constitutes about 12% of the materials in a typical new house; sheathing constitutes about 5% of the materials. Other wood products like doors and stairs comprise quite small proportions (1.9% and 0.2% respectively). These results justify focusing on the prices of lumber and sheathing products from the period September 1992 to May 1993.

2.2 Price Changes

This section describes price changes in selected dimensional lumber and sheathing materials. Details of

FIGURE 1:PRICE OF PLYWOOD SUB-FLOORING
FROM JANUARY 1990 TO MAY 1993

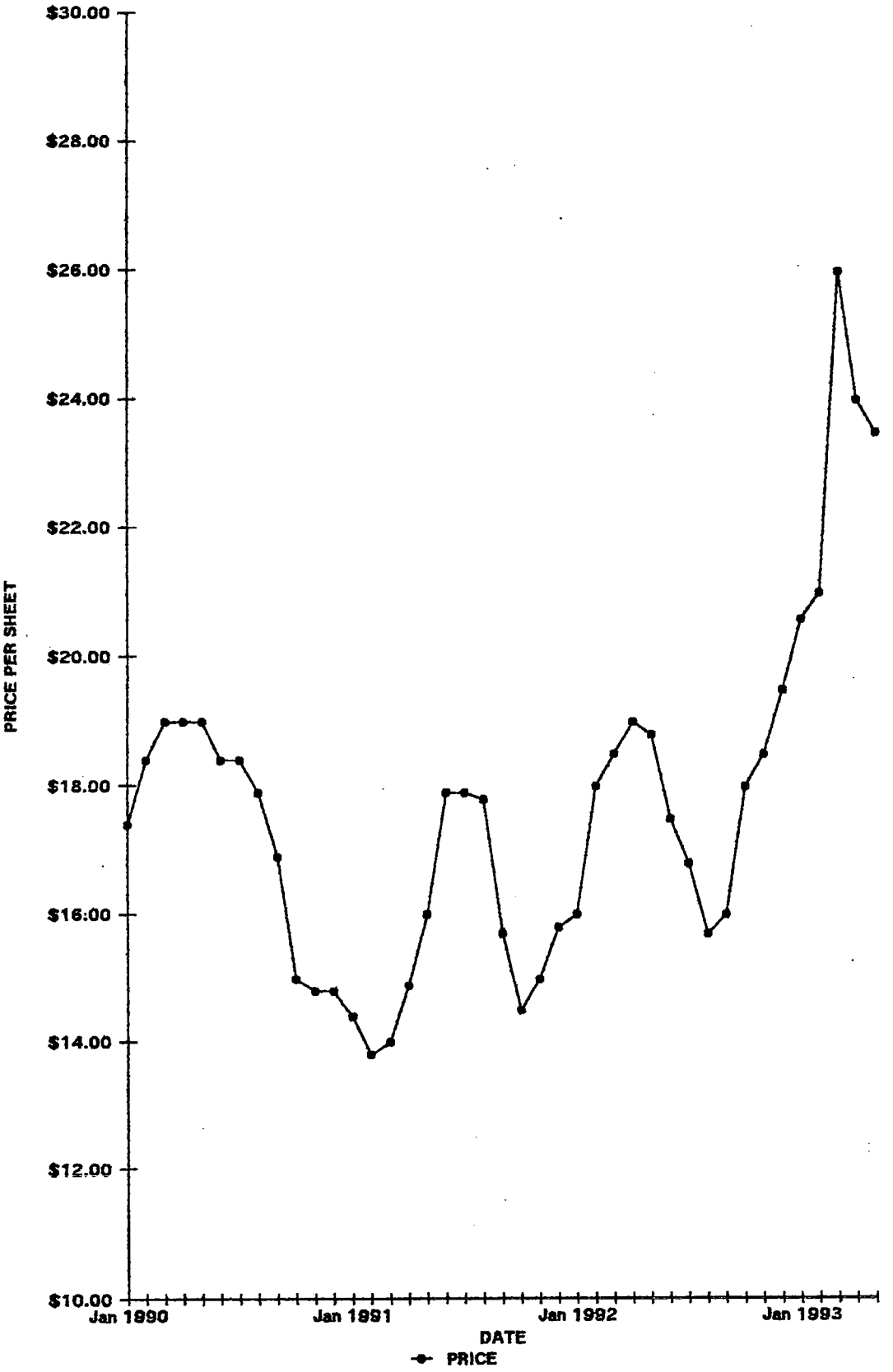


TABLE 1

PROPORTIONAL PRICE INCREASE FOR SELECTED WOOD MATERIALS IN THE EDMONTON MARKET FROM SEPTEMBER 1992 TO MARCH 1993

MATERIAL	PROPORTIONAL PRICE INCREASE
2 X 10 JOIST	94%
2 X 6 STUD	76%
2 X 4 STUD	81%
5/8 T&G OSB	63%
3/8 OSB	44%
DOOR & FRAME	0%
BIFOLD DOOR	0%
CASINGS	18%

TABLE 2

WOOD CONTENT OF A TYPICAL WOOD HOUSE

Category and Element	Material	Cost	Proportion of Total Mat. Cost
FRAMING			
Floor Joists & Beams	2x10 @ 16" o.c. &	$1,924.00	3.9%
Bmt. Stpg.	2x4	$145.00	0.3%
Bridging	2x2	$78.00	0.2%
Ext. Studs	2x6 @ 16" o.c.	$1,115.00	2.3%
Int. Studs	2x4 @ 16" o.c.	$619.00	1.3%
Blocking		$69.00	0.1%
Gar. Dr. Bm.		$48.00	0.1%
Roof Framing	2x4	$310.00	0.6%
Roof Trusses	2x4 Fir	$1,475.00	3.0%
Fascia		$54.00	0.1%
TOTAL		**$5,837.00**	**11.8%**
SHEATHING			
Flooring	5/8" T&G	$1,080.00	2.2%
Underlay	K3 or 3/8"Fir	$86.00	0.2%
Wall Shthg	5/16" OSB	$693.00	1.4%
Roof Shthg	3/8" Spruce	$756.00	1.5%
TOTAL		**$2,615.00**	**5.3%**
STAIRS		**$119.00**	**0.2%**
DOORS	Mahogany	**$945.00**	**1.9%**

Note: Quantities and prices are extracted from the 1992 Alberta House Cost Comparison Study.

price changes in these products in each of the four markets analyzed are shown in Tables 3, 4, 5 and 6.

