

**REPORT OF THE DEPARTMENT OF
HOUSING AND COMMUNITY DEVELOPMENT ON**

**Premature Deterioration
of Fire-Retardant
Treated Plywood**

**TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA**



HOUSE DOCUMENT NO. 27

**COMMONWEALTH OF VIRGINIA
RICHMOND
1993**



COMMONWEALTH of VIRGINIA

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT

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MEMORANDUM

TO: The Honorable L. Douglas Wilder and Members of the Virginia General Assembly

FROM: Neal J. Barber *Neal*

THROUGH: Cathleen A. Magennis, Secretary of Economic Development

DATE: December 22, 1992

SUBJECT: House Joint Resolution No. 238 - 1992

The 1992 General Assembly, by House Joint Resolution No. 238, directed the Department of Housing and Community Development to study the premature deterioration of fire-retardant treated plywood in roof sheathing and to develop a particular protocol to determine the structural characteristics and durability of the material.

Enclosed for your review and consideration is the report prepared by the Department in response to this resolution.

NJB:vh

cc: William P. Dickinson, Jr.

Enclosure

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Preface

House Joint Resolution No. 238 passed by the 1992 General Assembly directed the Department of Housing and Community Development to examine and report on a number of issues associated with the use of fire-retardant treated (FRT) plywood. Specific tasks included the study of the premature deterioration of FRT plywood in roof sheathing and the development of a protocol to determine the structural characteristics and durability of FRT plywood. In addition, the Department was to consider the advisability of enacting a statutory five-year warranty period for FRT roof sheathing.

In response to House Joint Resolution No. 238, on September 14, 1992, the Department held a public hearing to receive public input concerning the current use of FRT plywood as roof sheathing as well as other regulatory issues being considered at the time. A public comment period through October 12, 1992, was established for the submission of written comments relative to this issue.

The State Building Code Technical Review Board, a Governor appointed Board with the authority to hear building code appeals arising from local appeals and to interpret the provisions of the Virginia Uniform Statewide Building Code (USBC), was requested to take official action in determining the appropriateness of the continued use of FRT plywood as roof sheathing.

Staff members of the Code Development and the Policy Analysis and Research Offices, within the Department, compiled and analyzed the latest studies and documentation concerning the use of FRT plywood as roof sheathing and presented this information to the Technical Review Board as well as keeping the Board of Housing and Community Development informed of the progression of the study.

It was found that the plywood industry, the nationally recognized standard writing organizations and the Federal Government, through the Forest Products Laboratory, have been actively seeking resolution to the concerns raised by the failure of these products. Numerous workshops and conferences have been held between the groups and several directly relevant national standards have been, and are, in the process of being developed.

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Executive Summary

This study on the premature deterioration of fire-retardant treated plywood used as roof sheathing was conducted by the Department of Housing and Community Development in response to House Joint Resolution 238 of the 1992 General Assembly. The study requested the Department to develop a particular protocol to determine the structural characteristics and durability of the products and to give consideration as to whether a separate five-year warranty period should be enacted.

Introduction

The Department determined in its study of the premature deterioration of fire-retardant treated plywood used as roof sheathing that failure of certain products is due largely to exposure to elevated temperatures which activates chemical reactions causing strength loss. In many cases the reaction is severe enough to require replacement of the material.

The Department also determined that the development of a protocol for determining structural characteristics and durability of FRT plywood is currently under way at the national level by a consortium of trade and industry groups. The American Society for Testing and Materials (ASTM) has approved an emergency protocol standard, ES 20-91, and is currently balloting a companion standard known as the Standard Practice for Establishing Allowable Spans and Loads for Fire Retardant Treated Plywood Roof Sheathing. In addition the American Wood Preservers Association is currently striving to develop a procedure for standardizing FR-treating formulations.

Findings

The Department believes that the Virginia Uniform Statewide Building Code (USBC) should be based on nationally recognized standards developed utilizing a consensus process which includes a wide representation from industry, code enforcement, engineering and technical fields. To reproduce the standard writing process currently used at the national level for use in developing state-wide standards would require extensive expenditures of both time and money and would seem to duplicate unnecessarily efforts already underway on a national basis.

The Department recognized that the USBC provisions relating to the approval of FRT plywood were in need of clarification to give the building official clear guidance in whether the products were to be approved. In addition it was recognized that there are FRT plywood products on the market and in use which have not experienced failure, one of which has been in use for over ten years. The national model code organizations' National Evaluation Service Committee has currently issued approvals based on extensive evidence submitted for two specific products, neither of which have had any reported incidents of failure since their development.

