

Minnesota Attorney General: Administrative Rules Proceedings

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Version 3
August 20, 2018

ADMIN 1000 (Rev. 1/78)

STATE OF MINNESOTA

DEPARTMENT Health

Office Memorandum

TO : Office of the Secretary of State
Attn: Donna Scott
180 State Office Building

DATE: December 17, 1980

FROM : Pauline M. Bouchard
Assistant to the Director
Division of Environmental Health

PHONE: 296-5331

SUBJECT: Court Action Regarding Formaldehyde Rules.

On November 20, 1980, the Attorney General filed with your office a rule relating to formaldehyde, 7 MCAR § 1.234.

Since the filing, an Order for Injunction has been issued by a District Court Judge prohibiting enforcement of the rule by the Commissioner of Health.

Attached is a copy of the Order, to be filed along with the above-referenced rule.

PMB:bjp

Attachment

bcc: Jerry Anderson
Special Asst. Attorney General

STATE OF MINNESOTA DISTRICT COURT

COUNTY OF HENNEPIN FOURTH JUDICIAL DISTRICT

Court File No. 773142

Manufactured Housing Institute, a not for profit Illinois corporation; Liberty Homes, Inc., an Indiana corporation; The Commodore Corporation, a Delaware corporation; Moduline International, Inc., a Washington corporation; and Woodlund Homes, Inc., a Minnesota corporation,

Plaintiffs,

-vs-

ORDER FOR TEMPORARY INJUNCTION

George R. Pettersen, M.D., individually and as Commissioner of Health of the State of Minnesota, The Department of Health of the State of Minnesota and the State of Minnesota,

Defendants.

This cause coming to be heard upon the motion of plaintiffs for a Temporary Restraining Order and/or Temporary Injunction which motion has been supported by affidavits; and Stephen H. Cohen, Esq. of Robins, Zelle, Larson & Kaplan appearing for plaintiffs; and William Miller, Assistant Attorney General, appearing for defendants, and each of them, and the Court having read the submissions of the parties hereto and being fully advised in the premises;

IT IS HEREBY ORDERED:

That Plaintiffs' Motion for Temporary Injunction is granted, and that the defendants, and each of them, their agents, representatives and attorneys, and all persons working in concert or participating with said defendants, are hereby restrained and enjoined from enforcing or attempting to enforce the provisions of the temporary regulations complained of, to-wit:

The provisions of Temporary Rule 7 MCAR §1.234 of the regulations of the Minnesota Commissioner of Health.

IT IS FURTHER ORDERED that this Temporary Injunction shall remain in full force and effect until further order of this Court upon the understanding of the parties that the defendants intend to initiate proceedings under the Minnesota Administrative Procedure Act to adopt permanent rules pursuant to Minnesota Laws 1980, Chapter 594, Sections 1 and 2, in lieu of and as a replacement for the Temporary Rules here at issue.

IT IS FURTHER ORDERED that plaintiffs are not required to post any bonds or undertakings for the pendency of the Temporary Injunction; and,

IT IS FURTHER ORDERED that nothing contained herein is meant to have any effect whatsoever upon the provisions of the warning set forth in the above-referenced statute or upon the provisions of Section 2 Subd. 4 of the statute, and that all parties hereto retain all their rights as to the enforcement or challenging the enforcement of said warning and of Section 2 Subd. 4 of said statute; and,

IT IS FURTHER ORDERED that defendants, and each of them, need not file responsive pleadings to Counts I through III of Plaintiffs' Complaint inclusive, and further are not required to file responsive pleadings to the balance of Plaintiffs' Complaint until twenty (20) days after plaintiffs shall in writing request such responsive pleadings.

IT IS FURTHER ORDERED that a copy of this Order shall be served upon the defendants, and each of them, by delivery of said Order and service of the same upon counsel for the defendants appearing before this Court who is duly authorized to receive service of said Order.

Dated this 5th day of December, 1980.

BY THE COURT:

Judge of the District Court

5 December
Judge Neil Riley

Our File #642

ADMIN 1000 (Rev. 1/78)
SF-00006-01

STATE OF MINNESOTA

DEPARTMENT ATTORNEY GENERAL

Office Memorandum

TO : GEORGE R. PETTERSEN
Commissioner of Health

Attn: BILL MILLER, S.A.A.G.

DATE: Nov. 20, 1980

FROM : JERRY S. ANDERSON
Special Assistant
Attorney General

PHONE: 296-1288

SUBJECT: Rules as Approved In the Matter of the Proposed Adoption of Temporary Rules Relating to Formaldehyde

Enclosed herewith are the rules you have submitted for approval. These rules have been approved by this office and filed with the Secretary of State. Note that they have NOT been filed with the State Register; this must be done promptly by your agency.

Upon receipt and before transmittal to your agency, however, it is important that you recheck these rules as to:

1. Affixation of the stamps of the Attorney General and Secretary of State to the last page of the rules;

2. Coverage by these stamps of all rules submitted; and

3. Inclusion of all pages of the rules in the approved set.

Directly following the approved rules is a complete set of required documents and transcript which must be retained with the rules by you or your agency.

If you have any questions in this regard, please contact me.

JSA/bw
Encl.
cc: Duane Harves
Susan Robertson

ROBERT J. CHRISTIANSON
GEORGE D. McCLINTOCK
EVERETT A. DRAKE
DONALD L. ROBERTSON
WRIGHT W. BROOKS
RODGER L. NORDBYE
GEORGE E. HARDING
JOHN S. HOLTEN
G. ALAN CUNNINGHAM
ROBERT W. OELKE
ERWIN M. GOLDSTEIN
JAMES A. HALLS
GERALD T. FLOM
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ARTHUR L. DOTEN
DUANE W. KROHNKE
GEORGE W. FLYNN
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PETER R. KITCHAK
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FRANK B. BUTLER
GORDON B. CONN, JR.
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JOSEPH M. PRICE
W. SMITH SHARPE, JR.
PHILIP S. GARON
JOHN F. BEUKEMA
WALTER J. DUFFY, JR.

FAEGRE & BENSON

1300 NORTHWESTERN BANK BUILDING

MINNEAPOLIS, MINNESOTA 55402

612/371-5300

TELEX 29-0034

J. B. FAEGRE (RETIRED)

JOHN C. BENSON
PAUL CHRISTOPHERSON
JOHN B. FAEGRE, JR.
COUNSEL

JAMES P. STEPHENSON
F. REID CARRON
A. DAVID KELLY
JOHN K. STEFFEN
CHARLES E. BOHLEN, JR.
JOHN B. GORDON
THOMAS M. MAYERLE
THOMAS G. MORGAN
EDWARD G. HEILMAN
JOHN H. HINDERAKER
ROBERT L. SCHNELL, JR.
RICHARD A. NELSON
BRIAN B. O'NEILL
THOMAS J. MOORE
WILLIAM R. BUSCH, JR.
BONNIE M. FLEMING
HENRY F. FRISCH
RANDY L. MILLER
JACK M. FRIBLEY
JOHN S. JADIELA
DAVID B. DEAN
STEVEN C. SCHROER
JOHN P. BORGER
HEIDI M. HOARD
JAMES G. RAY
RICHARD A. HELDE

MARGARET S. ANGLE
STEVEN R. ANDERSON
JAY D. CHRISTIANSEN
CHARLES S. FERRELL
DAVID B. MILLER
JAMES E. NICHOLSON
REBECCA L. ROM
NICHOLAS J. SPAETH
MARK F. ENGEBRETSON
JAMES A. O'NEAL
RICHARD T. THOMSON
MICHELE M. MIELKE
BETSY TAYLOR
ROBERT L. COLLINS
MARC J. DETTMANN
BRUCE M. ENGLER
SUSAN L. JACOBSON
WALTER A. PICKHARDT
ANNA W. SHAVERS
DONALD C. SHEPARD
WENDY J. WILDUNG

November 19, 1980

The Honorable Warren R. Spannaus
Attorney General
State of Minnesota
Room 102
State Capitol
St. Paul, MN 55155

Dear Attorney General Spannaus:

These comments are submitted on behalf of the Formaldehyde Institute ("Institute") in response to the revised proposed temporary rule adopted by the Commissioner of Health banning the sale of newly constructed residential units having an ambient air level of formaldehyde in excess of 0.5 parts per million.

In the interest of brevity and given the operative time constraints, we will not here repeat the constitutional and procedural objections to the rule discussed at some length in our letter dated October 9, 1980. Many, if not all of the defects inherent in the rule as originally submitted are, the Institute believes, still present in the rule as resubmitted. We also will not here repeat the arguments set forth in the letter to you dated November 17, 1980 submitted on behalf of the Manufactured Housing Institute ("MHI"). Instead, we simply note in passing that the Institute concurs wholeheartedly in the position taken by MHI. We would, however, call your attention to the following four fundamental flaws which we believe are so serious as to warrant disapproval of the revised rule as submitted to your office:

(1) The rule as promulgated exceeds the scope of the legislature's statutory authorization to the Commissioner of Health. Minn. Laws 1980, Ch. 594, §1 explicitly provides that the Commissioner may regulate the sale of building materials and housing units containing products made with urea formaldehyde. The legislative history of Minnesota's formaldehyde statute indicates a clear legislative intent to exempt materials made with phenol formaldehyde from regulation and, indeed, to encourage the substitution of building materials containing phenolic resins for those containing urea resins. Despite this clear legislative directive, the NIOSH ambient air test method mandated by the Commissioner does not distinguish between emissions due to phenol formaldehyde, and those due to urea formaldehyde. Contrary to the Commissioner's assertion at page 3 of the memorandum to Jerry S. Anderson from Roger L. DeRoos dated November 12, 1980, it is simply not true that the only source of free formaldehyde in newly constructed residential units will be urea formaldehyde containing building materials. Thus, in adopting an ambient air approach, as opposed to the product standard approach advocated by the Institute, the Commissioner has exceeded the scope of his regulatory authority.

(2) In promulgating the revised rule, the Commissioner has failed to consider all relevant facts. In particular, the Commissioner has failed to consider the technological feasibility of implementing the test methods mandated by the rule. In a meeting with Special Assistant Attorney General Jerry S. Anderson on October 10, 1980, Pauline Bouchard, representing the Commissioner's office, essentially acknowledged that there are not, at present, adequate testing facilities in this state to administer the NIOSH test with respect to all newly constructed residential housing. The rule, nonetheless, requires immediate compliance by manufacturers with the NIOSH standard. Since manufacturers will be unable to test all units constructed and cannot sell such units untested without risking criminal sanctions, the rule as promulgated effecitvely constitutes a taking of property without just compensation. Moreover, the failure to consider the technological feasibility of complying with the standards imposed renders the rule arbitrary and capricious. See United States v. Nova Scotia Food Products Cor., 568 F.2d 240, 251 (2d Cir. 1977).

(3) The rule, as drafted, is impermissibly vague. With respect to the section on testing conditions, for example, it is not clear which rooms in a residential unit are considered "habitable." Nor is it clear whether the three air samples to be taken are to be taken from three different rooms or whether three air samples from the same room will suffice. Finally, and perhaps

most importantly, the rule does not specify when the test is to be performed. Thus, it is conceivable that a manufacturer could test a unit on the day prior to sale, under conditions of temperature and humidity then existing, and find the unit to be in compliance. On the day after sale, a consumer could repeat the same test, albeit under different conditions of temperature and humidity, and using samples taken from different rooms, and reach a totally different result. The upshot is that the manufacturer is left in the dark, with no way of predicting with any degree of assurance his potential exposure to liability under the formaldehyde statute. Such uncertainty offends the notice requirement of constitutional due process.

(4) The revised rule contains significant changes from the temporary rule originally published by the Commissioner in the June 23, 1980 State Register and it is, accordingly, imperative that the rule as revised be republished to give all interested parties a chance to comment on the proposed changes. Some of the most significant changes reflected in the revised rule concern the section on testing conditions. At the outset, regarding the ventilation requirement specified by the Commissioner, the rule as redrafted contains an inherent contradiction. On the one hand, the rule specifies that the test conditions set forth are an attempt to approximate normal living conditions. On the other hand, the rule requires testing with doors and windows closed for one hour prior to sampling. We respectfully submit that at an indoor temperature of 80 degrees with 60 percent humidity, it would hardly be "normal" to have all doors and windows in a residential unit closed.