To get a better understanding of the price patterns in the four markets in absolute and comparative terms , the prices of one major lumber product and one major sheathing product in each of the four markets were charted. Figure 2 illustrates changes in price for floor joists in the Vancouver, Edmonton, Toronto and Halifax markets from September 1992 to May 1993. The material is generally 2"x10" spruce but not exclusively. The criterion for selection was to chose the predominant floor joist material in each market. Figure 2, along with Figure 1, shows the following:

1. Dimensional lumber prices started to rise in each market in October 1992.

2. Lumber prices reached their peak in March 1993 and have generally been falling rapidly since then.

3. Vancouver prices have been lower than prices in other areas for the review period.

Figure 3 shows prices for sub-flooring in the four market areas. Prices generally refer to 5/8" OSB but not exclusively since, as in the case of floor joists, they pertain to the material which is the predominant sub-flooring in each market. Figure 3, along with Figure 1, shows the following:

1. The price of sheathing materials began to rise in each market in September, 1992.

2. Sheathing prices generally reached a peak in March 1993 and have been falling since then.

3. Sheathing prices in Vancouver were generally lower than those in the other market areas reviewed.

2.3 Discussion of Price Changes

This section discusses the reasons for the changes in the price of wood, the impact of the changes and the relative magnitude of the current prices in a broader context. The views expressed below are drawn from various newspaper articles and business newsletters, and from discussions with housing, forestry and investment industry representatives.

To deal with actual price patterns, it is appropriate to discuss reasons for the price increases from

TABLE 3

PRICES FOR SELECTED WOOD PRODUCTS IN THE VANCOUVER MARKET FROM SEPTEMBER 1992 TO MAY 1993

DATE	DIMENSIONAL LUMBER (Prices ar expressed in $/1,000 board feet)			SHEATHING (Prices are expressed in $/4'x8'sheet)					
	2"X10" FIR	2"X10" SPRUCE	2"X4" FJ FIR	5/8"T&G OSB	5/8"T&G SPRUCE	5/8"T&G FIR	3/8" OSB	7/16" OSB	1/2" SPRUCE
Sep 1992	409	389	395	12.25	13.90	14.95	7.95	8.95	11.75
Oct 1992	390	375	385	13.75	15.75	15.99	8.75	9.95	12.10
Nov 1992	449	399	385	13.95	16.55	16.95	8.65	9.50	9.90
Dec 1992	469	399	389	14.50	16.95	17.25	8.95	10.75	10.95
Jan 1993	515	445	415	14.95	18.55	18.75	9.20	11.50	11.85
Feb 1993	575	525	459	16.95	19.75	19.75	9.95	11.95	12.25
Mar 1993	715	645	525	17.95	20.65	20.95	10.49	12.99	13.39
Apr 1993	775	725	575	18.95	21.95	22.45	11.49	13.65	13.95
May 1993	559	575	539	16.95	16.95	17.95	9.95	11.75	11.95

TABLE 4

PRICES FOR SELECTED WOOD PRODUCTS IN THE EDMONTON MARKET FROM SEPTEMBER 1992 TO MAY 1993

DATE	DIMENSIONAL LUMBER (Prices ar expressed in $/1,000 board feet)			SHEATHING (Prices are expressed in $/4'X8' sheet)		
	2"x10" FIR	2"X6" SPRUCE	2"X4" SPRUCE	5/8"T&G FIR	3/8"OSB	7/16"OSB
Sep 1992	489	369	359	15.99	8.99	9.99
Oct 1992	469	359	329	17.99	9.09	10.99
Nov 1992	469	359	349	18.49	8.79	9.59
Dec 1992	579	389	389	19.49	8.99	9.99
Jan 1993	619	419	419	20.59	9.69	10.69
Feb 1993	729	479	479	20.99	9.99	10.99
Mar 1993	949	649	649	25.99	12.99	14.49
Apr 1993	899	599	599	23.99	12.49	14.49
May 1993	899	588	588	23.49	10.99	11.99

TABLE 5

PRICES FOR SELECTED WOOD PRODUCTS IN THE TORONTO MARKET FROM SEPTEMBER 1992 TO MAY 1993

DATE	DIMENSIONAL LUMBER (Prices ar expressed in $/1,000 board feet)			SHEATHING (Prices are expressed in $/4'X8' sheet)			
	2"x10" SPRUCE	2"X6" SPRUCE	2"X4" SPRUCE	5/8"T&G WBD	5/8"T&G SPRUCE	7/16" WBD	3/8" SPRUCE
Sep 1992	540	415	425	16.00	20.80	11.20	12.16
Oct 1992	540	415	425	18.40	21.60	12.32	12.80
Nov 1992	645	505	520	17.60	23.60	11.52	14.88
Dec 1992	645	505	520	17.60	23.60	11.52	14.88
Jan 1993	710	530	520	18.56	23.82	12.64	14.88
Feb 1993	710	530	595	18.56	24.96	12.64	15.20
Mar 1993	875	605	675	23.20	26.08	16.32	15.68
Apr 1993	975	730	780	23.20	27.36	16.32	16.48
May 1993	715	505	585	18.72	23.04	12.32	13.76

TABLE 6

PRICES FOR SELECTED WOOD PRODUCTS IN THE HALIFAX MARKET FROM SEPTEMBER 1992 TO MAY 1993

DATE	DIMENSIONAL LUMBER (Prices ar expressed in $/1,000 board feet)			SHEATHING (Prices are expressed in $/4'X8' sheet)	
	2"x10" SPRUCE	2"X6" SPRUCE	2"X4" SPRUCE	3/4" SPRUCE	1/2" SPRUCE
Sep 1992	420	340	315	21.99	12.99
Mar 1993	892	450	450	31.99	20.99
May 1993	750	498	424	31.99	18.99