Conclusions

To clarify the current requirements of the USBC relating to the approval of FRT plywood sheathing, the State Building Code Technical Review Board was requested to issue an official interpretation. Staff submitted to the Board all documentation-which was received during the public comment period and subsequent public hearing held by the Department relative to this issue. The Review Board ruled that the building official is not required to accept the use of FRT plywood sheathing since nationally recognized standards for determining its structural characteristics and durability are still in the process of being developed and have not been incorporated into the USBC. They further ruled that in determining whether to approve the use of a specific product, the building official may consider approvals issued by the nationally recognized model code organizations' evaluation services.

Recommendations

The Department does not recommend legislative action to ban of the use of FRT plywood, recognizing that with the issuance of the Technical Review Board interpretation, building officials are unlikely to approve its use without adequate documentation to assure its structural performance and durability. The Department and the Board of Housing and Community are currently preparing to update the USBC under the procedures of its public participation guidelines and the Administrative Process Act. During the public input phase of that process, the Board may determine whether to reference the new national standards for FRT plywood in the USBC if they are finalized at that time or, if substantiated by public comment, may delete the provisions of the code permitting the use of FRT plywood until such time as national standards are deemed to be adequate.

The Department believes that legislative action to extend the warranty period for FRT plywood roof sheathing used in new construction is appropriate and will serve to ensure adequate product performance until such time as national standards have been fully developed and incorporated into the Uniform Statewide Building Code. A recommendation for proposed legislation is included in Appendix A of this document.

It is further recommended by the Department that the General Assembly consider establishing a legislative commission to explore possible options for helping homeowners resolve existing problems with FRT roof installations.

Introductory Chapter

The Department of Housing and Community Development has undertaken the study of various issues connected with the use of fire-retardant treated plywood roof sheathing panels in response to House Joint Resolution No. 238. The legislature's formal directive reflects the continuing concern among individual home owners, owners of multi-unit structures, building contractors, and local building officials about whether FRT plywood roof sheathing could or should continue to be permitted as a building material in Virginia.

The reader should recognize that this study focuses on the future of FRT plywood roof sheathing in Virginia. Although the past performance of the product is responsible for much of the current concern, this report does not address issues connected with the resolution of claims against manufacturers, builders, or the wood-treatment industry. Nor does this study address other issues associated with the use of FRT dimension lumber, which are outside the scope of the Joint Resolution. It should be noted, however, that the Department has recommended that studies be conducted to determine ways and means of addressing the replacement of defective material already in use and to determine what legal mechanisms are available for corrective action.

The Department approached this study with several goals in mind. First, to evaluate the best available information on the product and its performance. Second, to recommend a course of action that will assure the continued production of safe, affordable housing. Finally, to enable builders, building officials, and consumers of housing to have confidence in the expected performance of the products in question.

Chapter I -- Background

The Product and Its Use

Fire-retardant treated plywood has been treated, usually through a pressure process, with chemicals known to reduce flammability. Typically, these have included inorganic or organic salts--often monoammonium phosphate, phosphoric acid, or other phosphates buffered with boric acid. In the event of a fire, the chemicals inhibit the rate of flame travel across the surface of wood and reduce the amount of potential heat. The resulting reduction in the production of flammable volatiles significantly slows the progress of fire. This, in turn, increases the likelihood of suppressing the fire before more extensive property damage or casualties occur.

FRT plywood roof sheathing products began to be widely used during the late 1970s and early 1980s. The product's use increased when two of the principal model building code organizations approved it as an alternative to the construction of fire-rated parapet walls extending above the roof plane of attached dwellings such as townhouses, apartments, and condominiums. A primary concern with structures of this class is that fire may spread rapidly to adjacent units by leaping from roof to roof.

The Building Officials and Code Administrators, International, Inc. (BOCA), whose model codes are the basis for the Virginia Uniform Statewide Building Code (USBC), first approved using FRT plywood roof sheathing in 1979. In 1984, the Council of American Building Officials (CABO), whose code provisions may be used as an alternative to BOCA in the case of one- and two-family dwellings, permitted the use of FRT as an alternative to parapet walls.¹

Typically, if a parapet wall was not constructed, the model codes specified the use of FRT plywood roof sheathing for a width of four feet on either side of the fire-rated wall(s) on the lot line. This alternative offered builders significant initial cost savings over the construction of parapet walls. Hence, the use of FRT sheathing grew rapidly along with the increased pace of home building in the late 1970s and early 1980s. Increased demand for the product also spurred a number of competing wood treatment companies to develop individually formulated chemical compounds to attain the desired flame spread rating for treated plywood. As many as a dozen manufacturers marketed at least twenty different treatment products at various times during the during the 1980s. Five wood treatment companies accounted for over 95 percent of the FRT plywood use in the eastern United States during most of the previous decade.²

¹NAHB National Research Center, Home Builders Guide to Fire Retardant Treated Plywood (Washington, D.C.: NAHB, November 1990).