Beyond this, however, current available technology will simply not permit the building industry to meet the 0.5 ppm. standard set forth in the rule under the extreme conditions specified above. The change in the permissible temperature range for testing, coupled with the specific ventilation requirements contained in the revised rule, thus, have far-reaching implications for an entire industry. Such changes, the Institute submits, are not mere modifications of the rule as originally published, but are the kind of wholesale rewriting of the rule which must be found to trigger the need for republication with the resulting opportunity for interested and impacted parties to comment.

For all of the reasons set forth above, as well as those discussed more fully in the Institute's earlier comment letter and in the November 17, 1980 letter submitted by MHI, we urge that the revised proposed temporary rule be disapproved.

Very truly yours,

FAEGRE & BENSON

By _____
Gordon G. Busdicker

_____
Jerry W. Snider

_____
Elizabeth L. Taylor

On behalf of the Formaldehyde Institute

cc: Jerry Anderson, Esq.

RECEIVED
NOV 19 1980
ATTORNEY GENERAL
ADMINISTRATIVE AGENCIES

Our File No. 642

ADMIN 1000 (Rev. 1/78)
SF-00006-01

STATE OF MINNESOTA

DEPARTMENT ATTORNEY GENERAL

Office Memorandum

TO : GEORGE R. PETTERSEN
Commissioner of Health
Attn: BILL MILLER
Special Assistant
Attorney General

DATE: October 15, 1980

FROM : JERRY S. ANDERSON
Special Assistant
Attorney General

PHONE: 296-1288

SUBJECT: In the Matter of the Proposed Adoption of Temporary Rules Relating to Formaldehyde

The rules in the above-entitled matter have not been approved by this office for the following reasons:

1. The rules as proposed, which were published in the State Register on June 23, 1980, related to the sale, rental, or lease of newly-constructed residential units only. The rule as adopted, however, in § 1.234 C.1., now governs the sale of any residential unit. The effect of this change, as you are aware, is to include residential units previously owned and occuped. Thus, this new version of the rule clearly affects classes of persons that the originally proposed rule did not and who would have had no reason to comment on the proposed rule. This change is therefore a substantial change from the rule as proposed and cannot be approved due to improper notice.

2. Section 1.234 C.2. of the rule as adopted, relating to the installation of foam insulation, did not appear in the rule as proposed and published. Because this section goes to a new subject matter of significant substantive effect, it is also a substantial change from the rule as proposed and is improper because of lack of notice to persons affected by this change.

3. With regard to both subdivisions C.1. and C.2., the statute that authorizes the Commissioner to make rules relating to formaldehyde, Minn. Laws 1980, ch. 594, § 1, states that the standard shall govern "the sale of building materials and housing units that contain products made with urea formaldehyde." (Emphasis added.) This rule, however, provides for an ambient air limit of .5 ppm of formaldehyde without being limited to urea formaldehyde. While it may be true, as I have been told, that the test doesn't distinguish between different types of formaldehyde, the effect of the rule as adopted is to regulate sales based on the combined level of all types of formaldehyde. Thus, subdivisions C.1. and C.2. are overly broad under the statutory authority granted and must be limited to urea formaldehyde.

4. Subdivisions E.1-5, and 11 are not proper rules and must be deleted. This material is merely informative and has no substantive effect on the test method that is to be employed. Subdivisions E.6-10 form the substance of the test method being required; the rule must be limited to this.

5. In subdivision F.1.c., the use of the term "normal ventilation" is impermissibly vague. No standards or criteria are included to inform those affected by the rule as to what is "normal" in a given situation. The implication is that there is a "normal" ventilation that will be applied to all tests.

6. Subdivision F.1. does not include a condition as to the location in a given room where a sample is to be taken. Apparently, a test may be affected by the proximity to a formaldehyde gas emitter. Therefore, this subdivision, in combination with subdivision F.2., is impermissibly vague.

7. Subdivision F.2.b. is impermissibly vague in that it does not state what effect the results of a consumer's test shall have. In its present form, this subdivision might be interpreted to turn a legal sale pursuant to subdivisions C.1. and F.2.a. into an illegal sale if the result of the consumer's test is greater than .5 ppm. Thus, this subdivision must be deleted or rewritten to set forth the ramifications of such a test. If the choice is made to rewrite the subdivision to include a remedy, consideration should be given to the extent of the Commissioner's authority under the statute to make a rule that affects the legal sale of a residential unit after the fact.

8. The Commissioner of Health has no authority to adopt subdivision G. The proposed rules in this subdivision relate solely to matters included in Minnesota Statutes chapter 325, which governs the regulation of manufacturers and sale. In reviewing chapter 325, I am unable to find anything that gives the Commissioner of Health authority to adopt rules regarding any matter therein. The only relationship that exists between sections 1 and 2 of Minn. Laws 1980, ch. 594 is with regard to the Commissioner's determination, and as I understand that determination, it was that a significant health problem exists, not that .5 ppm constitutes a significant health problem. Therefore, subdivision G.1. in its present form is unnecessary as well as lacking in statutory authority. This subdivision could be rewritten, however, to relate solely to this rule.

Additionally, this office has received outside comments regarding the legality of these rules. Because of the apparent merit to some of these arguments, and because this office has not received from the agency a response to these comments, I request that the following issues regarding the possible illegality of parts of this rule be addressed in writing by the agency.

1. Is the Commissioner's determination that a significant health problem is presented by the use of building materials that emit urea formaldehyde gas a rule and therefore subject to rulemaking procedures under the Minnesota APA?

The ramifications of such a decision are twofold. First, if § 1.234 A. is a rule, it was not included in the proposed rules and therefore may constitute a substantial change. Second, the remainder of this rule is only valid if such a determination has been made. If the determination was improper, or made improperly, § 1.234 B.-F. may not be adopted.

Please address the definition of a rule in Minn. Stat. § 15.0411, subd. 3, relevant case law, and the legislative history of Minn. Laws 1980, ch. 594, § 1 to the extent that such history is relevant.

2. Does § 1.234 B.1. create an equal protection problem, in that mobile homes have a different standard to meet than other types of residential units that may include the same items?

3. Is § 1.234 C.1. invalid on due process or related grounds in that it affects residential units, which contain building materials that emit urea formaldehyde gas, that have already been constructed without notice of a standard that would have to be met? Related to this issue are questions of the prospective or retroactive nature of these rules and governmental taking of private property by virtue of prohibiting the sale of an existing structure because of the cost of repair or replacement.

4. Does 1 MCAR § 1.234 conflict in any manner with existing rules relating to the energy efficiency of residential units and what impact does this rule have on persons who have complied with or attempted to comply with such rules? Does the Department of Health need to be concerned with any such rules? Apparently, the Department of Administration, Building Code Division, and the Minnesota Energy Agency have adopted rules relating to energy conservation standards pursuant to Minn. Stat. § 116H.129.

After consideration of the above comments and agency action, if any, these rules may be resubmitted for our review. At the time of resubmission please be sure to include the original and two copies of the Rule as Adopted and the Order Adopting Rules, as well as one copy of any necessary supporting material. Also, please include a transmittal memorandum specifying that the rule is being resubmitted so that we may obtain our initial file in this matter.

If you have any questions regarding this matter, please contact me.

JSA:mb
Enclosure

cc: Duane Harves
Susan Robertson

AG Copy

STATE OF MINNESOTA
COUNTY OF HENNEPIN

BEFORE THE MINNESOTA
COMMISSIONER OF HEALTH

In the Matter of Temporary Rules Relating to Formaldehyde * ORDER FOR ADOPTION

Minnesota Laws 1980, Chap. 594, sec. 1 required the Commissioner of Health, hereafter "commissioner," to determine if a significant health problem is presented by the use of building materials that emit formaldehyde gases. The commissioner determined that formaldehyde emitted by building materials does present a significant health problem. This determination was made public in the form of a press release, issued on May 22, 1980, a copy of which is attached hereto and made a part hereof.

Minnesota Laws 1980, Chap. 594, sec. 1 further required the commissioner to promulgate temporary rules pursuant to Minn. Stat. § 15.0412 subd. 5 (1978) establishing standards governing the sale of building materials and housing units that contain products made with urea formaldehyde. Such rules were proposed by publication in the State Register, June 23, 1980, p. 1963. Comments were received thereon until August 1, 1980, and all have been reviewed. The rules were submitted to the Attorney General for review on October 9, 1980 and rejected on October 15, 1980.

After having afforded interested persons an opportunity to present comments, statements and arguments, having considered all of the submissions and applicable statutory standards and criteria including the grounds for rejection by the Attorney General upon earlier review, and having confirmed the need for the above-captioned rules,

NOW, THEREFORE, IT IS ORDERED that 7 MCAR §1.234, a copy of which is attached hereto and made a part hereof, is adopted as a temporary rule, this 7th day of November 1980, pursuant to authority vested in me by Laws, 1980, Chap. 594, sec. 1. The rules will be effective for 90 days from the date of their

approval by the Attorney General and may remain in effect for an additional 90 days upon issuance of a new order.

STATE OF MINNESOTA

George R. Pettersen, M.D.
Commissioner of Health

STATE OF MINNESOTA

COUNTY OF HENNEPIN

BEFORE THE MINNESOTA

COMMISSIONER OF HEALTH

In the Matter of Temporary * Rules Relating to Formaldehyde*

SUPPLEMENTARY ORDER FOR ADOPTION

Minnesota Laws, 1980, Chap. 594, authorized the commissioner of health to adopt a temporary rule relating to standards governing the sale of residential units which are constructed of materials containing urea formaldehyde. A temporary rule, 7 MCAR § 1.234 was adopted by order of the commissioner of health on November 7, 1980. The rule as adopted did not specify an effective date. Thus the rule did not adequately inform those persons who would be affected thereby, as to when the rule would take effect.

NOW, THEREFORE, IT IS ORDERED that 7 MCAR § 1.234A.3 be amended to read as follows: ""newly constructed" means that construction of the unit was completed after December 15, 1980."

IT IS FURTHER ORDERED that 7 MCAR § 1.234, as amended herein, is adopted as a temporary rule this 14th day of November, 1980, pursuant to authority vested in me by Laws, 1980, Chap. 594, sec. 1. The rule as amended will be effective for 90 days from the date of approval by the Attorney General and may remain in effect for an additional 90 days upon issuance of a new order.

STATE OF MINNESOTA

George R. Pettersen M.D.

George R. Pettersen, M.D.
Commissioner of Health

Temporary Rule as Adopted

7 MCAR § 1.234. Formaldehyde in Residential Units.*

A. Definitions. For the purpose of this rule the following terms or phrases shall have the meanings given below:

1. "building materials" means any material containing urea formaldehyde which is used in the construction of a residential living unit, including but not limited to particle board, plywood and paneling. The phrase also includes urea formaldehyde-containing material which is installed in a residential unit by the manufacturer or seller during construction of the unit and prior to the time of sale.

2. "commissioner" means the commissioner of health.

3. "newly constructed" means that construction of the unit was completed after December 15, 1980.

4. "residential unit" means any mobile home, single-family residence, or living unit in a multi-unit structure, regardless of type of ownership.

B. Formaldehyde level. After the effective date of this rule,

1. the ambient indoor air of any newly constructed residential

*The commissioner of health has determined that a significant health problem is presented by the use of building materials that emit formaldehyde gas. Because individuals are known to react differently to the same level of formaldehyde, the commissioner hereby declares that the 0.5 ppm level which is stated in the rule relating to the sale of residential units (7 MCAR § 1.234) does not necessarily constitute a "significant level of formaldehyde" for the purpose of Minn. Laws, 1980, Chap. 594, § 2, subd. 4.

overly broad

unit which is sold shall not contain more than 0.5 parts per million (ppm) of formaldehyde which is attributable to building materials.

C. For the purpose of this rule, measurements for formaldehyde shall be made according to the method and under the conditions prescribed in parts D and E of this rule.

D. Test Method. Formaldehyde shall be measured according to NIOSH Manual of Analytical Methods, 2nd Edition, NIOSH 77-157-A, 1977, Method # P&CAM 125, as follows:

1. Apparatus

a. Sampling Equipment. The sampling unit for the impinger collection method consists of the following components:

(1) A graduated midget impinger containing the absorbing solution or reagent.