FIGURE 2: SELECTED LUMBER PRICES IN FOUR MARKET AREAS

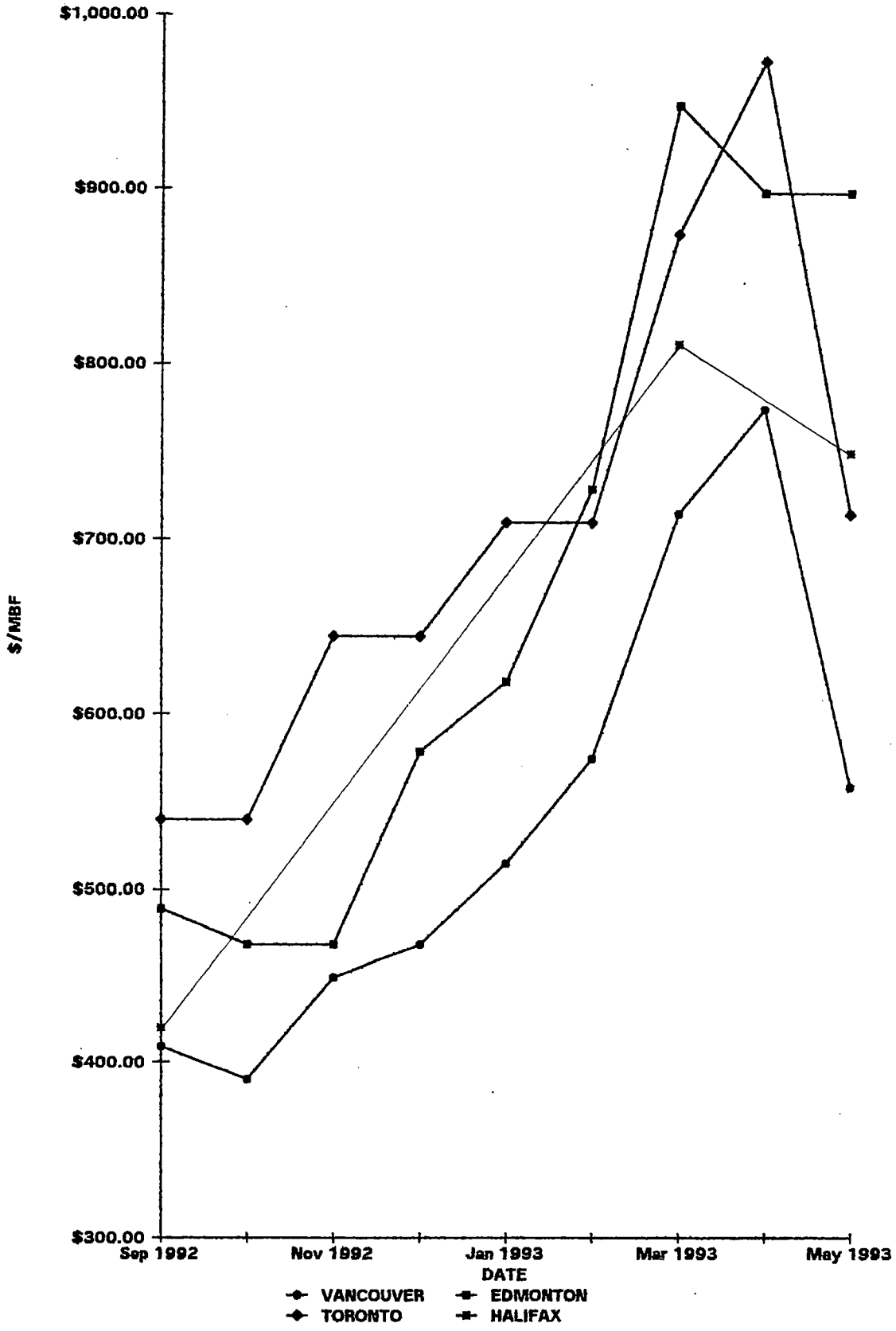
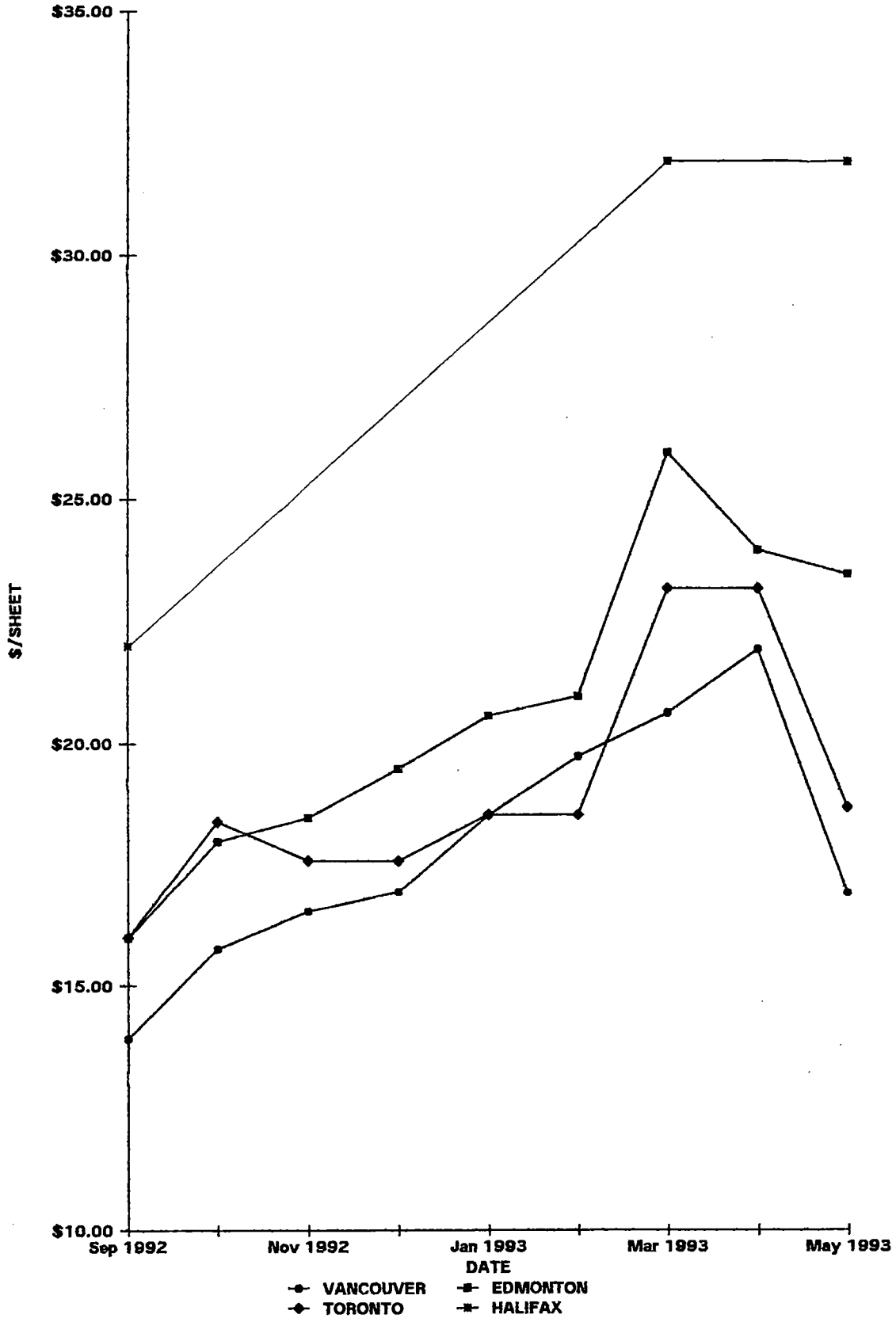


FIGURE 3: SELECTED SHEATHING PRICES IN FOUR MARKET AREAS



September 1992 to March 1993 and price decreases since then separately.