²NAHB National Research Center, Investigation of Problems and Solutions Relating to Fire Retardant Treated Plywood Roof Sheathing (NAHB, October 1989), 5, 19-21, 25; NAHB National Research Center, Home Builders Guide

Nature of the Problem

By the mid-1980s, builders and individual home owners began to report serious problems with FRT plywood roof sheathing. These included sagging, buckling, and bowing of roofs as well as severe loss of strength, cross-grain checking, and general brittleness in individual panels. A "charred" appearance often accompanied these defects. The most serious problems typically appeared within three to eight years of the date of construction, although some problems occurred as early as one year after installation. However, the performance of different FRT formulations varied greatly. Some products were strongly associated with high levels of degradation of treated plywood. Yet few or no problems were associated with others.³

Scope of the Problem

Problems associated with FRT plywood roof sheathing have a nationwide scope, although their incidence has been far greater in the east and southeast where the products have been in service the longest and where the regionally dominant model codes have long permitted their use. A 1989 report to the National Association of Homebuilders estimated, on the basis of the amount of treated product manufactured between 1981 and 1988, that nearly one million units faced the potential failure of FRT roof panels. The same report pegged estimated repair costs for all exposed units at more than \$2 billion.⁴ In 1990, one Virginia county estimated that between 2,000 and 3,000 roofs within its jurisdiction were suspect. The same county estimated potential repair costs at between \$4 and \$9 million.⁵ In November 1992, a trial opened in Fairfax County involving a home builder and one wood-treatment company. In New Jersey, homeowners and other parties to FRT litigation recently reached a \$50 million settlement. Eventually some 35,000 homeowners in that state may have roofs replaced. A 1991 legislative enactment enabling New Jersey to pursue indemnification from home warranty companies that have thus far refused to pay claims involving FR-treated roofs prompted the settlement. Negotiations on the possible creation of a nationwide pool of funds for roofing repairs has also occurred.⁶

As the extent of the problem became increasingly apparent, builders grew more

to Fire Retardant Treated Plywood (Washington: NAHB, November 1990), 5.

³Susan LeVan and Mary Collet, "Choosing and Applying Fire Retardant-Treated Plywood and Lumber for Roof Designs," General Technical Report FPL-GTR-62(Madison, WI: USDA, Forest Service, Forest Products Laboratory, June 1989).

⁴NAHB National Research Center, Investigation of Problems . . . , 21-24.

⁵County of Loudoun, Department of Technical Services, "Fire Retardant Treated Plywood," September 24, 1990, 7.

⁶Jacqueline L. Salmon, "Settlement Reached in Roofing Case," Washington Post, November 7, 1992.

reluctant to use any FRT plywood sheathing products.⁷ The loss of confidence in the product, locally-enacted bans on FRT products, and the initiation of extensive litigation by various parties altered the market for FRT products. The number of products and manufacturers has decreased sharply since 1988; only three principal manufacturers and a limited number of products are currently available.

Research

The scope of the problem and its potential costs stimulated differing responses from concerned parties, including the forest products industry, the wood preserving industry, individual home owners, owners of multi-unit structures, home builders, building code organizations, and building officials. A significant research effort has taken place since 1988, with the Forest Products Laboratory of the U.S. Forest Service playing a major role.⁸ The problem is now generally believed to arise from the combined effect of certain FRT formulations (particularly those with a low pH, i.e. acidic) and high temperatures ($\geq 130^{\circ}\text{F}$) possibly exacerbated by increased moisture levels. These environmental conditions are typically present in roof sheathing installations employing FRT products--and particularly so in the southeastern United States. The combination of elevated temperatures and some FRT formulations leads to acid-catalyzed dehydration, which lowers the temperature at which wood begins to decompose. Ultimately, this process degrades the structural properties of plywood panels, culminating in the gross structural defects that have been widely reported.⁹

The wood preservation industry has responded to the obvious threat posed by the loss of confidence in their FRT products in two different ways. First, the industry has sought to develop a standard for FRT formulations. Thus, the industry's key trade association, the American Wood-Preservers' Association (AWPA), has under consideration a standard covering four specific formulations prescribing minimum and maximum values of acceptability for use in the treatment of wood.¹⁰ The effect of this standard, if adopted, would be to assure greater uniformity among the FRT formulations that may gain acceptance in the industry. In a second approach, individual manufacturers offer builders warranties, subject to varying provisos depending upon the manufacturer and

⁷For a typical discussion of the problem in the popular media see Jacqueline L. Salmon, "Razing the Roofs," Washington Post, September 17, 1990.