(2) A pump suitable for delivering flow rates of 1 liter per minute for 24 hours. The sampling pump is protected from splashover or water condensation by an adsorption tube loosely packed with a plug of glass wool and inserted between the exit arm of the impinger and the pump.

(3) An integrating volume meter such as a dry gas or wet test meter.

(4) Thermometer.

(5) Manometer.

(6) Stopwatch.

b. Spectrophotometer or Colorimeter. An instrument capable of measuring the absorbance of the color developed solution at 580 nm.

c. Associated laboratory glassware.

2. Reagents

a. Chromotropic Acid Reagent. Dissolve 0.10 g of 4,5-dihydroxy-2,7-naphthalenedisulfonic acid disodium salt (Eastman Kodak Company, Rochester, New York, Cat. No. P230) in water and dilute to 10 ml. Filter if necessary and store in a brown bottle. Make up fresh weekly.

b. Concentrated sulfuric acid.

c. Formaldehyde Standard Solution "A" (1 mg/mℓ). Dilute 2.7 mℓ of 37 percent formalin solution to 1 liter with distilled water. This solution must be standardized as described in Section 9.1. The solution is stable for at least a 3-month period. Alternatively sodium formaldehyde bisulfite (Eastman Kodak Company, Cat. No. P6450) can be used as a primary standard. Dissolve 4.4703 g in distilled water and dilute to 1 liter.

d. Formaldehyde Standard Solution "B" (10 μg/mℓ). Dilute 1 mℓ of standard solution "A" to 100 mℓ with distilled water. Make up fresh daily.

e. Iodine, 0.1 N (approximate). Dissolve 25 g of potassium iodide in about 25 mℓ of water, add 12.7 g of iodine and dilute to 1 liter.

f. Iodine, 0.01 N. Dilute 100 mℓ of the 0.1 N iodine solution to 1 liter. Standardize against sodium thiosulfate.

g. Starch Solution, 1 Percent. Make a paste of 1 g of soluble starch and 2 mℓ of water and slowly add the paste to 100 mℓ of boiling water. Cool, add several mℓ of chloroform as a preservative, and store in a stoppered bottle. Discard when a mold growth is noticeable.

h. Sodium Carbonate Buffer Solution. Dissolve 80 g of anhydrous sodium carbonate in about 500 mℓ of water. Slowly add 20 mℓ of glacial acetic acid and dilute to 1 liter.

i. Sodium Bisulfite, 1 Percent. Dissolve 1 g of sodium bisulfite in 100 mℓ of water. It is best to prepare a fresh solution weekly.

3. Procedure

a. Cleaning of Equipment. Care must be exercised to ensure the absence of probable contaminants like organic materials that can be charred by concentrated sulfuric acid. Soaking glassware for one hour in a 1:1 mixture of nitric and sulfuric acids, followed by thorough rinsing with double-deionized water will remove all possible organic contaminants.

b. Collection and Shipping of Samples

(1) Pour 20 mℓ of the absorbing solution (distilled water) into each graduated midget impinger.

(2) Connect two impingers in series to the vacuum pump (via the absorption tube) and the prefilter assembly (if needed) with short pieces of flexible tubing. The minimum amount of tubing necessary to make the joint between the prefilter and impingers should be used. The air being sampled should not be passed through any other tubing or other equipment before entering the impingers.

(3) It has been recommended that two impingers must be used in series because under conditions of sampling, the collection efficiency of only one impinger is approximately 80 percent. With two impingers in series the total collection efficiency is approximately 95 percent. The contents of each impinger should be analyzed separately.

(4) Turn on pump to begin sample collection. Care should be taken to measure the flow rate, time and/or volume as accurately as possible. The sample should be taken at a flow rate of 1 ℓpm for one hour.

These conditions give a total of 60 liters of air that is drawn through the system. However, a shorter sampling time can be used providing enough formaldehyde is collected to be above the lower limit of sensitivity of the method.

(5) After sampling, the impinger stem can be removed and cleaned. Tap the stem gently against the inside wall of the impinger bottle to recover as much of the sampling solution as possible. Wash the stem with a small amount (1-2 mℓ) of unused absorbing solution and add the wash to the impinger. Then the impinger is sealed with a hard, non-reactive stopper (preferably Teflon). Do not seal with rubber. The stoppers on the impingers should be tightly sealed to prevent leakage during shipping. If it is preferred to ship the impingers with the stems in, the outlets of the stem should be sealed with Parafilm or other non-rubber covers, and the ground glass joints should be sealed (i.e., taped) to secure the top tightly.

(6) Care should be taken to minimize spillage or loss by evaporation at all times. Refrigerate samples if analysis cannot be done within a day.

(7) Whenever possible, hand delivery of the samples is recommended. Otherwise, special impinger shipping cases designed by NIOSH should be used to ship the samples.

(8) A "blank" impinger should be handled as the other samples (fill, seal and transport) except that no air is sampled through this impinger.

c. Analysis

(1) Transfer the sample from each impinger to either a 25 mℓ or 50 mℓ graduate. Note the volume of each solution.

(2) Pipet a 4 mℓ aliquot from each of the sampling solutions into glass stoppered test tubes. A blank containing 4 mℓ of distilled water must also be run. If the formaldehyde content of the aliquot exceeds the limit of the method, a smaller aliquot diluted to 4 mℓ with distilled water is used.

(3) Add 0.1 mℓ of 1 percent chromotropic acid reagent to the solution and mix.

(4) To the solution pipette slowly and cautiously 6 mℓ of concentrated sulfuric acid. The solution becomes extremely hot during the addition of the sulfuric acid. If the acid is not added slowly, some loss of sample could occur due to spattering.

(5) Allow to cool to room temperature. Read at 580 nm in a suitable spectrophotometer using a 1 cm cell. No change in absorbance was noted over a 3 hour period after color development. Determine the formaldehyde content of the sampling solution from a curve previously prepared from standard formaldehyde solutions.

(6) During the analysis procedure, it is good practice to group together the two impingers from each sampling series and label them as "A" and "B." The formaldehyde content calculated in "A" is added to that calculated in "B" to give the total amount in the sampled atmosphere by the impingers in series.

4. Calibration and Standards

a. Standardization of Formaldehyde Solution

(1) Pipette 1 mℓ of formaldehyde standard solution "A" into an iodine flask. Into another flask pipette 1 mℓ of distilled water. This solution serves as the blank.

(2) Add 10 mℓ of 1 percent sodium bisulfite and 1 mℓ of 1 percent starch solution.

(3) Titrate with 0.1 N iodine to a dark blue color.

(4) Destroy the excess iodine with 0.05 N sodium thiosulfate.

(5) Add 0.01 N iodine until a faint blue end point is reached.

(6) The excess inorganic bisulfite is now completely oxidized to sulfate, and the solution is ready for the assay of the formaldehyde bisulfite addition product.

(7) Chill the flask in an ice bath and add 25 mℓ of chilled sodium carbonate buffer. Titrate the liberated sulfite with 0.01 N iodine, using a microburette, to a faint blue end point. The amount of iodine added in this step must be accurately measured and recorded.

(8) One mℓ of 0.0100 N iodine is equivalent to 0.15 mg of formaldehyde. Therefore, since 1 mℓ of formaldehyde standard solution was titrated, the mℓ of 0.01 N iodine used in the final titration multiplied by the factor, 0.15, gives the formaldehyde concentration of the standard solution in mg/mℓ.

(9) The factor, 0.15, must be adjusted or determined accordingly on the basis of the exact normality of the iodine solution.

b. Preparation of Standard Curve

(1) Pipet 0, 0.1, 0.3, 0.5, 0.7, 1.0, and 2.0 mℓ of standard solution "B" into glass stoppered test tubes.

(2) Dilute each standard to 4 mℓ with distilled water.

(3) Develop the color as described in the analysis procedure

(4) Plot absorbance against micrograms of formaldehyde in the color developed solution. Note that the microgram concentration of the formaldehyde is determined based on the standardization value of solution A.

5. Calculations

a. Convert the volume of air sampled (V) to the volume of air at standard conditions (V_s) of 760 mm of mercury and 25°C, using the correction formula:

$$V_s = V \times \frac{P}{760} \times \frac{298}{(T + 273)}$$

where:

V_s = volume of air in liters at standard conditions
V = volume of air sampled in liters
P = barometric pressure in mm of mercury
T = temperature of sample air, °C

b. Determine the total concentration (C_t) of formaldehyde present in the two sample impingers in series, A and B.

$$C_t = C_A \times F_A + C_B \times F_B$$

where:

C_t = total μg of formaldehyde in the sample.

C_A and C_B = respective formaldehyde concentration in μg of the sample aliquots taken from impingers A and B as determined from the calibration curve

F_A and F_B = respective aliquot factor; $\frac{\text{sampling soln. vol. in m}\ell}{\text{m}\ell \text{ aliquot used}}$

c. The concentration of formaldehyde in the sampled atmosphere may be calculated by using the following equation, assuming standard conditions are taken as 760 mm of mercury and 25°C:

$$\text{ppm (volume)} = \frac{C_t \times 24.47}{V_s \times \text{M.W.}}$$

where:

V_s = liters of air sampled at standard conditions

M.W. = molecular weight of formaldehyde (30.03)

24.47 = $\mu\ell$ of formaldehyde gas in one micromole at 760 mm Hg and 25°C.

6. Alternate Test Method. Measurements made by an alternate analytical method are deemed to be valid only if the alternate method has been approved by the commissioner. Such approval shall be granted if the proponent of the alternate method can demonstrate that the alternate method results in measurements which have at least the same precision, reliability and accuracy as those obtained with the use of the NIOSH method prescribed above.

F. Testing Conditions. All of the conditions prescribed below must be met before a test result is considered valid. The following conditions are imposed to assure that the amount of formaldehyde measured is that which may be expected to be present when the unit is maintained under normal living conditions, and is that which is reasonably attributable to the building materials.

1. A test shall be performed under the following conditions of temperature, humidity and ventilation:

a. temperature range: 65 to 80 degrees Fahrenheit;

b. humidity range: 40 to 60 percent;

c. windows and doors closed for one hour prior to the taking of air samples. In addition, where a housing unit has a specific provision for dilution of air by mechanical means, such mechanical means shall be operated for one hour prior to the performance of any test. Such mechanical means does not include the use of special purpose fans such as kitchen or bathroom fans.

2. Air sampling:

a. A test shall consist of three different air samples taken in habitable rooms of the residential unit. The test results shall be the average of the measurements of the three samples.

b. The air samples shall be taken in the center of the room, at a point which is approximately equidistant from opposing walls, and at a height of 3.5 to 4 feet above the floor.

3. In order to validly test for formaldehyde which is attributable to building materials, the consumer shall remove from the unit, at least 30 minutes before the air samples are taken, any major source of formaldehyde which was not present in the unit at the time of sale, and cease any activity such as smoking which may contribute significantly to the level of formaldehyde in the air of the unit. Such sources include, but are not limited to the following: draperies or furniture made of plywood or particleboard and upholstered furniture.