In general terms, prices rose from September 1992 to March 1993 because actual or perceived demand for wood increased during that period and actual supply decreased. Demand increased for the following reasons:

1. As part of the optimism about the U.S. economy in the late fall, estimates for U.S. housing starts in 1993 were for increased production. Housing is the main consumer of wood in the U.S.

2. As wood prices started rising, speculators became active in the lumber futures market and drove prices higher.

3. A number of U.S. builders purchased lumber in preparation for the start of the housing construction season, generally in March.

At the same time, the following factors contributed to a decrease in wood supply:

1. Opposition from environmentalists (who focus on preserving a habitat in the forest for the spotted owl) resulted in increased bans on harvesting trees from U.S. national forests. For example, as recently as 1988, U.S. forestry companies relied on U.S. national forests for 51% of their log supply; they can now only rely of U.S. forests for 40% of their log supply.

2. Opposition from environmentalists in British Columbia is also resulting in reductions in lumber production.

3. The shutdown of logging operations at Christmas exacerbated limited supply problems.

4. For a number of reasons, including computerized inventory control and the need to cut costs, inventories of many companies are low. This means there is limited supply in the distribution network to cope with rapid increases in demand.

In March 1993, wood prices peaked and have been falling rapidly since then. Converse to the situation in the fall of 1992, prices fell because demand fell and supply increased (to an extent).

Demand decreased for the following reasons:

1. The expected number of U.S. housing starts did not occur as expected. Many starts were delayed due to bad weather.

2. In March, some market analysts realized that lumber stock prices were higher than the market could sustain. The prices of futures lumber contracts began to fall. This affected investors who began to sell lumber stocks. These developments pushed prices down.

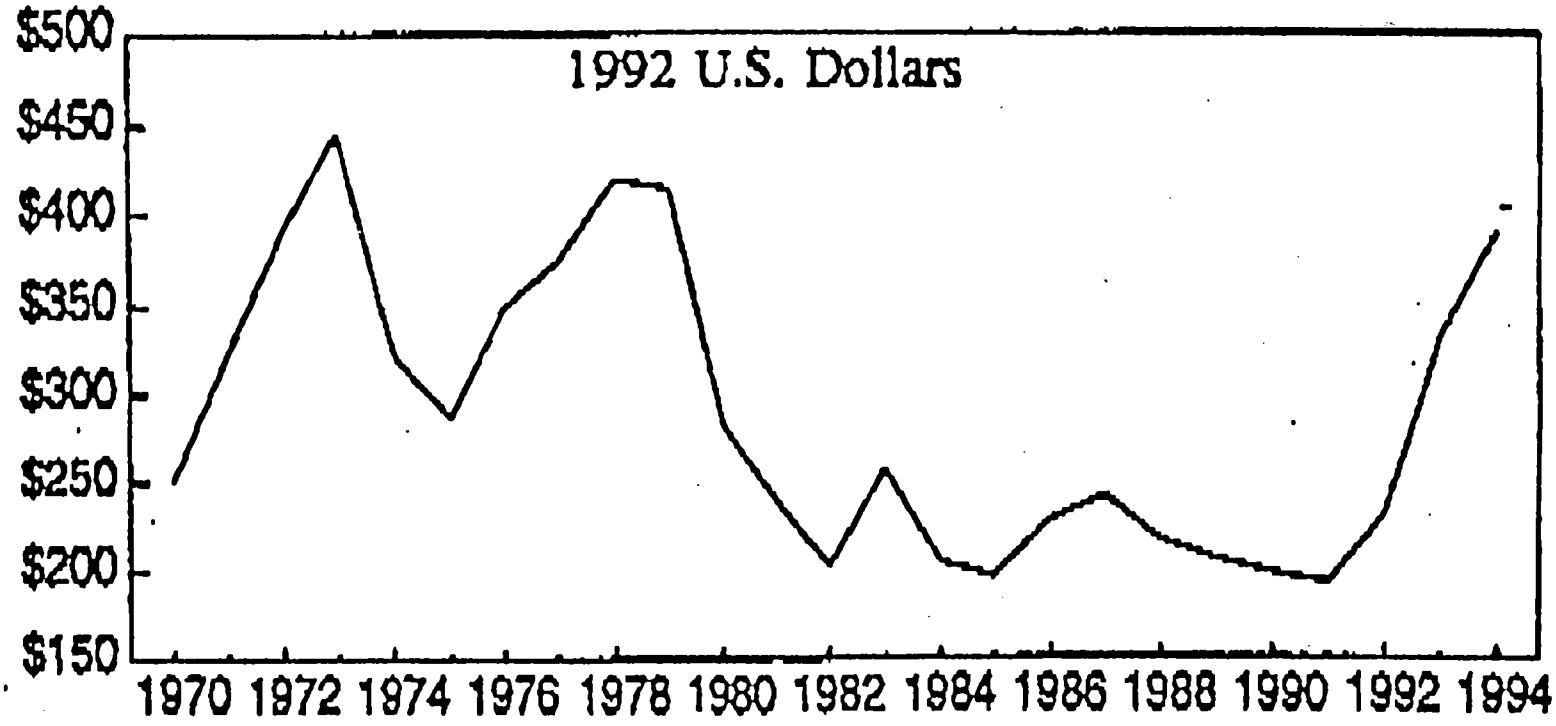
3. The lumber market in Europe is weak which also limited demand.

During the same period, a number of mills in British Columbia increased production to take advantage of high prices. President Clinton also intervened in the conflict over lumbering in the northwest U.S. These actions had some effect on increasing lumber supplies during the high price period.

The wood price increases have had a number of adverse impacts, both because of the size of the increases and the suddenness with which they occurred. Price increases in the U.S. (at their peak) translated into an increase in the average cost of a new house by $3,700 (U.S.). In parts of Canada, the cost increase was about $6,000. Where these prices were passed on to home buyers, housing affordability was reduced. However, the rapidity of the increase often meant that builders could not pass on the cost increases because they had signed contracts with purchasers. This meant that builders who did not have long term negotiated prices with their suppliers had to absorb the increases themselves. Since March 1993, many lumber suppliers have incurred the same problem: they bought lumber at high prices but since then have had to sell it for less because of a falling market.