⁸Susan L. LeVan and Jerrold E. Winandy, "Effects of Fire Retardant Treatments on Wood Strength: A Review," Wood and Fiber Science, 22 (1990), 113-131; Jerrold E. Winandy, Robert J. Ross and Susan L. LeVan, "Fire Retardant Treated Wood: Research at the Forest Products Laboratory," Proceedings of the 1991 International Timber Engineering Conference (London: TRADA, 1991) 4.69-4.74; Jerrold E. Winandy, "Fire Retardant Treated Wood: Effects of Elevated Temperature and Guidelines for Design," Wood Design Focus (Summer 1990), 8-10; Susan L. LeVan, Robert J. Ross and Jerrold E. Winandy, "Effects of Fire Retardant Chemicals on the Bending Properties of Wood at Elevated Temperatures," Research Paper FPL-RP-498 (Madison: USDA, Forest Service, Forest Products Laboratory, September 1990).

⁹LeVan and Winandy, "Effects of Retardant Treatments . . .", 127-28.

¹⁰AWPA Committee P-7 Fire Retardant Systems Committee Minutes, September 21, 1992.

product, that seek to convey assurance that the product will provide a reasonable service life.

As a result of the research conducted since 1988, the American Society for Testing and Materials (ASTM) in 1992 published a protocol (ES20-91) for testing the performance of FRT plywood at elevated temperatures.¹¹ In June 1991, prior to its publication, the Forest Products Laboratory of the U.S. Forest Service carried out an evaluation of this protocol that concluded:

The results of this test protocol seem to present the engineering community with a reasonable comparative procedure for assessing the potential of commercial FR treatments to cause thermally induced in-service strength loss. Thus, results from this protocol can be used to begin the process of substantiating acceptable field performance for new or existing FR-treatments before they are used in service conditions with periodic or sustained exposure to elevated temperatures.¹²

In addition, ASTM has developed a proposed companion standard for establishing the allowable span and load recommendations for FRT sheathing installations.¹³ The proposed standard is currently undergoing ASTM's "balloting" process to determine whether it shall be published. If this standard becomes effective, it will provide a basis for adjusting engineering design criteria for roofs employing FRT sheathing in order to compensate for the known reductions in wood strength that result from the application of FRT materials.

The ASTM standards serve two purposes. The first permits an assessment of the likely strength stability of FRT plywood over extended time periods; the second provides building design professionals with a means for determining the key structural features of roofing systems using a given FR treated material.

In another fairly recent development, in 1991 and 1992 CABO's National Evaluation Service Committee issued reports evaluating (in terms of flame spread, structural performance, corrosion, and hygroscopicity) two specific FRT products, PYRO-GUARD produced by Hoover Treated Wood Products and DRICON® produced by Hickson Corporation.¹⁴ The evaluation reports, based on data and test reports submitted by the

¹¹Emergency Standard Test Method for Evaluating the Mechanical Properties of Fire-Retardant Treated Softwood Plywood Exposed to Elevated Temperatures.

¹²Jerrold Winandy, Susan L. LeVan, Robert J. Ross, Scott P. Hoffman, and Craig R. McIntyre, "Thermal Degradation of Fire-Retardant-Treated Plywood, Development and Evaluation of a Test Protocol," Research Paper FPL-RP-501 (Madison, WI: Forest Products Laboratory, U.S. Forest Service, USDA, June 1991), 10.

¹³Standard Practice for Establishing Allowable Spans and Loads for Fire Retardant Treated Plywood Roof Sheathing

¹⁴Council of American Building Officials, National Evaluation Service Committee, Report No. NER-303 (July 1, 1991) [DRICON®] and Report No. NER-457 (February 1, 1992) [PYRO-GUARD].

manufacturer to CABO, indicated that the two products comply with applicable code requirements of the three major model code organizations subject to a number of specific conditions. The conditions include strength design factors and span limits matching those in the pending ASTM standard for establishing load and span factors for FRT plywood. The CABO approvals relate to the safe and appropriate use of the individual products under anticipated thermal conditions up to 170°F, but they do not directly address the issue of long-term durability under high temperature conditions for either product.¹⁵ In other words, the FRT plywood can be expected to perform its structural functions satisfactorily with appropriate design modifications in place to compensate for the diminished strength attributable to the initial FR treatment and subsequent exposure to high temperatures; how long it will retain its durability in a specific instance cannot yet be definitely established. Further research, which is currently underway, should eventually provide this kind of assurance.