APPROVED AS TO FORM AND EXECUTION

11/20 1980

WARREN SPANNAUS, Attorney General

BY Jerry S. Anderson

SPECIAL ASSISTANT ATTORNEY GENERAL

OUR FILE - 642

Permanent Rule_____

Temporary Rule X

RULES REVIEW CHECKLIST

DATE RULES RECEIVED 10/8 DUE DATE 10/15

Resubmitted and Received 11/13 Due 11/20

a. Returned to Agency w/o Filing w/Secretary of State_____
b. Approved 11/20/80 Date Sent Back to Agency 11/20/80

- -

1. Rules as Adopted_____

2. Rules as Proposed_____

3. Certificate of Board's
   Authorizing Resolution, where applicable_____

4. Order for Hearing_____

5. Notice of Hearing_____
   Sufficiency_____

6. Secretary of State's List_____(one copy only)

7. Certificate of Acquisition of
   Secretary of State's List_____

8. Secretary of State's Certification of Delivery
   of Secretary of State's List to Agency_____

9. Affidavit of Mailing_____
   At least 30 days prior to hearing_____

10. Publication in State Register_____
    At least 30 days prior to hearing_____

11. Statement of Need and Evidence_____

12. Hearing Examiner's Report_____

13. Agency's Findings of Fact_____

14. Certificate of Board's Resolution
    Adopting Rules, where applicable_____

15. Order Adopting_____

16. Report of Chief Hearing Examiner_____

17. Order Approving Incorporation by Reference,
    where applicable_____

18. Certificate of Compliance with Rulemaking Procedures_____

19. Copy of Notice of Intent to Solicit Outside Opinion,
    where applicable_____

20. Petition by Public, where applicable_____

LAW OFFICES

ROBINS, DAVIS & LYONS

33 SOUTH FIFTH STREET

MINNEAPOLIS, MINNESOTA 55402

TELEPHONE (612) 339-4911

TELECOPIER (612) 339 4181

TWX 910-576-2737

SOLLY ROBINS
SIDNEY S. FEINBERG
BERNARD ROSENBERG
JAMES A. KARIGAN
SHELDON W. HALPERN
ELLIOT S. KAPLAN
JAMES L. FETTERLY
STANFORD ROBINS
SIDNEY KAPLAN
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CHARLES H. HALPERN (1911-1965)

WILLIAM P. LINHOFF, JR.
MICHAEL L. MEYER
LAWRENCE T. HOFMANN
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RITA A. McCONNELL
BETSY HALL

November 17, 1980

The Honorable Warren R. Spannaus
Attorney General
State of Minnesota
Room 102
State Capitol
St. Paul, Minnesota 55155

Dear Mr. Spannaus:

This letter is being submitted on behalf of the Manufactured Housing Institute to assist the Attorney General in reviewing the form and legality of the revised temporary rule adopted by the Commissioner of Health, 7 MCAR § 1.234 banning the sale of all newly constructed residential units having an ambient air level of formaldehyde greater than 0.5 parts per million. (Copies of the revised rule as presently adopted, the rule as previously adopted on October 8, 1980, and the rule as published in the State Registrar on June 23, 1980, are attached hereto as Exhibits A, B, and C respectively.) This letter will supplement the Manufactured Housing Institute's previous submission of October 9, 1980, addressing the rule as adopted on October 8, 1980. To avoid repetition, sections of the October 9, 1980 submission will be specifically adopted herein by reference. The focus of this letter will be on the differences between the present version of the rule and both the previously adopted rule and the rule as published in the State Register.

I.

THE RULE EXCEEDS THE STATUTORY AUTHORITY OF THE COMMISSIONER.

A. The Legislature Did Not Authorize The Commissioner To Ban The Sale Of Any Products Or Housing Units.

This section of the Manufactured Housing Institute's submission of October 9, 1980, is adopted by reference.

B. The Statute Provides No Enforcement For The Proposed Rule And Indicates That Legislative Intent That The Commissioners Rule Deal Only With The Warning And Remedy Provisions Of The Statute.

Consistent with the views expressed in the October 15, 1980, Memoandum of Special Assistant Attorney General Jerry S. Anderson, the Manufactured Housing Institute no longer believes that the Commissioner has the statutory authority to promulgate dealing with the remedy provisions of the statute, Minn. Laws 1980, ch. 594, § 2(4). Subject to that modification, this section of the Manufactured Housing Institute's submission of October 9, 1980, is adopted by reference.

C. The Statute Must Be Construed To Avoid Unreasonable Results.

This section of the Manufactured Housing Institute's submission of October 9, 1980, is adopted by reference.

D. This Statute Must Be Construed To Avoid Constitutional Questions.

This section of the Manufactured Housing Institute's submission of October 9, 1980, is adopted by reference.

E. The Statute Must Be Construed As Being Prospective.

The Commissioner has modified the effective date of the rule by changing the definition of "newly constructed". In the proposed rule as published in the State Register, this term meant that the residential unit had not previously been occupied. Now this term means that construction of the unit was completed after the effective date of this rule.[1] While this

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[1] It is the understanding of the undersigned that the definition is being further revised to omit the words "the effective date of this rule" and replace them with "December 15, 1980". This change does not affect the substance of the argument presented here. thiere will be residential units which are now substantially complete, but which will not be entirely completed until after December 15, 1980.

change lessens the retroactive effect of the rule, the rule still applies to units for which the construction has been substantially, not entirely, completed on the effective date of the rule. The cost of altering such a residential unit so as to comply with the 0.5 parts per million standard may well increase the total construction cost to a figure above the selling price of the unit. In this situation the rule would not only have a retroactive effect, but it would result in the taking of property without just compensation.

F. The Recommended Statutory Interpretation Gives Substantial And Significant Effect To Section One Which Authorizes Adoption Of Rules By The Commissioner.

Excepting the discussion of the Commissioner's function of making more specific the remedy provision of the statute, this section of the Manufactured Housing Institutes submission of October 9, 1980 as adopted by reference.

G. The Rule Is Not Limited To Regulating The Sale Of Building Materials And Housing Units That Contain Products Made With Urea Formaldehyde.

As pointed out in the October 15, 1980 Memorandum of Special Assistant Attorney General Jerry S. Anderson, the rule as adopted on October 8, 1980, was overly broad in that it was not limited to urea formaldehyde. Minn. Laws 1980, ch. 594, § 1 provides that the Commissioner may promulgate emergency rules "establishing standards governing the sale of building materials and housing units that contain products with urea formaldehyde." (Emphasis added.) There has been no change between the rule adopted on October 8, 1980, and the present rule with respect to the failure of the Commissioner to limit the application of those rules to products and housing units containing urea formaldehyde. The present rule provides that:

> After the effective date of this rule, 1. The ambient air of any newly constructed residential unit which is sold shall not contain more than 0.5 parts per million (ppm) of formaldehyde which is attributable to building materials.

This ban covers all types of formaldehyde, including not only urea but also phenol formaldehyde. While this formaldehyde must be "attributable to building materials" and that phrase

is defined as "any material containing urea formaldehyde", the test procedure set forth in the statute does not distinguish between those two types of formaldehyde. The Commissioner admits this in his Memorandum accompanying the new rule. The NIOSH test measures formaldehyde gas emitted both by products containing urea formaldehyde and by products containing phenol formaldehyde. The final parts per million figure derived from the test represents the combined effects of those two types of sources. Subdivision C of the rule requires the use of the NIOSH test until such time as an alternate test method may be devised and approved by the Commissioner. It is likely that no such alternate test will be approved before the temporary rule automatically expires 180 days after its effective date. For all practical purposes only the NIOSH test is available and under that test a residential unit may not be sold if it contains more than 0.5 parts of formaldehyde even though that formaldehyde may be derived from products containing phenol formaldehyde rather than urea formaldehyde. At the extreme, using the NIOSH test the rule will ban the sale of residential units which contain absolutely no urea formaldehyde if they contain sufficient quantities of phenol formaldehyde products to result in an ambient air level of formaldehyde greater than 0.5 ppm. Even if only "minute amounts" of phenol formaldehyde are present (as the Commissioner claims in his Memorandum) the "minute amounts" may mean the difference between being over and under the Commissioner's 0.5 ppm standard and thus ban sales due to, in part, the presence of phenol formaldehyde which the Commissioner is not empowered to regulate.

The extension of the sales ban to phenol formaldehyde is particularly significant in light of the legislative history of the statute. A review of the legislative history reveals the intent on the part of the legislature to encourage the substitution of phynol formaldehyde or urea formaldehyde in the manufacture of building materials. The legislature took care to limit each of the operative sections of the statute to urea formaldehyde. Not only the authorization for the Commissioner to promulgage rules, but also the warning requirement and the remedy provision of the statute are expressly limited by the use of the term "urea" "formaldehyde". By prescribing the use of a test which does not distinguish between urea formaldehyde and phenol formaldehyde, the Commissioner has thwarted and exceeded his authority under the statute. This impermissible and unauthorized extension of the sales ban to cover phenol formatledehyde goes to the very heart of the rule and is such a seriousness and direct violation of the statutory limitation that standing alone it is sufficient to require invalidation of the entire rule.

Finally, subdivision F3 of the rule provides for the conditions of a formaldehyde test to be conducted by the consumer. Because the test conditions require the consumer to remove formaldehyde emitters such as furniture, it must be assumed that this consumer test is designed to be conducted sometime after the purchase of a residential unit and the addition of furniture and other items by the consumer. Any test conducted at that time cannot be a standard governing the sale of housing units since the sale has been previously completed. The only apparent purpose for this consumer test is in connection with the remedy provisions of the statute. The Attorney General has already pointed out that the Commissioner of Health has no authority to adopt rules relating to Minn. Stat. ch. 325 in which the remedy provision is found. The Commissioner has omitted from the new rule various other provisions in the rule adopted on October 8, 1980 which dealt with the remedy provision, but subdivision F3 of the new rule remains.

II.

THE RULE HAS NOT BEEN PROPERLY PROMULGATED

A. The Commission's Determination of a Significant Health Problem Has Not Been Adopted as a Rule.

This section of the Manufactured Housing Institute's submission of October 9, 1980, is adopted by reference. The argument presented by the Commissioner in his Memorandum accompanying this Rule does not justify the failure to publish the finding of a significant health problem as a proposed rule in the State Register, solicit public comment, and submit a finally adopted rule to the Attorney General for review. Merely issuing this finding in a press release does not suffice under the Minnesota APA, nor does including the finding in the prefatory remarks to a published proposed rule or in a footnote to the present Rule. These backdoor attempts to comply with the requirements of the Minnesota APA demonstrate the Commissioner's awareness that this finding is indeed a "rule" as defined in that statute. The Legislature defined the term "rule" very broadly in that statute and it has been interpreted broadly by the Supreme Court of Minnesota. Had the Legislature wanted to exempt this finding from the Minnesota APA it must be presumed that it would have used express exemption language to do so. No such exemption appears in Minn. Laws 1980, ch. 594, § 1. The Commissioner must publish the finding as a rule, stating the factual basis which supports it, and allow meaningful

public comment. Until then rules such as 7 MCAR § 1.234 cannot be properly promulgated.

B. The Proposed Rule Lacks A Statement Of Its Supporting Factual Basis.

This section of the Manufactured Housing Institute's submission of October 9, 1980, is adopted by reference.

C. There Should Be A Formal Hearing On The Proposed Rule.

This section of the Manufactured Housing Institute's submission of October 9, 1980, is adopted by reference.

D. Environmental Effects Must Be Considered.

This section of the Manufactured Housing Institute's submission of October 9, 1980, is adopted by reference.

E. The Rule Is Overly Vague

The Commissioner has modified the rule so as to address some of the specific instances of vagueness cited in the Manufactured Housing Institutes submission of October 9, 1980. However, several provisions of the rule remain unreasonably vague. At the outset, the title of the rule is now followed by an asterisk which refers to a footnote. That footnote contains two provisions of the rule as adopted on October 8, 1980, which were found to be improper or at least questionable by the Attorney General's office. It is impossible to determine from the presently adpted rule itself what the significance of the provisions included in the footnote. In his Memorandum the Commissioner has explained that the footnote is purely advisory and neither adds to nor subtracts from the Rule. Such a statement should appear on the face of the Rule. Moreover, the Attorney General has already stated that merely informative material is not properly included in a rule. See paragraph 4 of the October 15, 1980 Memorandum of Jerry S. Anderson.

The test procedure remains vague in that critical factors such as temperature and humidity are specified only by ranges. Different temperature/humidity combinations within the permitted ranges can yield test results which vary, some being above and others being below the 0.5 ppm standard.

Subdivision F1 provides that "where a housing unit has specific provision for the dilution of air by mechanical means, such mechanical means shall be operated for one hour prior to

the performance of any test." It is unclear what constitutes a mechanical means for the dilution of air. (In this letter it has been assumed that air conditioning and forced air heating systems fall within the scope of that phrase.) Also, the rule does not indicate whether a heating system or air conditioner is to be set at some temperature and the device is to run on an "as needed" basis for one hour.

Subdivision F2 of the rule provides that a test shall be the average of three different air samples taken in habitable rooms, but does not specify whether all three samples may be taken from one room or whether each sample must be taken from a different room. Also, the test may yield a reslt below the 0.5 ppm when air samples are taken from certain rooms, and exceed that level when the air samples are taken from another set of rooms.