The rapid price increases from September 1992 to March 1993 and the subsequent fall in prices (along with uncertainty about how far they would fall) raises questions about "normal" or historic lumber prices. A review of lumber prices suggests they are not extremely high by historical standards. Figure 4 (obtained from a ScotiaMcLeod newsletter where it was unattributed) cites lumber prices over the last 23 years. It shows that, until about 1980, lumber prices were sometimes higher than the recent peak prices. Furthermore, experience suggests that lumber prices in the late

FIGURE 4: LUMBER PRICES FROM 1970 TO 1993



1980s and early 1990s were not viable for the lumber industry. In 1991, when lumber prices were low, the Canadian forest industry lost $2.5 billion .

These issues lead to questions about future wood prices which are discussed in Section 4 of this report.

3.0 IDENTIFICATION AND ASSESSMENT OF SUBSTITUTES

3.1 Selection of Substitutes

This section discusses a number of substitutes for traditional wood products for housing construction. The substitutes were identified by builders or building scientists interviewed in this study. The criteria for their selection were that they have been adopted or are being considered by builders in the markets surveyed, or are potential substitutes because of recent high wood prices (and not for other reasons). The substitutes are discussed in terms of

- what they comprise,
- their estimated cost compared with the estimated cost of traditional wood products which they have replaced or may replace at early May 1993 prices,
- the location where interviewees report they are currently being used or considered (which does not imply that they are not used or considered in other markets), and
- the apparent compatibility of the substitution with current building practice.

The substitutes are generally organized in order of their increasing departure from current practice.

3.2 Review of Substitutes

SUBSTITUTE 1: WOOD-I BEAMS INSTEAD OF DIMENSIONAL LUMBER FOR FLOOR JOISTS

1. Description: Wood-I beams are composite wood members comprised of flanges made of dimensional lumber or laminated stock and a web made out of a manufactured sheathing material. They are well known and are used in many markets already.

2. Locations of Recent Use or Consideration: Vancouver, Toronto and Ottawa.

3. Estimated Cost Comparison:

   Traditional Product: 2"x10" fir joists with 2"x2" bridging

Material cost:	$1.58/sq.ft.
Labour cost:	$ .15/sq.ft.
Total:	$1.73/sq.ft.

   Substitution Product: Wood-I beam with blocking

Material cost, depending on the type of wood-I beam selected.:	$1.42 to $1.64/sq.ft.
Labour cost:	$.10/sq.ft.

   (Estimated labour cost savings are based on a number of factors, including the greater spacing of the wood-I beam than the dimensional lumber joist.)

Total cost, depending on wood-I beam selected.	$1.52 to $1.74/sq.ft.

   Potential Savings: Up to $.20/sq.ft. of floor framing costs at current prices (i.e.2"x10" joists at $899/MBF and wood-Is from $2.07 to $2.43/ft.).

4. Comment: Wood-I beams are quite compatible with standard building practices. Discussions with suppliers indicate that the cost of wood-I beams has not been as volatile as that of dimensional lumber joists. Evidence suggests that their price has increased substantially but not as quickly as that of dimensional lumber. If wood-Is hold their current price, some will yield cost savings while the price of dimensional lumber exceeds $775/MBF.

SUBSTITUTE 2: FIBRE-REINFORCED GYPSUM UNDERLAYMENT INSTEAD OF PLYWOOD OR OTHER TYPICAL UNDERLAYMENTS

1. Description: Louisianna-Pacific has developed a new type of underlayment made out of cellulose fibre (recycled paper)and gypsum. It is reportedly very smooth, dimensionally stable (i.e. resistant to water), very resistant to fire and highly resistant to indentation (i.e. hard).

2. Location of Current Consideration: Calgary

3. Estimated Cost Comparison: The main factor in making cost comparisons with other products is material cost since labour cost is likely similar to that for other products. May 1993 costs for this product was about $16 per sheet. Prices of

competitive products vary but this product is quite competitive with some underlayments.

4. Comment: Using this type of underlayment should be quite compatible with current practice.

SUBSTITUTE 3: BUFFALO BOARD WITH WALL BRACING INSTEAD OF 5/16" OR 3/8" OSB OR PLYWOOD FOR WALL SHEATHING

1. Description: Buffalo board (also known by other names) is a bitumen-impregnated fibre board. It is quite soft and therefore its use requires wall bracing to achieve required shear resistance in the walls.

2. Location of Current Consideration: Ottawa

3. Estimated Cost Comparison: A comparison of costs between this substitute and traditional sheathing involves a comparison of the material costs and the cost of labour for installing wall bracing. In this case, 1"x4" bracing notched into the wall frame was assumed. Costs in this section are expressed in terms of cost of the sheathing plus bracing per lineal foot of wall.

   Traditional Product: 3/8" OSB
   Material cost: $3.46/lin.ft.
   Labour cost: see comment on labour costs for buffalo board

   Substitution Product: buffalo board
   Material cost: $2.64/lin.ft.
   Labour cost (expressed as an additional amount for installing the bracing): $.50/lin.ft.

   Potential Saving: About $.30 /lin ft. of wall.

4. Comment: The cost estimates above indicate that this substitution yields modest cost savings. They may be larger if metal bracing rather than 1"x4" bracing is used. Another consideration is that buffalo board prices have not fluctuated in recent times, which means that using it involves less financial risk to builders. This product can fit with current construction practices.

SUBSTITUTE 4: EXTERIOR GYPSUM BOARD INSTEAD OF 5/16" OR 3/8" OSB OR PLYWOOD FOR EXTERIOR SHEATHING

1. Description: Exterior gypsum board is resistant to moisture.

2. Locations of Current Consideration: Ottawa and Calgary

3. Estimated Cost Comparison: A comparison of costs between this substitute and traditional sheathing involves a comparison of the material costs for the two alternatives. Costs are expressed in terms of costs per lineal foot of wall.

   Traditional Product: 3/8" OSB
   Material cost: $3.46/lin.ft.
   Labour cost: Not relevant since it is about the same for the two products.

   Substitution Product: exterior gypsum board
   Material cost: $2.06/lin.ft.
   Labour cost: not relevant

   Potential Savings: About $1.40/lin.ft.

4. Comment: This product fits quite well with current construction practices and appears to yield substantial savings. The study did not investigate product performance issues.

SUBSTITUTE 5: INSULATED SHEATHING WITH STRAPPING ON 2"X4" STUDDINGS INSTEAD OF 5/16" OR 3/8" OSB OR PLYWOOD AS EXTERIOR SHEATHING ON 2"X6" STUDDINGS

1. Description: The insulated sheathing systems considered here are extruded polystyrene boards, not glass fibre boards. This focus affects the estimated labour costs. Using glass fibre boards requires additional backing at house corners and around door and windows which adds labour and material costs. According to the builder's estimator who was consulted, use of the polystyrene boards does not require this backing and avoids the associated costs. Other companies have produced and continue to develop insulated sheathings and other sheathings could be assessed.