Finally, the Virginia State Building Code Technical Review Board, the body officially charged with interpreting the provisions of the USBC, recently issued two rulings that have a direct bearing upon the issues identified in HJR 238. First, the Board ruled that until both of the ASTM standards discussed above have been finalized and incorporated into the USBC, local building officials are not required to approve the use of FRT plywood products. Second, the model code evaluation service reports mentioned in the preceding paragraph are not considered equivalent to approval by a nationally recognized product research, testing and certification organization. This is important because if the model codes evaluation service report was considered equivalent, building officials would have no choice but to accept the use of the two specific products (DRICON® and PYRO-GUARD) that have been evaluated by CABO. The Board did note, however, that building officials may take the model code evaluation service's findings into account in deciding whether to approve the use of a given material.¹⁶

This is the current status of key factors that must be considered before recommending specific actions relative to the continued use of FRT plywood sheathing panels in Virginia. The findings and their implications for recommendations concerning the regulatory or statutory response to this issue follow in the next section of this document.

¹⁵It should be noted that new construction building code requirements generally speak to the issue of the adequacy of materials or methods of construction but do not directly address the question of durability.

¹⁶Virginia State Building Code Technical Review Board, Interpretation Number 28/90, December, 1992.

Chapter II -- Findings

Past usage of FRT plywood sheathing in Virginia led to a significant incidence of roof failures during the latter half of the 1980s. At least several thousand homes in Northern Virginia and elsewhere had or have the potential to encounter structural failure for some sheathing products. However, these well-documented problems did not involve all FRT products, some of which continue in active service without significant degradation.

The following developments may be considered the major consequences of increased awareness of the problems associated with some FRT plywood products:

- Loss of builder and public confidence thinned the ranks of both FRT producers and products.
- Litigation among various interested parties, based upon the apparent failure of earlier FRT products, continues in many venues; building contractors, the wood treatment industry, home warranty providers, and building owners continue to contend over issues of responsibility and liability.
- A research effort begun under various auspices has only recently led to an increased understanding of the likely causes of product failure and suggested the means for improved predictions of future performance. The results of this research effort, discussed in the preceding section of the report, provide the best available information on the most probable causes of premature deterioration and have provided the basis for a testing protocol focusing on the structural and temporal performance of the product.
- Several directly relevant standards that address various facets of the FRT plywood problem (aside from flame-spread or fire resistiveness) have recently been developed or are under active consideration by a number of trade, product, standards writing, or model code organizations. These include the following items:
 - ✓ A test protocol developed as an Emergency Standard by the American Society for Testing and Materials and a pending companion standard for determining design values of treated products;
 - ✓ An evaluation of the test protocol by USDA's Forest Products Laboratory that indicates the protocol's usefulness as a basis for assessing acceptable field performance levels for FR-treatments;
 - ✓ CABO National Evaluation Service Committee approvals for two specific

products (DRICON® and PYRO-GUARD)¹⁷ based on structural calculations that are themselves based on the ASTM standards; and

- ✓ A pending American Wood-Preservers' Association Standard for FR-treatment formulations.
- The three major producers of FR-treated products (Hickson, Hoover, and Chemical Specialties Inc. [CSI]) now offer extended warranties for product performance. Hickson's warranty is for forty years, Hoover's for twenty. The specific provisions of the warranties vary, and their actual potential for indemnifying builders/owners in the event of product failure may also vary. Generally, the warranties specify compliance with attic ventilation and other structural and design requirements of the model codes as a condition for enforcement. On the basis of the terms of the warranties, the chain of liability in the event of product failure continues to appear to run from the owner to the builder to the manufacturer of the FR-treated product.
- According to the NAHB, there have been no reported structural failures involving any of the products currently being manufactured by the three major producers, which include DRICON® (Hickson), PYRO-GUARD (Hoover), and D-Blaze (CSI). PYRO-GUARD has been in use for four years, D-Blaze for seven years, and DRICON® for ten years. Earlier FR-treated products manufactured by some of these as well as other companies have had reported failures in the past.
- In Virginia, building officials may, but are not currently required to approve the use of FRT plywood sheathing because relevant ASTM standards have not been finalized or incorporated into the USBC and because the model code organization's evaluation service reports are not considered the equivalent of approvals from nationally recognized independent testing laboratories.
- If, at some future date, relevant nationally recognized approvals and standards for FRT sheathing products were incorporated in the USBC, then building officials would have to approve the use of these products subject to appropriate design standards and other code provisions.