Subdivision F3 provides some details concerning a test conducted by the consumer, but it is not clear whether the requirements of subdivisions F1 and F2 apply to such a consumer test. If those conditions do apply, there is no indication as to how the consumer is to proceed when atmospheric and environmental conditions prevent the consumer from achieving the required temperature, humidity, and ventilation standards. The rule does not specify whether the consumer must take air samples from the same rooms sampled by the manufacturer. With the exception of smoking, the consumer is not told what activities which contribute signifacantly to the level of formaldehyde in the unit must ceased for thirty minutes before the test is taken, nor is the consumer directed to any references from which he may obtain this information. The same is true for sources of formaldehyde which must be removed before testing.

Although some provisions of the rule have been stated with more specificity, other provisions remain impermissably vague.

F. Failure to Consider Relevant Facts and Lack of Substantial Evidence.

This section of the Manufactured Housing Institute's submission of October 9, 1980, is adopted by reference.

G. The Major Changes Recently Included In The Rule Require The Commissioner To Publish The New Rule And Receive Comments From The Public Before The New Rule Can Be Properly Adopted.

Comparing the present rule to the proposed rule which was published in the State Register on June 23, 1980, the following changes are observed:

(1) The present rule contains a statement (in a footnote) that the Commissioner has determined that a significant health problem is presented by the use of building materials that emit formaldehyde gas;

(2) The present rule contains a statement (in a footnote) that the 0.5 ppm level stated in the rule does not necessarily constitute a "significant level of formaldehyde" for the purposes of the remedy provision of the statute;

(3) The present rule contains both new and different test criteria regarding temperature, humidity, ventilation, and the number and location of air samples;

(4) The new rule contains a provision for consumer testing;

(5) The new rule changes the definition of "newly constructed" from an occupancy standard to a completion of constructive standard;

(6) The new rule applies only to the sale of residential units whereas the published rule applied also to the rental and lease of units;

(7) The new rule permits the development of an alternate test to be used in place of the NIOSH test.

These numerous and significant alternation, additions and delete one require publication of the new Rule and an opportunity for public comment. As previously discussed, the Commissioner's finding of a significant health problem underlies the entire rule, yet public comment has not been solicited on a rule incorporating that finding. Consumers could provide meaningful input on issues such as the consumer test, the definition of "building materials" and the rule's express limitation of the sale ban to formaldehyde emitted by those materials, and the elimination of the rental and lease of residential units from the scope of the rule. Manufactures and sellers could beneficially comment on the new test conditions and methods, the switch from an occupancy standard to a completion of construction standards in the definition of "newly constructed" residential units and the alternate test provision. Those

people and businesses who will be most directly affected by the new rule have not had the chance to participate in the making of the rule's provisions listed above. In the Minnesota APA the Legislature has guaranteed this right of public comment in the administrative temporary rule making process. Because of the degrees to which the new rule differs from the proposed rule published in the State Register, exceeding it in some respects and retroacting from it in others, the public's right to comment has been effectively denied.

III.

CONSTITUTIONAL PROBLEMS

A. The Delegation Doctrine

This section of the Manufactured Housing Institute's submission of October 9, 1980, is adopted by reference.

B. Substantive Due Process -- Void for Vagueness

This section of the Manufactured Housing Institute's submission of October 9, 1980, is adopted by reference. In addition, the new rule contains several inconsistencies which render it an unreasonable, arbitrary or capricious. As previously discussed, while the definition of the term "building material" is limited to products containing urea formaldehyde the NIOSH test prescribed by the rule does not differentiate between urea formaldehyde and phenol formaldehyde. Subdivision F of the rule prescribes testing conditions which are purportedly "imposed to assure that the amount of formaldehyde measured is that which may be expected to be present when the unit is maintained at a normal living condition, and is that which is reasonably attirbutable to the building materials." However, subdivision A1 defines "building materials" in such a fashion that carpeting, draperies, furniture and foam insulation are building materials when installed by the manufacturer or seller but are not building materials when installed by anyone else. It is difficult to understand how the test is to reflect normal living conditions when the test includes or excludes such common items as carpeting, draperies and upholstered furniture depending on the identity of the installer. Surely the effect of any formaldehyde emissions on the consumer does not depend upon this factor. If the consumer installs carpeting throughout his home then his normal living condition includes any formaldehyde emitted by that carpeting, yet the test prescribed by

the Commissioner excludes all formaldehyde emitted by the carpeting. One other test condition of subdivision f is that windows and doors be closed for one hour prior to the taking of air samples. At the same time, the rule requires that mechanical means for air dissolution (i.e. forced air heating and air conditioning systems) be operated for one hour prior to the performance of any test. One would think that on a warm day when air conditioning were normally be run, consumers in housing units which do not contain air conditioning would at least open their doors and windows. The test conditions include hot, muggy days where the temperature is 80 degrees F. and the relative humidity is 60%. Nonetheless, the purported "normal living condition" for a house without air conditioning on such a day is to have the doors and windows closed.

The consumer test of subdivision F3 requires consumer to remove formaldehyde emitters (such as draperies and furniture) and to cease formaldehyde emitting activities (such as smoking) for thirty minutes before air samples are taken. At the same time, subdivision F1 requires that the windows and doors be closed for one hour prior to the taking of air samples. Even if it were possible for the consumer to remove furniture from the residential unit half an hour before the test without opening any doors or windows, which must be closed for a full hour before the test, there is no reason to believe that the formaldehyde gas is emitted by the furniture will have dissipated from the residential unit in the thirty minutes before the air sample is taken. With the doors and windows closed it may take several hours before a substantial amount of the formaldehyde gas emitted by the furniture escapes or leaks out of the residential unit. Air samples taken before this occurs will include formaldehyde emitted by the furniture even though it does not fall within the definition of "building materials" as set forth in the rule.

One final example of the rule's arbitrariness is the fact that it regulates the sale of only "newly constructed" residential units. The rule does not cover residential units which were constructed before December 15, 1980. The Commissioner has recognized that these older units present their occupants with the same formaldehyde-related problems as "newly constructed" units because in the rule as adopted on October 8, 1980 extended the scope of the rule to all residential units both old and new.

When the inconsistencies discussed above are added to the fact that the capacity of existing test facilities is far short of the number of tests required to maintain past levels of newly

constructed residential unit sales the unreasonable, arbitrary and capricious character of the rule becomes evident.

C. Federal Preemption

This section of the Manufactured Housing Institute's submission of October 9, 1980 is adopted by reference.

D. Retroactivity -- Taking Without Just Compensation

As previously discussed the new rule is not quite as expansive in its retroactive effect as was the rule adopted on October 8, 1980. It is retroactive to the extent that it affects residential units which are now substantially completed but which will not become entirely completed until after the effective date of the Rule (December 15, 1980). With that proviso this section of the Manufactured Housing Institute's submission of October 9, 1980 is adopted by reference.

E. Equal Protection

The explicit differential treatment of conventional housing versus mobile homes which existed in the rule as adopted on October 8, 1980 has been eliminated in the new rule, but the essential discrimination against mobile homes remains. This discrimination is the result of the Rule's adoption of a definition of "building materials" which includes in the test formaldehyde emitted by "building materials" such as carpeting, furniture and insulation which are typically found in newly constructed mobile homes, but which are not typically found in newly constructed conventional housing. The rule requires measurment of the ambient air level in the mobile homes in the condition in which they will be sold, that is including furniture, carpeting and insulation installed by the manufacturer or seller. Although the mobile home without these articles may meet the rule's standards, the inclusion of these articles may place the ambient air level above the 0.5 ppm level. Conventional housing units will be tested for ambient air levels of formaldehyde at a time when they generally do not contain furniture, carpeting and a significant amount of insulation. This is because the consumers, not the manufacturers or sellers, of conventional homes usually install those items. However, when these articles are added to the conventional home by the

consumer the ambient air level of formaldehyde may rise substantially and exceed the 0.5 ppm level. Nonetheless, the conventional unit may be sold whereas the mobile unit may not. Housing units which will, when occupied by the consumer, present identical ambient air levels of formaldehyde are not treated identically under the Rule. This inequality is not rationally related to the statute's objectives and is an unconstitutional denial of equal protection. See, Clover Leaf Creamery Co. v. State, 289 N.W.2d 79 (Minn. 1979).

This violation of Equal Protection is exacerbated by the fact that conventional homes are typically built by in-state builders while a substantial percentage of mobile homes sold in this state are manufactured by out-of-state businesses. Such a discrimination in favor of in-state businesses violates not only equal protection, but also the Commerce Clause of the federal Constitution. See, City of Philadelphia v. New Jersey, 437 U.S. 617 (1978).

CONCLUSION

For all of the reasons discussed or referred to herein, we submit that the Attorney General disapprove the temporary Rule, 7 MCAR § 1.234.

Respectfully submitted,

ROBINS, ZELLE, LARSON & KAPLAN

Stephen H. Cohen
Gary J. Haugen
John N. Love

cc: Mr. Jerry S. Anderson
Special Assistant Attorney General

Temporary Rule as Adopted

7 MCAR § 1.234. Formaldehyde in Residential Units.*

A. Definitions. For the purpose of this rule the following terms or phrases shall have the meanings given below:

1. "building materials" means any material containing urea formaldehyde which is used in the construction of a residential living unit, including but not limited to particle board, plywood and paneling. The phrase also includes urea formaldehyde-containing material which is installed in a residential unit by the manufacturer or seller during construction of the unit and prior to the time of sale.

2. "commissioner" means the commissioner of health.

3. "newly constructed" means that construction of the unit was completed after the effective date of this rule.

4. "residential unit" means any mobile home, single-family residence or living unit in a multi-unit structure, regardless of type of ownership.

B. Formaldehyde level. After the effective date of this rule,

1. the ambient indoor air of any newly constructed residential

*The commissioner of health has determined that a significant health problem is presented by the use of building materials that emit formaldehyde gas. Because individuals are known to react differently to the same level of formaldehyde, the commissioner hereby declares that the 0.5 ppm level which is stated in the rule relating to the sale of residential units (7 MCAR § 1.234) does not necessarily constitute a "significant level of formaldehyde" for the purpose of Minn. Laws, 1980, Chap. 594, § 2, subd. 4.

unit which is sold shall not contain more than 0.5 parts per million (ppm) of formaldehyde which is attributable to building materials.

C. For the purpose of this rule, measurements for formaldehyde shall be made according to the method and under the conditions prescribed in parts D and E of this rule.

D. Test Method. Formaldehyde shall be measured according to NIOSH Manual of Analytical Methods, 2nd Edition, NIOSH 77-157-A, 1977, Method # P&CAM 125, as follows:

NOISH TEST OMITTED

6. Alternate Test Method. Measurements made by an alternate analytica method are deemed to be valid only if the alternate method has been approved by the commissioner. Such approval shall be granted if the proponent of the alternate method can demonstrate that the alternate method results in measurements which have at least the same precision, reliability and accuracy as those obtained with the use of the NIOSH method prescribed above.

F. Testing Conditions. All of the conditions prescribed below must be met before a test result is considered valid. The following conditio are imposed to assure that the amount of formaldehyde measured is that which may be expected to be present when the unit is maintained under normal living conditions, and is that which is reasonably attribut to the building materials.

1. A test shall be performed under the following conditions of temperature, humidity and ventilation:

a. temperature range: 65 to 80 degrees Fahrenheit;

b. humidity range: 40 to 60 percent;

c. windows and doors closed for one hour prior to the taking of air samples. In addition, where a housing unit has a specific provis for dilution of air by mechanical means, such mechanical means shall be operated for one hour prior to the performance of any test. Such mechanical means does not include the use of special purpose fans such as kitchen or bathroom fans.

2. Air sampling:

a. A test shall consist of three different air samples taken in habitable rooms of the residential unit. The test results shall be the average of the measurements of the three samples.

b. The air samples shall be taken in the center of the room, at a point which is approximately equidistant from opposing walls, and at a height of 3.5 to 4 feet above the floor.

3. In order to validly test for formaldehyde which is attributable to building materials, the consumer shall remove from the unit, at least 30 minutes before the air samples are taken, any major source of formaldehyde which was not present in the unit at the time of sale, and cease any activity such as smoking which may contribute significantly to the level of formaldehyde in the air of the unit. Such sources include, but are not limited to the following: draperies or furniture made of plywood or particleboard and upholstered furniture.