2. Locations of Current Consideration: Toronto and Ottawa

3. Estimated Cost Comparison: The analysis in this section provides cost comparisons in terms of the cost per lineal feet of wall.

Traditional Product:
Material cost: from $10.02 to $10.38/lin.ft., depending on sheathing selected.
Labour cost: see comment below for labour cost of the substitution product.

Substitution Product:
Material cost:: $10.17 per lin.ft.
Labour cost: As noted in comments on Substitution 3, the estimated additional cost of installing strapping is $.50/lin ft. of wall.

Potential Savings: This option does apparently not provide cost savings.

4. Comment: While this option does apparently not yield cost savings, performance factors have not been considered. Further, builders should realize that insulated sheathing prices have not fluctuated in recent times and this reduces financial risks to builders. Insulated sheathings can be incorporated into current construction practices quite easily.

SUBSTITUTE 6: PANELIZED WALL SYSTEM INSTEAD OF 2"X6" STUDDINGS, 3/8" OSB SHEATHING AND BATT INSULATION

1. Description: For purposes of this comparison, the 7S Stressed Skin Panel Building System was selected, although some other systems could be selected. The 7S system consists of OSB panels separated by "C" studs. The cavity is filled with polyurethane foam.

2. Locations of Current Consideration: Ottawa and some major U.S. builders.

3. Estimated Cost Comparison: A major user of the system confirmed that framers were charging the same for erecting the 7S System as for conventional walls. This may not be logical, or apply in the future or in all markets. However, in this analysis it meant that labour costs could be ignored and that cost comparisons could focus exclusively of material costs. Costs for the panelized system were obtained from a builder who has experience with the system. Costs are expressed in terms of cost per lineal foot of wall.

Traditional Product: 2"x6" studdings with OSB sheathing and batt insulation.
Material cost, including studdings, sheathing, insulation and vapour barrier: $17/lin.ft.

Substitute Product: 7S panels
Panel cost: $26/lin.ft.

Potential Savings: The estimates indicate that this system does not provide any savings relative to the costs of conventional methods and products.

4. Comment: While the cost estimates indicate that the panel system costs more than conventional approaches, the panel system does provide other benefits. For example, the insulation value of this particular system is about 40% greater than conventional walls and it yields more floor space because its walls are thinner than conventional walls. Further, it is possible that costs could be lower in some applications. Panelized systems can be incorporated into conventional building practices.

SUBSTITUTE 7: 2 1/2" STEEL STUDDINGS INSTEAD OF 2"x4" WOOD STUDDINGS FOR BASEMENT FROST WALLS

1. Description: The steel studdings referred to here are the non-load bearing type which are common and readily available.

2. Location of Current Consideration: Edmonton

3. Estimated Cost Comparison: The information obtained on the cost of the steel studding wall combined labour and material costs, and the costs are therefore combined for both approaches in the cost comparison. Costs are expressed in terms of cost per lineal foot of wall.

   Traditional Product: 2"x4" studding wall
   Material and labour cost: $4.34/lin.ft.

   Substitution Product: 2 1/2" steel studding wall
   Material and labour cost: $4.25/lin.ft.

   Potential Savings: $.09/lin.ft.

4. Comment: This substitution indicates that a minor cost saving can be achieved at current prices. It can be incorporated quite well into current building practices partly because it does not involve much planning or coordination with other trades. If steel frame construction was integrated with wood frame construction on the above-grade floors, for example, considerable planning and

coordination would have to be carried out to ensure that load bearing walls were built properly and the crews responsible for each type of framing knew the extent of their responsibilities.

SUBSTITUTE 8: STEEL WALL AND FLOOR FRAME INSTEAD OF WOOD FRAME

1. Description: The type of steel house selected for analysis in this study is one built by a company in Ottawa because it is the most advanced of any known efforts. The elements which are steel are the floor and wall frames. The sub-floor is OSB, the walls are (usually) covered with rigid insulation, the trusses are wood and the roof sheathing is wood.

2. Locations of Use and Consideration: Ottawa, Calgary and at least one major builder in the U.S.

3. Estimated Cost Comparison: The comparisons made here include labour and material costs for a floor frame, sub-floor, wall frame, wall sheathing and insulation (rigid insulation in the steel frame house, and OSB and batt insulation in the wood frame house) and frost wall in two houses. The steel house used for estimating purposes is a 1,276 sq.ft. two-storey and the wood house is a 1,625 sq.ft. split level house finished on three levels. The costs of the included elements are expressed in terms of cost per square foot.

   Traditional Product: wood frame
   Material cost: $6.08/sq.ft.
   Labour cost: $2.76/sq.ft.
   Total cost: $8.84/sq.ft.

   Substitution Product: steel frame
   Material cost: $5.57/sq.ft.
   Labour cost: $3.75/sq.ft.
   Total: $9.32/sq.ft.

   Potential Saving: The cost estimate indicates that the steel house costs slightly more. However, as noted, the wood frame house used as an example is a slit-level design and the lower level in this design costs less than an above-grade level. This suggests that the steel frame house is competitively priced at current wood prices.

4. Comment: Another example of a steel house built in Canada was far more costly. The builder incurred

very high costs due to high professional fees, higher plumbing and electrical costs, other trade "learning curve" costs and resulting high supervision costs. However, to be fair, the example referred to was a prototype, in which some such added costs are expected. One design difference between the Ottawa company's approach and the other example is that the Ottawa company uses wood trusses; the other example used steel trusses manufactured for the prototype house.

A major U.S. builder is reportedly planning to build steel-frame houses in the near future. They will contain a steel floor, walls and roof. Design and pricing details are not yet available.

Proponents of steel houses cite a number of positive features: they will not shrink, swell, warp or rot; steel frames are not combustible; and the after-sales service costs (e.g. repairing nail popping damage) are lower. In addition, some proponents cite the decreasing quality of wood and prospects for its ongoing high cost as additional reasons for building with steel.

Steel frame house construction does not fit well with traditional wood frame construction practices.

SUBSTITUTE 9: STEEL POST AND BEAM FRAME WITH WOOD FIBRE FLOOR, ROOF AND CURTAIN-WALL TRUSSES INSTEAD OF CONVENTIONAL WOOD FRAME CONSTRUCTION

Comment: This system is not a currently available substitute. It is a construction concept advocated by some building scientists for reasons outlined above in the discussion on Substitute 8 plus other building performance reasons. It is mentioned here because it advocates a potential wood substitute-steel-as one of its key elements.