¹⁷CSI is reported to be seeking a similar approval from the CABO National Evaluation Committee.

Chapter III -- Conclusions

A permanent ban of all FR-treated plywood sheathing products is not clearly indicated by the currently available information. Although many of the products now identified as first- or second-generation have experienced significant degrees of in-service degradation, virtually all of these products have been withdrawn from the market. Thus, while the serious problems associated with past practices in many cases continue to await resolution, the future use of FR-treated products should be based on an assessment of the likely performance of products currently available and in use.

What kind of assurances are available relating to the long-term performance of FRT plywood roof sheathing? ASTM's ES-20 emergency standard provided a scientifically-based standard for testing the comparative structural durability of FR-treated products. The pending ASTM span and load standards should also provide greater assurance to those designing and using roofs with FR-treated components. It is important to understand that the standards cannot, however, provide absolute assurance that the products will have a service life equal to that of other components of a given roof. Additional research should ultimately provide better information on the remaining questions about the use of these products, including the effects of cyclical thermal changes on the product. Research on these issues is continuing at the FPL. Its conclusions will likely enable the relevant standard and code writing organizations to provide approvals or guidelines for the future use of FRT sheathing.

Although the newer formulations by manufacturers which have had known failures of previous products have generally not been in place long enough to substitute field experience for the more precise scientific evaluation that many would prefer, the new products do appear to be performing in a substantially better manner than their predecessors. Again, while this cannot convey absolute assurance to the builder or consumer, it does provide evidence that the newer products are not experiencing the rapid deterioration evident with some of the earlier products.

Manufacturers' warranties, despite their limitations, provide a possible fall-back source of assurance to builders--though they do little to provide greater comfort to homeowners. Hence there may be a rationale for extending a longer-term statutory warranty covering FR-treated roofs directly to the homeowner. Unlike the manufacturer's warranty, Virginia's implied warranty statute holds that the builder or seller of a new dwelling warrants that the dwelling is sufficiently "free from structural defects, so as to pass without objection in the trade" ¹⁸ In 1992, the General Assembly amended the provisions of the implied warranty to extend its coverage over foundations to five years. A similar extension to include roofs employing FRT plywood sheathing would have two direct effects. First, the aggrieved consumer would have a clearly defined cause of

¹⁸ Section 55-70.1, Code of Virginia.

action against the warranty's vendor. Second, builders, aware of the terms of the implied warranty and their obligations, would tend to exercise greater caution in selecting which materials to employ in occupancies where FR treatments are one option.

Chapter IV -- Recommendations

Legislative action to ban, via statute, the use of FRT plywood sheathing products is not indicated due to the recent interpretation issued by the State Building Code Technical Review Board which establishes that the building official is not required to accept the material. The building official may take into consideration approvals by the national model code evaluation services in determining approval of specific products. The Board of Housing and Community Development may, in adopting a 1993 edition of the USBC, alter the provisions of the code to require FRT products to meet the new standards developed by ASTM and AWWA if they are finalized by that time or may prohibit the use of the product by deleting the provisions of the code recognizing its use. This process will give the industry, building officials and those affected by the use of the products an opportunity to submit comment and recommendations to the Board via the public participation process. If nationally recognized standards for determining structural performance of FRT plywood are finalized and incorporated into the USBC in the 1993 edition and a product meets all required standards, there would be little basis remaining for a prohibition of its use. Until such time, the building official may prohibit the use of the FRT plywood at the local level or may consider approval by the model code evaluation services or other substantial documentation in determining whether to approve the use of the material.

The Department believes that legislative action to extend the warranty period for FRT plywood roof sheathing used in new construction is appropriate and will serve to ensure adequate product performance until such time as national standards have been fully developed and incorporated into the Uniform Statewide Building Code. A recommendation for proposed legislation is included in Appendix B of this document.

Further Recommendations

In compiling information and completing the study of the premature deterioration of FRT plywood used in roof sheathing, it became apparent to the Department that the FRT plywood roof sheathing in a significant number of existing dwellings in Virginia may have to be replaced. The Attorney General stated in 1989 that there appeared to be, "no viable legal tools available . . . with which the Commonwealth could mitigate the problems."¹⁹ Given the apparent scope of the current problem, however, the Department recommends that studies be conducted by a legislative commission to determine what, if any, actions may be possible to help resolve the problems faced by homeowners in existing dwellings which have been determined to have or suspected to have defective roofing materials.