Temporary Rule as Adopted

7 MCAR § 1.234. Formaldehyde in Residential Units.

A. The commissioner of health has determined that a significant health problem is presented by the use of building materials that emit formaldehyde gas.

B. Definitions. For the purpose of this rule the following terms or phrases shall have the meanings given below:

1. "building materials" means any material containing urea formaldehyde which is used in the construction of a residential living unit, including but not limited to particle board, plywood and paneling. The phrase also includes urea formaldehyde foam insulation and carpeting which is installed in a mobile home by the manufacturer during construction of the unit.
2. "commissioner" means the commissioner of health.
3. "residential unit" means any mobile home, single-family residence, or living unit in a multi-unit structure, regardless of type of ownership.

C. Formaldehyde Level. After the effective date of this rule,

1. the ambient indoor air of any residential unit which is sold shall not contain more than 0.5 parts per million (ppm) of formaldehyde which is attributable to building materials, and
2. the installation of urea formaldehyde foam insulation in a residential unit shall not cause the ambient level of formaldehyde in the air of the unit to exceed 0.5 ppm of formaldehyde.

D. For the purpose of this rule, measurements for formaldehyde shall be made according to the method and under the conditions prescribed in parts E and F of this rule.

E. Test Method. Formaldehyde shall be measured according to NIOSH Manual of Analytical Methods, 2nd Edition, NIOSH 77-157-A, 1977, Method # P&CAM 125, as follows:

NIOSH TEST OMITTED

12. Alternate test method. Measurements made by an alternate analytical method are deemed to be valid only if the alternate method has been approved by the commissioner. Such approval shall be granted if the proponent of the alternate method can demonstrate that the alternate method results in measurements which have at least the same precision, reliability and accuracy as those obtained with the use of the NIOSH method prescribed above.

F. Testing Conditions. All of the conditions prescribed below must be met before a test result is considered valid. The following conditions are imposed to assure that the amount of formaldehyde measured is that which may be expected to be present when the unit is maintained under normal living conditions, and is that which is reasonably attributable to the building materials.

1. A test shall be performed under the following conditions of temperature, humidity and ventilation:
   a. temperature range: 65 to 80 degrees Fahrenheit;
   b. humidity range: 40 to 60 percent;
   c. normal ventilation rate, or
   d. where a housing unit has a specific provision for dilution of air by mechanical means, such mechanical means shall be operated for one hour prior to the performance of any test, unless the operation of such device would result in the test not being conducted under normal living condition:
2. Air sampling:
   a. A test shall consist of three different air samples taken in habitable rooms of the residential unit. The test results shall be the average of the measurements of the three samples.
   b. If a consumer has a complaint relating to a single room of a residential unit, then the test shall consist of three air samples taken from that single room. The test result shall be the average of the measurements of the three samples.

3. In order to validly test for formaldehyde which is attributable to building materials, the consumer shall remove from the unit, at least 30 minutes before the air samples are taken, any major source of formaldehyde which was not present in the unit at the time of sale, and cease any activity such as smoking which may contribute significantly to the level of formaldehyde in the air of the unit. Such sources include, but are not limited to the following: draperies or furniture made of plywood or particleboard and upholstered furniture.

G. Consumer Remedy.

1. Because individuals are known to react differently to the same level of formaldehyde, the commissioner hereby declares that the 0.5 ppm level which is prescribed in part C (above) does not constitute a significant ambient air level of formaldehyde for the purpose of Minn. Laws, 1980, Chap. 594, § 2, subd. 4.

2. If a consumer seeks a remedy under § 2, subd. 4 of the law, the following shall be deemed as complying with the medical report requirement of that subdivision:

   a. the consumer may submit to the manufacturer or seller a written medical report prepared by a licensed physician. The report shall specify the nature and degree of the health risks to the consumer which relate to formaldehyde; and

   b. the physician's report shall include a statement that the consumer must vacate the premises.

~~5 MCAR § 1.0105 Capital expenditure aid.~~

~~A. Districts shall be eligible for capital expenditure aid when foundation aid, tuition, and fees, are insufficient to provide for capital purchases.~~

~~B. All equipment not approved in the budget review, purchases at a cost in excess of $4,000.00 must be preapproved by the commissioner of education.~~

~~C. All equipment shall be accounted for by the standard inventory control system.~~

~~D. Repairs on facility, equipment, or improvement of grounds that exceed $4,000.00 and not included in the budget review shall be included in B. for approval.~~

~~5 MCAR § 1.0107 Categorical aid.~~ ~~Categorical aid shall be allocated on the following criteria for districts operating high cost programs which require expenditures in excess of funding available through foundation aid and capital expenditure aid:~~

~~A. Preservation of the present plant and equipment.~~

~~B. Development of programs for emerging business and industry.~~

~~C. Unique programs designed to serve special populations.~~

~~D. Educational services for special populations.~~

~~E. High operating costs.~~

~~F. Rules and regulations imposed by other regulatory bodies which may affect the student teacher ratio as well as operating equipment costs.~~

Department of Health Environmental Health Division

Proposed Temporary Rule Governing the Level of Formaldehyde in Residential Units

Request for Public Comment

Notice is hereby given that the Department of Health has proposed the following temporary rule for the purpose of implementing provisions of Laws of 1980, ch. 594, §§ 1, 2 and 12, relating to formaldehyde.

All interested persons are hereby afforded the opportunity to submit their comments on the proposed rule for 20 days immediately following publication of this material in the *State Register* by writing to Pauline Bouchard, Division of Environmental Health, Minnesota Department of Health, 717 Delaware Street S.E., Minneapolis, Minnesota 55440. The temporary rule may be revised on the basis of comments received. Any written material received shall become part of the record in the final adoption of the temporary rule.

Since temporary rules can remain in effect by law, for no more than 180 days from their effective date, permanent rules will be proposed and a public hearing will be held on the proposed permanent rules at some time in the fall of 1980. A formal Notice of Hearing will appear at the appropriate time in the *State Register*.

June 9, 1980

George R. Pettersen, M.D.
Commissioner of Health

Temporary Rule as Proposed

7 MCAR § 1.234 Formaldehyde levels in residential units.

A. Any newly-constructed residential unit which is sold, rented or leased after the effective date of this rule, shall not contain more than 0.50 parts of formaldehyde per million parts of ambient air.

B. For the purpose of determining compliance with this rule,

1. "Newly constructed" means that the unit has not been previously occupied;

2. "Residential unit" means any mobile home, single-family residence or living unit in a multi-unit structure, regardless of type of ownership.

C. Measurements for formaldehyde shall be made under normal living conditions of temperature, which is defined as 68 degrees Fahrenheit to 75 degrees Fahrenheit; and of relative humidity, which is defined as 40% to 60%.

NOISH TEST OMITTED

KEY: RULES SECTION — Underlining indicates additions to proposed rule language. ~~Strike outs~~ indicate deletions from proposed rule language. **PROPOSED RULES SECTION** — Underlining indicates additions to existing rule language. ~~Strike outs~~ indicate deletions from existing rule language. If a proposed rule is totally new, it is designated "all new material."

EXHIBIT C

LAW OFFICES

ROBINS, DAVIS & LYONS

33 SOUTH FIFTH STREET

MINNEAPOLIS, MINNESOTA 55402

TELEPHONE [612] 339-4911

TELECOPIER [612] 339 4181

TWX 910-576-2737

SOLLY ROBINS
SIDNEY S. FEINBERG
BERNARD ROSENBERG
JAMES A. KARIGAN
SHELDON W. HALPERN
ELLIOT S. KAPLAN
JAMES L. FETTERLY
STANFORD ROBINS
SIDNEY KAPLAN
STEPHEN A. KRUPP
ALAN R. MILLER
STEVEN L. ROSS
STEPHEN H. COHEN
JAMES R. SAFLEY
STEPHEN D. GORDON
A. JAMES ANDERSON
JOHN D. SHUFF
MICHAEL V. CIRESI
MARK J. FEINBERG
DEBORAH J. PALMER
BRUCE A. FINZEN
M. ARNOLD LYONS
HARDING A. ORREN
ARNOLD M. BELLIS
LAWRENCE ZELLE
ROBERT J. TWEEDY
HOWARD A. PATRICK
STANLEY E. KARON
JOHN F. EISBERG
DALE I. LARSON
THOMAS C. KAYSER
LEO F. FEENEY
JEFFREY S. HALPERN
STEPHEN J. DAVIS
ROBERT M. WATTSON
GARY H. LEVINSON
LESLIE H. NOVAK
JAMES D. STEINER
JAMES L. HARLOW
JOHN C. HART
ERNEST I. REVEAL III

JULIUS E. DAVIS [1912-1979]
CHARLES H. HALPERN [1911-1965]

WILLIAM P. LINHOFF, JR.
MICHAEL L. MEYER
LAWRENCE T. HOFMANN
PATRICK E. SHIPSTEAD
TERRY L. WADE
JOHN G. BRIAN III
BARRY G. REED
MARK J. KARON
MEL I. DICKSTEIN
MAURY S. LANDSMAN
JOHN B. MASSOPUST
ROBERT W. TICE
JEROME GETTE
DAVID E. BLAND
ELIZABETH H. ESINHART
FREDERICK H. MASTERS
LYNN M. ROBERSON
PARREL A. CAPLAN
PAUL L. GINGRAS
JAMES W. ROCKWELL
WILLIAM H. STANHOPE
GARY J. HAUGEN
ANDREW W. HORSTMAN
PETER C. MAYRAND
JAN D. HALVERSON
DAVID F. HERR
JOHN N. LOVE
CAROL T. SKLUZACEK
R. LAWRENCE PURDY
MARK L. WILSON
JAMES C. ERICKSON
DAVID S. EVINGER
RITA A. McCONNELL
BETSY HALL

October 9, 1980

The Honorable Warren R. Spannaus
Attorney General of the State of Minnesota
Room 102
State Capitol
St. Paul, Minnesota 55155

Dear Mr. Spannaus:

This letter is being submitted on behalf of the Manufactured Housing Institute to assist the Attorney General in reviewing the form and legality of the Commissioner of Health's proposed temporary rule, 7 MCAR § 1.234 (hereinafter the Rule), banning the sale of all residential units having an ambient air level of formaldehyde greater than 0.5 parts per million. (A copy of the Rule as adopted and the Order for Adoption is attached hereto as Exhibit A. A copy of the proposed Rule as published in the State Register on June 23, 1980 is attached hereto as Exhibit B.) Consistent with the Attorney General's function in reviewing the proposed Rule, this letter will focus on the legal issues and will not discuss in detail the medical aspects of formaldehyde or the economic impact of the proposed Rule. Medical and economic evidence has been submitted to the Commissioner of Health in opposition to the proposed rule. Counsel will provide copies to Attorney General on request.

The issues discussed herein cover three general categories. First, the interpretation of a formaldehyde statute, Minn. Laws 1980, Chapter 594 (hereinafter the statute). Second, state laws governing the promulgation of this Rule. Third, constitutional deficiencies regarding the proposed Rule.

SAINT PAUL OFFICE
1210 MINNESOTA BUILDING
SAINT PAUL, MINNESOTA 55101
TELEPHONE (612) 224-5884

SOUTHEASTERN REGIONAL OFFICE
SUITE 550
2690 CUMBERLAND PARKWAY
ATLANTA, GEORGIA 30339
TELEPHONE (404) 434-7100

WESTERN REGIONAL OFFICE
SUITE 200
19600 FAIRCHILD DRIVE
IRVINE, CALIFORNIA 92715
TELEPHONE (714) 851-0291

SOUTH CENTRAL REGIONAL OFFICE
SUITE 212
4825 LBJ FREEWAY
DALLAS, TEXAS 75234
TELEPHONE (214) 980-6754

I.

THE RULE EXCEEDS THE STATUTORY AUTHORITY OF THE COMMISSIONER.

A. The Legislature Did Not Authorize the Commissioner to Ban the Sale of Any Products or Housing Units.

It is well established that the rules and regulations of an administrative agency must be consistent with the statute which authorizes the agency to act. Gurrero v. Wagner, 246 N.W.2d 838 (Minn. 1976); U.S. v. Larionoff, 431 U.S. 864 (1977); Ruiz v. Morton, 462 F.2d 18 (9th Cir. 1972), aff'd 415 U.S. 199 (1974); Bates v. U.S., 581 F.2d 575 (6th Cir. 1978). The statute does not call for or even mention any ban on the sale of residential units exceeding a certain level of formaldehyde. The only ban provided in the statute is found in Section 2, subdivisions 1 and 3.