SUBSTITUTE 10: RECYCLED MATERIALS INSTEAD OF NEW MATERIALS

1. Description: Major efforts and advances are being made to reduce construction waste, re-use building materials and recycle various materials for use as building materials. For example, a number of industry and government organizations have established a new program in Ontario called the Build Green Program. The purposes of the program are to develop industry and public awareness of building materials with recycled content and to

help industry and government develop new products. The Program is already being implemented as shown in Figure 5.

The main motive of such programs is largely to preserve the environment. As noted earlier in this report, the motive of this study is to discuss substitutes to wood products that have been selected because of the high cost of wood. These motives are not contradictory but they do have different focuses.

The following material focuses on the work of one company to illustrate what can be done. The company is Architectural Clearinghouse located in Edmonton. It sells materials from buildings slated for demolition or improvement to contractors, and inventories used materials at a warehouse for sale to builders and the public. It maintains a computerized inventory of available and wanted material.

2. Estimated Cost Comparisons: The following list provides some examples of the materials available, their current prices and prices of comparable new materials.

Materials	Price Used	Price New
2"x6" lumber	$.35/BF	$.60/BF
hardwood flooring	$1.00-1.50/sq.ft.$	$4.00-$4.50/sq.ft.
oak doors	$100/door	$500-600/door
windows	20% of the price of new windows	

3. Comment: The main market for the used materials is renovation contractors. One of the difficulties that they and new home contractors have is approval to use them from regulatory authorities, particularly in new buildings. The Build Green Program is beginning to deal with this problem. ORTECH has been asked to develop an inventory of recycled building materials suitable for use in new office construction.

FIGURE 5: LIST OF BUILD GREEN PRODUCTS

Build Green

BUILD GREEN PRODUCTS

The following manufacturers have been identified as having a product that contains a recycled component. Further technical and performance data can be obtained by calling the

Build Green Hotline
416-822-4111 Ext. 372

Look for the Build Green Logo in your local material supply outlets!

Attic Baffles
Henry Moulded Products (recycled cardboard)
Insul-Tray Inc. (recycled cardboard)

Bathroom Vanities
Canac Kitchens Ltd (substrate of remanufactured wood scraps)
NHB Vanities (substrate of remanufactured wood scraps)

Beams - Parallam
MacMillan Bloedel Ltd (parallel strand lumber manufactured from veneer wood waste)

Bricks
Great Lakes Brick & Stone (recycled wood products)

Carpet
Triathlon Carpets (recycled plastic soft drink bottles)

Carpet Undercushion
Dura Undercushions Ltd (recycled tire rubber)

Ceiling Grid Components
Simplicitee (recycled steel)

Ceiling Tiles
Ottawa Fibre Inc. (recycled glass)
Canadian Gypsum Company (recycled paper)

Cement Board
Canadian Gypsum Company (contains recycled fibres)

Countertop
Avonite (recycled scrap plastic)

Doors
Premdor Inc. (short lengths of wood bonded together with finger joints)

Drywall
Canadian Gypsum Company (recycled newsprint)
Highland American Corporation (recycled newsprint)

Eavestrough/Gutters/ Downspout
Plastmo Ltd (recycled vinyl)
Hunter Rainaway (recycled aluminum)

Foundation - Concrete
Durisol Materials Ltd (recycled wood chips bonded with concrete)

Garden Fencing
Daymond Building Products (recyclable vinyl)
Dupont Canada (recycled plastic)

Insulation - Ceiling & Wall
Climatizer Wall Insulation Systems Ltd (recycled newsprint)
Can-Cell Insulation Inc (recycled newsprint)
Ottawa Fibre Inc (recycled glass)

Interior Wood Trim
Premdor Inc. (short lengths of wood bonded together with finger joints)

Kitchen Cabinets
Canac Kitchens Ltd (substrate of remanufactured wood scraps)
NHB Kitchens (substrate of remanufactured wood scraps)

Office Partition Frames
Alwind Industries (recycled aluminum)

Paint - Exterior & Interior
Color Your World Inc (low volatile organic compound, water based finishes containing no lead, cadmium, chrome VI or mercury)

Roofing
Tile Master Roofing Systems by Mair Roofing Mfg Ltd (recycled galvanized steel)
Gregg Steel Shakes (recycled steel)

Siding
MacMillan Bloedel Ltd, Champlain Div. (remanufactured wood products)
Louisiana-Pacific (remanufactured wood products)
Thermar Aluminum Siding (recycled aluminum accessories)

Wall Panels
Homosote Company (recycled newsprint)
Pan-Terre (recycled vegetable fibres and cellulose)

Canadian Business Discovers Build Green Materials

A feature attraction of the National and Ottawa Business shows will be the Green Office of the Future designed and constructed using recycled building materials under the direction of the Build Green program. Together with the Ontario government's Green Workplace Program, the Build Green Program will direct the design and construction of the Green Office of the Future.

The Ottawa Business Show will be held in Lansdowne Park on April 28 & 29 and the National Business Show will take place at Exhibition Place in Toronto, May 5 & 6.

LANSING BUILDALL

Build Green products are now available at Lansing Buildall

4.0 WOOD PRICE FORECASTS

The extremely rapid increase in and volatility of wood prices since September 1992 have raised builders' interest in substitutes for wood. However, ongoing interest in and the feasibility of using substitutes depends largely on future wood prices. For this reason, the study included a review of some wood price forecasts.

Some insight into future lumber prices can be obtained from the futures market for lumber. Futures contract prices are recorded daily in many financial newspapers and are illustrated in Table 7. One price of interest is the settlement price for the longest contract available at any particular time. In Table 7, that value is $289.30 (U.S.). This is what the market activity of investors and speculators defines as the "best guess" value of lumber at the future date specified. It is not fixed. It usually changes every day, reflecting investors' changing opinions about the likely value of lumber at a contract's maturity date. It has been very volatile during the past seven months, reflecting the volatility of lumber prices. However, in recent weeks it has been valued in the range of $300 (U.S.). This indicates investors' current opinions about lumber prices about six months from now.

Various investment analysts have forecast the price of lumber. In early May 1993, the Financial Times reported one forecast of $322 (U.S.) as the average lumber price for 1993. In April, an analyst from ScotiaMcLeod published a detailed report in which he forecast the average lumber price at $325 (U.S.) in 1993 and $375(U.S.) in 1994. Some of the key arguments underpinning the forecast are summarized below:

1. U.S. housing starts are forecast to increase moderately from 1.03 million in 1992 to 1.28 million in 1993 and 1.4 million in 1994. New residential construction will account for an estimated 35% to 37% of total lumber demand.

2. Repair and remodelling activity is estimated to increase moderately in the few years at a little over 3% annually. Repair and remodelling activity will account for an estimated 33% of total U.S. lumber demand.