¹⁹ Letter from Attorney General Mary Sue Terry to the Honorable Emilie F. Miller dated June 9, 1989.

Appendix A

GENERAL ASSEMBLY OF VIRGINIA--1992 SESSION HOUSE JOINT RESOLUTION NO. 238

Requesting the Department of Housing and Community Development to study the premature deterioration of fire-retardant treated plywood and to develop a protocol to determine its structural characteristics and durability.

Agreed to by the House of Delegates, February 9, 1992
Agreed to by the Senate, March 4, 1992

WHEREAS, since 1978 the Virginia Uniform Statewide Building Code (VUSBC) has allowed the use of fire-retardant treated (FRT) plywood to be used as roof sheathing in the construction of attached dwelling units, multiple family structures and nonresidential structures; and

WHEREAS, it has been discovered that certain types of FRT plywood deteriorates prematurely through the activation of acid hydrolysis in attics during prolonged exposure to heat and humidity; and

WHEREAS, the premature deterioration of FRT roof sheathing has caused roofs to fail if walked upon or under the weight of snow, thereby posing a higher danger to firefighters, roofing contractors and residents; and

WHEREAS, it has been discovered that, in certain instances, roofs constructed with FRT plywood have begun to deteriorate within five years of construction; and

WHEREAS, the American Plywood Association (APA) withdrew its endorsement of FRT plywood in 1988 and has not reinstated its endorsement; and

WHEREAS, although the APA, the National Forest Products Association (NFPA) and the American Society of Testing and Materials (ASTM) are in the process of developing industry-wide standards to determine the structural characteristics and durability of FRT plywood, a comprehensive industry-wide standard continues to be lacking; and

WHEREAS, the Building Officials and Code Administrators (BOCA) Building Code and the VUSBC have been amended to require certification and testing of FRT materials prior to their approval for use in building projects; and

WHEREAS, local building officials are forced to evaluate and accept testing procedures presented by individual manufacturers on an ad hoc basis without benefit of industry standards based on actual performance in the field; and

WHEREAS, such ad hoc evaluation by building officials does not necessarily ensure that all FRT products approved under the BOCA Building Code and the VUSBC are reliable and will not deteriorate prematurely; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the Department of Housing and Community Development be requested to study the premature deterioration of FRT plywood in roof sheathing and to develop a particular protocol to determine the structural characteristics and durability of FRT plywood. The study shall include, but not be limited to, an analysis and recommendation as to whether the use of FRT plywood in roof construction should be prohibited in Virginia until appropriate testing data is available. The study shall also consider whether a separate five-year warranty period for FRT roof sheathing, instead of the blanket one-year period for all structural defects, should be enacted to serve as a safety net for the repair of roofs which deteriorate prematurely despite their certification. During the course of the study, the Department shall solicit input from local building officials, industry, and other organizations and state agencies, as appropriate.

The Department shall complete its work in time to submit its findings and recommendations to the Governor and the 1993 Session of the General Assembly as provided in the procedures of the Division of Legislative Automated Systems for the processing of legislative documents.

Appendix B

Draft Legislation for Extending the Period During Which Fire-Retardant Treated Plywood Roof Sheathing is Subject to the Provisions of the Virginia New Home Implied Warranty Statute

1 **§ 55-70.1. Implied warranties on new homes.** -- A. In every contract for the sale of a
2 new dwelling, the vendor shall be held to warrant to the vendee that, at the time of the
3 transfer of record title or the vendee's taking possession, whichever occurs first, the
4 dwelling with all its fixtures is, to the best of the actual knowledge of the vendor or his
5 agents, sufficiently (i) free from structural defects, so as to pass without objection in the
6 trade, and (ii) constructed in a workmanlike manner, so as to pass without objection in
7 the trade.

8 B. In addition, in every contract for the sale of a new dwelling, the vendor, if he be in
9 the business of building or selling such dwellings, shall be held to warrant to the vendee
10 that, at the time of transfer of record title or the vendee's taking possession, whichever
11 occurs first, the dwelling together with all its fixtures is sufficiently (i) free from
12 structural defects, so as to pass without objection in the trade, (ii) constructed in a
13 workmanlike manner, so as to pass without objection in the trade, and (iii) fit for
14 habitation.