> Subdivision 1. No manufacturer shall sell any building materials and no builder shall sell or lease a housing unit containing urea formaldehyde unless the manufacturer or builder has made the following written disclosure
> . . . .
>
> Subdivision 3. No person shall sell for use in a dwelling place building materials subject to the written disclosure requirement of subdivision 1 unless the seller has provided to the purchaser a copy of the written disclosure provided by the manufacturer. No person shall for gain install or use in a dwelling place building materials subject to the written disclosure requirement of subdivision 1 unless the installer or user has provided to the person on whose behalf the materials are installed or used a copy of the written disclosure provided by the manufacturer.

Laws of 1980, Chapter 594, § 2, subd. 1, 3 (emphasis added).

Under the terms of the statute the only products or housing units which are banned are those not containing the required warning or disclosure. The statute permits the sale of housing units containing urea formaldehyde so long as the warning is given. As distinguished from the proposed Rule, the Legislature

went only so far as to require a warning to be placed on the urea formaldehyde materials and to provide a remedy for persons injured by exposure to urea formaldehyde.

The statute must be construed as a whole. Minn. Stat. § 645.16; Van Aspern v. Darling Olds, Inc., 254 Minn. 62, 93 N.W.2d 690 (1959). Accordingly, the section of the statute authorizing the Commissioner to promulgate rules must be interpreted in light of the requirements set forth by the Legislature, namely the warning and remedy provisions of the statute. Under such a construction the Commissioner is authorized only to promulgate rules which pertain to the warning and remedy provisions.

The Commissioner's rule banning all sales of residential units which contain more than 0.5 parts of formaldehyde per million parts of ambient air is inconsistent and conflicts with the statute. This statute requires a warning to be placed on such residential units. Obviously the warning requirement contemplates sales of such units. There is no purpose in putting a warning on a residential unit which cannot be sold.

The original draft of the senate bill, SF 2100, which later became this statute, recognized that warnings and bans are mutually exclusive. The original bill banned the sale of housing units containing a certain level of formaldehyde, and required a warning to be placed on all products incorporating urea formaldehyde. The warning was not required with respect to housing units because such a warning would be inconsistent with the sales ban.

The amendment of the original senate bill also indicates the legislature's choice of a warning requirement as opposed to a sales ban for housing units as well as building materials. The retraction of the sales ban evidences a determination that such a ban was an inappropriate measure in this situation. Legislative history is to be examined in interpreting a statute. Minn. Stat. § 646.16(6). Such a change in a bill must be considered in determining legislative intent. See, e.g., Can Mfrs. Institute, Inc. v. State, 289 N.W.2d 416, 424 (Minn. 1979). The proposed Rule thwarts the legislature's intention by resurrecting the concept of a sales ban.

B. The Statute Provides No Enforcement for the Proposed Rule and Indicates the Legislative Intent that the Commissioner's Rules Deal Only with the Warning and Remedy Provisions of the Statute.

The Legislature's intention to direct the Commissioner to promulgate rules dealing only with the warning and remedy provisions of the statute is also found in the unusual wording of the enforcement provisions of the statute. Subdivision 6 of Section 2 of the statute provides that violation only of the warning requirement is an unlawful practice against which the Attorney General may take legal action. It is noteworthy that this enforcement provision does not apply to Section 1 of the statute which authorizes the Commissioner to promulgate rules. The clear implication is that the Legislature saw no need to provide enforcement for the Commissioner's rules because it expected that those rules would pertain only to the warning requirement for which enforcement was provided, or to the remedy provision which by its own terms can be enforced by the injured consumer. Had the Legislature contemplated the promulgation of rules needing additional enforcement, such as a rule banning sales, it is only reasonable to assume that it would have expressly provided for enforcement of such rules. Having previously rejected the inclusion of any such ban in the statute, the Legislature did not intend or anticipate that the Commissioner would institute such a ban through his rulemaking authority.

It is significant that the statute makes no reference to any other statutes which grant authority to the Commissioner to make and enforce rules for the protection of public health, and that in promulgating the Rule the Commissioner relied solely on the authority granted him under this statute. His request for public comment published in the State Register stated that "Notice is hereby given that the Department of Health has proposed the following temporary rule for the purpose of implementing of Laws of 1980, ch. 594, §§ 1, 2 and 12, relating to formaldehyde." The Order for Adoption of the Rule refers only to Chapter 594 as providing authority for the Rule.

C. <u>The Statute Must Be Construed to Avoid Unreasonable Results</u>.

That the Rule goes beyond the authority granted to the Commissioner under the statute is further evidenced by an interpretation of the statute in accordance with the rules of construction set forth in Minn. Stat. c. 645. Section 645.17(1) provides that in interpreting a statute it should be presumed that the Legislature did not intend a result that is absurd, impossible of execution or unreasonable. Based upon information

obtained from the manufacturers and suppliers of building materials there is no assurance that the 0.5 standard for formaldehyde set forth in the proposed Rule can be met under the existing technology and the present state of the art. There is absolutely no reason to believe that a typical homeowner (or mobile home owner) can reasonably bring his home within the 0.5 level set by the Commissioner so that it can be sold.[1] Because of the numerous difficulties inherent in the N.I.O.S.H. testing procedure set forth in the Rule, it may literally be impossible, and certainly is impractical and unreasonable, for residential unit sellers to test each unit before it is sold. The test is uncertain and the number of qualified testing facilities is totally inadequate to conduct such tests within a reasonable period of time. See Exhibit C attached hereto. That exhibit was prepared when the Rule required only "newly-constructed residential units". The already acute shortage of test facilities has been extremely exacerbated by the recent expansion of the Rule to require tests for all residential units that are sold, old as well as new. An intent to allow the Commissioner to require such an unreasonable test and ban should not be attributed to the Legislature.

The N.I.O.S.H. test was the only test permitted under the Rule as it was originally proposed. The Commissioner of Health has now modified the proposed Rule to allow manufacturers to submit other testing procedures to the Commissioner for approval. However, this modification does not render the Rule any less unreasonable. Since a temporary rule can be effective only for 180 days, and since it will take nearly that long for alternative test procedures to be analyzed and approved by the Commissioner, the alternate test provision will have little, if any, practical effect. Moreover, this provision does nothing to alleviate the severe shortage of qualified testing facilities.

D. The Statute Must Be Construed to Avoid Constitutional Questions.

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[1] As originally published in the State Register, the Rule applied only to "newly-constructed residential units". The Commissioner has recently modified the Rule to eliminate this limitation. The Rule now applies to "any residential unit". The need for publication and comment on this and other recent modifications is discussed in Section IIG of this letter.

Section 645.17(3) states a presumption that the Legislature did not intend to violate the Constitution of the United States or of Minnesota. A constitutional interpretation of a statute will always be preferred over an unconstitutional construction. Schumann v. Commissioner of Taxation, 253 N.W.2d 130 (Minn. 1977). As will be discussed later in this letter, any construction of the statute which permits the Commissioner to promulgate the Rule at issue here renders the statute unconstitutional on several grounds. Moreover, a statute should be construed narrowly so as to avoid any serious constitutional question, even though that question might ultimately be resolved in a manner which would permit the statute to stand. Kittson County v. Wells, Denbrook & Assoc., Inc., 241 N.W.2d 799 (Minn. 1976). Therefore, any interpretation of this statute raising such questions should be rejected in favor of another reasonable interpretation which presents no constitutional difficulties.

E. The Statute Must Be Construed as Being Prospective.

The statute must be construed as being prospective in its application because there is no clear and manifest intent by the Legislature that the statute be retroactive. Minn. Stat. § 645.21. However the Rule, though prospective on its face, has retroactive effects. By banning the sale of certain residential units the Commissioner has burdened both manufacturers and retailers of such units with inventories of units which could have been sold prior to the Rule but which now may not be sold. The retailers have already paid for these units and the manufacturers have already paid for the time and labor necessary to construct them and now they must absorb these costs without any revenues because they are prohibited from selling the units. To be prospective in its application, the Rule would have to allow the retailers and manufacturers sufficient time to sell these units which complied with all Federal and State laws at the time they were built. The Legislature recognized this need by purposely delaying the effective date of the warning requirement of the statute until January 1, 1981. This was to provide sufficient time in which to sell housing units and formaldehyde products which had not been labeled with the warning because at the time of their manufacture no such warning was required.

F. The Recommended Statutory Interpretation Gives Substantial and Significant Effect to Section 1 Which Authorizes the Adoption of Rules by the Commissioner.

An interpretation of the statute which authorizes the Commissioner to promulgate rules in connection with the warning and remedy provisions of the statute contemplates a significant role for the Commissioner in developing an appropriate response to the urea formaldehyde situation. The Commissioner will still have the task of determining whether a significant health problem is presented by the use of building materials that emit formaldehyde gases as required in Section 1 of the statute. This will entail findings regarding the effect of various levels of formaldehyde on different segments of the state's population, the seriousness of those effects, whether the effects are transient or permanent, whether the duration of exposure influences these effects, and many other findings. If a significant health problem is found, then the Commissioner will be responsible for determining what constitutes a "significant ambient air level of formaldehyde." This determination is needed to particularize the showing required under the remedy provision of the statute. In addition, this level might tie into the Commissioner's determination of whether a significant health problem is presented. The Commissioner may take the position that such a significant health hazard is presented only where the ambient air level exceeds a certain parts per million figure. This would permit the Commissioner to promulgate rules specifying the situations in which the warning and remedy provisions of the statute apply. It remains for the Commissioner to adopt rules governing the implementation of the warning requirement. Under the statutory interpretation presented here it would still be left to the Commissioner to promulgate rules regarding the details of the remedy provision of the statute.[2] For example, the Commissioner can make rules regarding the

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[2] It is the position of the Manufactured Housing Institute that the remedy provision of the statute, section 2, subd. 4 of Chapter 594 of the Laws of 1980 is unconstitutional because it provides for irrebuttable presumptions in violation of due process and because it is void for vagueness. It is understood that the constitutionality of that provision is not an issue presently before the Attorney General and that it is not directly related to the proposed Rule. For these reasons the provision's constitutionality will not be discussed in this letter. The remedy provision is considered here only insofar as it relates to the legislative intent in granting the Commissioner rule-making authority. However, the Attorney General may wish to

form and content of the physician's statement that the consumer must vacate the premises and the type of medical records needed to document the relationship between the consumer's illness and formaldehyde. The Commissioner will still be charged with the responsibility of adopting reasonable, valid and reproducible test procedures for measuring product content or emissions of formaldehyde.

G. Conclusion.

The interpretation of the statute followed by the Commissioner in promulgating this Rule is not supported by the language of the statute, is inconsistent with the Legislature's intent and raises serious constitutional questions. The interpretation of the statute presented in this letter is derived from the language of the statute, comports with the Legislature's intent and avoids constitutional difficulties while still maintaining the importance of the Commissioner's function in developing and implementing this State's policy on urea formaldehyde products.

II.

THE RULE HAS NOT BEEN PROPERLY PROMULGATED.

A. The Commissioner's Determination of a Significant Health Problem Has Not Been Adopted as a Rule.

Section 1 of the statute provides:

> Within 30 days after April 24, 1980 the Commissioner of Health shall determine if a significant health problem is presented by the use of building materials that emit formaldehyde gases. If he determines that such a problem exists he shall promulgate rules pursuant to Chapter 15, including emergency rules, establishing standards governing the

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consider the legality of the proposed Rule in light of the Commissioner's failure to include in the Rule adequate specification for the constitutional implementation of the remedy provision.

sale of building materials and housing units that contain products made with urea formaldehyde.