3. Non-residential construction is expected to increase moderately as well.

4. U.S. consumption of lumber is estimated to increase by 3.9% in 1993 and by 4.8% in 1994.

TABLE 7: QUOTATIONS FROM THE FUTURES PRICES MARKET FOR MAY 21, 1993

FUTURES PRICES

Season High	Season Low	Month	Open	High	Low	Settle	Net Chge	Prev Op.Int
INDEXES								
WOODS AND FIBRES								
LUMBER (CME) 160,000 board feet								
US$ per 1,000 bd. ft.; 10 cents = $16 per contract								
Est. Vol. 802, Prev. Vol. 654, Prev. Open Int. 2,370								
451.10	208.00	Jul93	287.00	288.80	277.00	277.00	— 10.00	1,304
439.00	220.00	Sep93	303.10	304.00	292.80	292.80	— 10.00	533
428.90	220.00	Nov93	304.00	304.10	289.30	289.30	— 10.00	376
COTTON 2 (NYCE) 50,000 lbs.								
US cents per lb.; 0.01 = $5 per contract								
Est. Vol. 2,500, Prev. Vol. 2,557, Prev. Open Int. 33,170								
66.28	53.00	Jul93	61.30	61.38	60.81	60.96	— .11	15,608
64.49	54.40	Oct93	60.35	60.35	59.70	59.75	— .42	2,893
64.25	54.60	Dec93	59.52	59.55	58.95	58.95	— .40	11,738
64.00	55.50	Mar94	60.50	60.50	59.96	59.96	— .34	2,069
64.60	59.50	May94	60.90	60.90	60.70	60.70	— .20	520
65.05	60.90	Jul94	61.42	61.20	61.20	61.20	— .15	340

5. Public timber is being increasingly withdrawn in northwest U.S. and in British Columbia due to pressure from environmentalists. This will reduce available supply from these regions.

6. On the other hand, some factors will offset increasing demand and reduced supply problems. Lumber demand in Europe is weak and some areas like southern U.S., Chile and New Zealand may increase lumber production and exports from their region.

7. High lumber prices will also give impetus to efforts to develop and use substitutes for wood.

5.0 CONCLUSIONS

This study on substitutes for traditional wood products as a method for dealing with high wood price increases has drawn the following conclusions:

1. Wood prices increased dramatically from September 1992 to March 1993. Since the they have fallen rapidly. This price increase and volatility have caused difficulty for builders, suppliers and consumers. Many builders and suppliers have been forced to deliver product at prices below its cost to them. Where the cost increases have been passed onto consumers, the affordability of their homes has decreased.

2. A number of builders have adopted or are exploring substitutes for traditional wood products because of the high price of those wood products. Of the ten substitutes identified in this study, nine are available now or can be available in the near future in some markets. Of those nine, cost estimates in this study indicated that seven yield or can potentially yield some cost savings at early May 1993 wood prices. More specifically, they are

   - wood-Is instead of dimensional lumber as floor joists,
   - fibre-reinforced underlayment instead of some alternates,
   - exterior gypsum sheathing instead of traditional wood sheathing,
   - buffalo board with wall bracing instead of 5/16" or 3/8" OSB or plywood

- steel studdings instead of wood studdings for frost wall construction,

- steel frame instead of wood frame floor and walls

- recycled materials instead of new materials

3. Wood prices are forecast to increase from about $300 per MBF (U.S.) in early May 1993 to about $325 per MBF (U.S.) during the remainder of 1993 and about $375 per MBF (U.S.) in 1994. If prices increase as forecast, they will give impetus to the development and use of substitutes for traditionally used wood materials. Some interesting and quite different housing construction concepts are being examined, such as the steel post and beam system referred to in Substitution 9, and CMHC and CHBA should maintain an awareness of them.

BIBLIOGRAPHY

Bloomfield, Patrick. "Behind Three Hot Market Sectors", in The Financial Post, May 5, 1993, p. 18.

Francis, Diane. "Time to Storm Fortress Europe", in The Financial Post, August 10, 1992, p. S3.

Horvitch, Sonja. "Wall, Bay Streets Standing Still", in The Financial Post, November 13, 1992, p. 17.

Horvitch, Sonja."Bullish Markets Race To Records", in The Financial Post, April 17, 1993, p. 31

Horvitch, Sonja."Toronto, New York Stocks Post Gains" in The Financial Post, May 6, p. 22

Hryciuk, Dennis. "Mill Owners Worried By Lumber Crash", in the Edmonton Journal, May 11, 1993, p. D7.

Hryciuk, Dennis."Cost of Lumber Tumbles But Home Priced No Lower", in the Edmonton Journal, May 13,1993.

Hryciuk, Dennis."Forest Industry Charges May Be Linked To Markets", May 15, 1993, in the Edmonton Journal, p. B2.

Kennedy, Peter. "Forestry Prepares For New Growth", in The Financial Post, November 14, 1992, p. 5.

Kennedy, Peter."Lumber Price Rise Could Reap Profit", in The Financial Post, January 23, 1993, p. 6.

Laphier, Gary. "It's Time To Take Profits In Forest Products Stocks", in the Financial Times, May 1-7, 1993, p. 10.

McDonald, Terry. "U.S. Northwest Is A 300-Mile Affluent Suburb", in The Financial Post, October 5, 1992, p. U10.

McHugh, Michael. "Prices Rise Again As Market Awaits Inflation", in The Financial Post, April 7, 1993, p. 20.

McHugh, Michael."Prices Soar As Inflation Wanes", in The Financial Post, April 10, 1993, p. 25.

Schreiner, John. "MacBlo Returning To Profit", in The Finacial Post, April 10, 1993, p. 3.

Tropp, Brian F. "A Tree Topp View", in a ScotiaMcleod newsletter, April 29, 1993.

APPENDIX 1: LIST OF INTERVIEWEES

Bruce Clemmensen, Clemmensen & Associates Limited
Jeff Doll, Coscan
John Drake, Excel Homes
Oliver Drerup, Drerup Construction Ltd.
Andre Gagner, APCHQ
Bradley Gerrard, Architectural Clearinghouse
Harvey Jager, H. Jager Developments
Michael Kilpatrick, Integrated Building Systems Ltd.
Gary Leithead, Alberta Forest Products Association
Richard Lind, Everts Lind Enterprises Ltd.
Dennis Little, Descon
Joseph Lstiburek,
Lewis Nakatsui, Lincolnberg
Jorg Ostrowski, ACE
Bill Parneta, Parklane Homes
Dennis Paterson, Nelson Homes
Norman Ross, Tech Cost
Tom Smith, Port Coquitlam Building Supplies
Keith Swanland, Lincolnberg Homes
Daven Vucko, Louisiana Purchase