15 C. The above warranties implied in the contract for sale shall be held to survive the
16 transfer of title. Such warranties are in addition to, and not in lieu of, any express or
17 implied warranties pertaining to the dwelling, its materials or fixtures. A contract which
18 waives, modifies or excludes some or all of the warranties contained in this section shall
19 be valid, but the words used to waive, modify or exclude such warranties shall be
20 conspicuously (as defined in § 8.1-201 (10)) set forth on the face of such contract, and
21 shall specify the particular warranty or warranties to be waived, modified or excluded.

22 D. If there is a breach of warranty under this section, the vendee, or his heirs or personal
23 representatives in case of his death, shall have a cause of action against his vendor for
24 damages.

25 E. The warranty shall extend for a period of one year from the date of transfer of record
26 title or the vendee's taking possession, whichever occurs first, except that the warranty
27 pursuant to subdivision (i) of subsection B for the foundation of new dwellings and for
28 fire-retardant treated plywood roof sheathing in new dwellings shall extend for a period
29 of five years from the date of transfer of record title or the vendee's taking possession,
30 whichever occurs first. Any action for its breach shall be brought within two years after
31 the breach thereof. As used in this section, the term "new dwelling" shall mean a
32 dwelling or house which has not previously been occupied for a period of more than sixty
33 days by anyone other than the vendor or the vendee or which has not been occupied by
34 the original vendor or subsequent vendor for a cumulative period of more than twelve
35 months excluding dwellings constructed solely for lease. The term "new dwelling" shall
36 not include a condominium or condominium units created pursuant to Chapter 4.2 (§
37 55-79.39 et seq.) of this title.

38 F. The term "structural defects," as used in this section, shall mean a defect or defects
39 which reduce the stability or safety of the structure below accepted standards or which
40 restrict the normal use thereof.

Appendix C

Summary of Public Comment

The Department received a number of comments and proposals as a result of the September 14, 1992, public hearing and subsequent comment period. The majority of commentators were representing the building enforcement community, through local government or building official organizations. One consultant for the treating industry testified at the public hearing and several manufacturers responded with the submission of written material concerning their products.

The Fairfax County Board of Supervisors made specific recommendations for the development of a testing protocol to include the following items:

1. Test specimens be exposed to the temperatures and humidity levels reflecting the end use conditions of the installed product.
2. Test specimens be subject to the same drying procedures as used by the manufacturer of the product.
3. Strength testing of the samples should be conducted in accordance with appropriate standards referenced by the BOCA Code.
4. Loss of strength should be calculated for the last year of the service life.
5. Testing should include the strength factors of connectors.
6. Flame spread rating testing based on the characteristics of the material at the end of its service life.
7. Involve at a minimum, the U.S. Department of Commerce, Forest Products Laboratory, representatives of nationally recognized testing agencies such as Underwriters Laboratories and the National Association of Home Builders.

The Virginia Building and Code Officials Association recommended also including representatives from the American Plywood Association, American Wood Preservers Association, American Institute of Architects, Farris Wood Treating Companies and their organization.

A consultant representing Hoover Treated Wood Products stated briefly why the previous products manufactured by the company had not performed satisfactorily and that the third generation product had undergone in depth testing and received approvals from the CABO model code organization's evaluation service.

Other localities indicated that further study of the issue was necessary. Several building officials stated that a ban was not necessary as the new ASTM standard does provide necessary information and the industry does offer warranties on the products.

Appendix D

VIRGINIA STATE BUILDING CODE TECHNICAL REVIEW BOARD

INTERPRETATION

Interpretation Number: 28/90

Code: Uniform Statewide Building Code - Volume I, New Construction Code, 1990 Edition

Section No(s): 107.1, 1702.4

QUESTION #1: Considering the documented failure of fire-retardant treated plywood used as roof sheathing, is the building official required to approve its use if the criteria in Section 1702.4 is met?

ANSWER #1: No, in response to the failures, the industry has developed a protocol standard (ASTM-ES 20) for testing FRT plywood exposed to elevated temperatures and is currently balloting a companion standard for determining design values and durability of the products. Until these standards are finalized and incorporated into the USBC, the building official is not required to approve the use of the products.

QUESTION #2: Are the nationally recognized model code writing organization's evaluation services considered nationally recognized product research, testing and product certification organizations as referenced in Section 107.1?

ANSWER #2: No, that terminology applies only to nationally recognized independent testing laboratories which test and list products; however, the building official may consider approvals by the model code evaluation services in determining whether a material should be approved.

This Official Interpretation was issued by the State Building Code Technical Review Board by ballot subsequent to discussion at their meeting of November 20, 1992.



Chairman, State Building Code Technical Review Board

DEC 16, 1992

Date

Appendix E

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