It is clear that no rules establishing standards governing the sale of building materials and housing units are to be promulgated until the Commissioner of Health first determines that there is a significant health problem presented. This initial determination itself falls within the definition of "rule" under Minn. Stat. § 15.0411(3). "Rule" is defined to include every agency statement of general applicability and future effect, with certain specific exceptions. It has been held that "the legislative scheme in so defining 'rule' was obviously to include agency activities within the general definition of 'rule' and then to exclude such specific activity as was deemed beneficial to the concerns of efficient government and public participation." McKee v. Likins, 261 N.W.2d 566, 577 (Minn. 1977). In McKee the court found that a policy bulletin issues by the Commissioner of Public Welfare which allowed Medicaid coverage of elective, non-therapeutic abortions constituted rulemaking under the Minnesota Administrative Procedure Act. The term has been given a very broad scope by the Minnesota Supreme Court. See, Minnesota-Dakota Retail Hardware Association v. State, 279 N.W.2d 360 (Minn. 1979); Can Mfrs. Institute, Inc. v. State, 289 N.W.2d 416 (Minn. 1979); Johnson Bros. Wholesale Liquor Co. v. Novak, (Supreme Court Docket No. 49856, reported in "Finance and Commerce", May 30, 1980, page 14). Similarly, under the Federal Administrative Procedure Act a certification by the Secretary of Labor that employment of certain classes of aliens would not adversely affect the wages and working conditions of workers in the United States was found to be a "rule" and thus governed by the rulemaking procedures of that act. Lewis-Mota v. Secretary of Labor, 469 F.2d 478 (2nd Cir. 1972).

Because the Commissioner of Health's conclusion that there is significant health problem was an agency statement of general applicability made to implement or make specific the formaldehyde statute, and because none of the exceptions to the definition of "rule" apply, the Commissioner was bound to follow the rulemaking procedures set forth in Minn. Stat. § 15.0412. Assuming arguendo that it would have been proper to promulgate this rule as a temporary rule under subdivision 5 of § 15.0412, the Commissioner was still required to publish his proposed determination of a significant health problem in the State Register and allow 20 days for interested persons to submit data and views on the proposed temporary rule. This was not done.

Instead, the Commissioner issued a press release in which he set forth his conclusion. The press release did not satisfy the notice requirements of subdivision 5 nor has the Attorney General reviewed the proposed rule and published his decision in the State Register. The Commissioner's determination was never published as an adopted rule. Moreover, as discussed in Section B below, any determination of a significant health problem published by the Commissioner must be accompanied by a statement of the factual basis supporting the determination.

Until the procedures required in subdivision 5 of Minn. Stat. § 15.0412 are carried out with respect to the Commissioner's determination of a significant health problem, no other rules relating to the standards governing the sale of building materials and housing units may be promulgated. For this reason the proposed Rule banning the sale of residential units containing an ambient air level of formaldehyde greater than 0.5 parts per million cannot properly be promulgated until the Commissioner's determination of a significant health problem has been adopted pursuant to the Minnesota Administrative Procedure Act.

B. The Proposed Rule Lacks a Statement of its Supporting Factual Basis.

One of the most significant infirmities in the proposed Rule is the fact that it is not accompanied by any statement of the factual basis supporting it. Without such a statement the public does not have sufficient information to assess the proposed Rule and rationally comment upon it. Moreover, without such a statement a court cannot properly perform its function of judicial review. It has become an increasingly accepted principle of administrative law that even when there is no statutory requirement for a statement of reasons to accompany a rule, the basis for the agency's decision should appear clearly on the record, not in conclusory terms but in sufficient detail to permit prompt and effective review. Dry Color Mfrs. Ass'n Inc. v. Department of Labor, 468 F.2d 98 (3rd Cir. 1973). In that case, OSHA promulgated a temporary emergency standard prescribing plant operating procedures and equipment, work practices and procedures for preventing exposure to 14 chemicals said to be carcinogens. The conclusory statement provided by the Secretary of Labor that exposure to the 14 chemicals posed a grave danger to employees was found to be insufficient to satisfy the requirements of the Act calling for a statement of reasons and the general principle that the basis for the

agency's action be made clear on the record. Even emergency measures taken in response to an imminent and serious health danger must be accompanied by a statement of the reasons for the regulation. Without such a statement it is far too easy for post hoc rationalizations to be offered during judicial review which do not necessarily reflect the reasoning of the agency at the time the standard was issued. There must be at least a general explanation as to why the procedures prescribed were chosen in light of the recommendations of scientific experts and other governmental bodies, the types of prevailing industrial practices and the alternative kinds of regulation considered by the agency.

In United States v. Nova Scotia Food Products Corp., 568 F.2d 240 (2nd Cir. 1977) the court held that the Food and Drug Administration was required to disclose to the public the scientific data upon which the agency's actions were based. Without such disclosure it would be impossible for the public to submit meaningful comments. Without adequate comments the agency's actions would lead in the direction of arbitrary decision making. A concise general statement of the reasons for the regulation was required under the Federal Administrative Procedure Act, but the rationale is equally applicable here to the Rule proposed by the Commissioner of Health. A test of the adequacy of the "concise general statement" was stated as follows:

> We do not expect the agency to discuss every item of fact or opinion included in the submissions made to in in informal rule-making. We do expect that, if judicial review which Congress had thought it important to provide is to be meaningful, the "concise general statement of . . . basis and purpose" mandated by Section 4 will enable us to see what major issues of policy were ventilated by that informal proceedings and why the agency reacted to them as it did.

568 F.2d at 252. The Commissioner of Health did not publish any statement of the factual basis for the proposed Rule. Until such a statement is published the public cannot adequately comment on the proposal, nor can the courts fulfill their role in the process of judicial review. For these reasons the proposed Rule is seriously deficient and must not be adopted.

C. There Should Be a Formal Hearing on the Proposed Rule.

Assuming that the Commissioner properly adopts a rule concluding that a significant health problem is presented, further rules establishing standards governing the sale of building materials and residential units should be promulgated as permanent rules under the procedure outlined in § 15.0412(4) after a public hearing and the preparation of a report by the hearing examiner. The statute merely authorizes the Commisthe Commissioner to promulgate temporary rules, it does not require that this summary procedure be followed instead of the formal rulemaking process of subdivision 4. The temporary rulemaking procedure of § 15.0412(5) is simply insufficient for dealing with a rule so pervasive and powerful as that which the Commissioner has proposed. In McKee v. Likins the court found that a policy bulletin regarding Medicaid coverage of elective, non-therapeutic abortions involved the question of social and political policy so important to the public as a whole as to require the rulemaking process of the Minnesota Procedure Act, including notice and public hearing requirements, be followed. The proposed rule banning sales of residential units containing urea formaldehyde products also involves important societal interests and affects the entire home owning public. See Exhibit C attached hereto. The rule has a tremendous impact on both the type and the amount of housing available to the people of this State. It will significantly affect the cost of such housing. The continued existence of the jobs of a great many workers in several industries depends upon the rules which the Commissioner finally adopts. Because the housing industry is at the hub of the State's entire economy, any rule which significantly influences that industry will have a substantial impact on the State's economy as a whole. For these reasons it is essential that the formal rulemaking procedures of the Minnesota Administrative Procedure Act be followed in this case.

D. Environmental Effects Must Be Considered.

A related problem with the proposed Rule is its failure to follow the procedure set forth in the state's Environmental Policy Act, Minn. Stat. § 116D.04 and the regulations promulgated thereunder. The Act provides that where there is a potential for significant environmental effects resulting from any major governmental action, such action shall be preceded by a detailed statement on the environmental impact on the proposed action. No such environmental impact statement (EIS) has been prepared in connection with the proposed Rule banning

residential unit sales. Clearly this Rule has the potential for significant environmental effects because it is directed specifically at changing the environment, the ambient air level of formaldehyde in residential housing units. Under the rules promulgated by the Environmental Quality Counsel, 6 MCAR § 3.026 an EIS is not required where there is an imminent and substantial danger to the public health making major governmental action necessary and the preparation of an EIS impracticable. If in fact such a situation is presented here, the regulation still requires the agency to consult with the chairman of the Environmental Quality Counsel to arrange for alternative means of environmental review before taking action. This procedure was not followed by the Commissioner before promulgating this rule.

Moreover, even before the preparation of an EIS or arrangement for alternative means of environmental review, the Commissioner was required to publish notice of his impending action in the "EQC Monitor" pursuant to 6 MCAR § 3.035. § 3.031 provides that such action cannot be implemented until at least 30 days after such publication. Publication in the "EQC Monitor" is required of impending actions which may have a potential for significant environmental effects. Certainly the proposed ban on the sale of residential units qualifies as such an impending action. Even assuming that this is a situation in which the Commissioner could have arranged an alternative means of environmental review rather than publishing notice in the "EQC Monitor" such alternatives were not pursued.

The Supreme Court of Minnesota has recognized the requirement that environmental impacts be considered both by courts and by state agencies in rendering decisions dealing with environmental matters. Reserve Mining v. Herbst, 256 N.W.2d 808, 841 (Minn). The requirements of the National Environmental Policy Act have been applied to proposals for regulations drafted by federal administrative agencies. Scientists' Inst. for Pub. Info., Inc. v. Atomic Energy Com'n., 481 F.2d 1079 (D.C. Cir. 1973). The Commissioner of Health cannot promulgate this rule until complying with the State statutes and regulations regarding environmental policy. Only by such compliance will the public be given the opportunity to understand and comment upon the environmental impacts of the proposed rule prior to its adoption.

E. The Rule is Overly Vague.

The test procedure set forth in the rule is susceptible of many interpretations which lead to different test results. The test is influenced by factors such as temperature and humidity, yet the rule provides only a range for these factors. The test could show a formaldehyde level greater than or less than the 0.5 ppm standard depending upon where within those ranges the prevailing temperature and humidity fell at the time of the test. No standard is given regarding where in the residential unit the test is to be conducted. The formaldehyde level may vary as one moves closer to formaldehyde emitters such as panelling, carpeting, or cabinets. Ventilation also significantly influences the ambient air level of formaldehyde. The rule simply states without further specification that the test is performed with a "normal ventilation rate" or, if the unit has mechanical air dilution, the test shall be performed after an hour of operation of the mechanical dilution system unless the operation of such device would result in the test not being conducted under "normal living conditions". The term "normal" is particularly vague and susceptible of myriad plausible interpretations.

This vagueness might be used by the Commissioner to find violations of the proposed rule by conducting tests under different conditions from those existing at the time the manufacturer tested the unit. The proposed Rule leaves the Commissioner with excessive discretion in setting the test conditions for each test. Under the Minnesota Administrative Procedure Act administrative officials are not permitted to act on their own impulses or whims, however well intentioned they may be. Monk & Excelsior Inc. v. Minn. St. Bd. of Health, 225 N.W.2d 821 (Minn. 1975). The manufacturer cannot know what conditions to use when it conducts its own tests. In this respect the proposed Rule is contrary to one of the stated purposes for an agency's adoption of a rule, "to implement or make specific the law enforced or administered by it." Minn. Stat. § 15.0411, subd. 3 (emphasis added).

As previously discussed in Section I.C of this letter, the proposed Rule has been modified to allow manufacturer to submit alternative test procedures to the Commissioner for approval. This only expands the scope of the Commissioner's discretion and leaves the proposed Rule even more vague and uncertain.

F. Failure to Consider Relevant Facts and Lack of Substantial Evidence.

Finally, the proposed rule is arbitrary and unreasonable in that the Commissioner did not consider all of the relevant facts before proposing the rule and the rule is not supported by substantial evidence of a significant health problem at the 0.5 ppm level of formaldehyde in the ambient air. The failure to include factors such as the feasibility of prompt compliance with the rule, the existence of sufficient testing facilities, the impact of the rule on the price of housing units, the impact of the rule on individual entrepreneurs who may not be able to conduct the required tests quickly enough to maintain sales and remain financially viable, the impact of the rule on individual homeowners who will not be able to sell their homes without conducting an expensive test and; who may have to wait many months before one of the few testing facilities can perform the test, and who may not be able to afford the cost of "repairing" their homes if they do not meet the 0.5 standard, the impact of the rule on the employees who fabricate the products which go into residential units and those who actually construct the units, the impact of the rule on the future availability of housing in this state and the need for such a rule in light of the warning requirement of the statute renders the proposed Rule unreasonable, arbitrary and capricious. The present medical evidence pertaining to health effects of a 0.5 ppm level of formaldehyde in the ambient air is inconclusive. After reviewing the same studies cited by the Commissioner in his press release HUD determined that further studies were needed for a determination on the existence of a substantial health hazard could be reached.

G. The Major Changes Recently Included in the Proposed Rule Require the Commissioner to Publish the New Rule and Receive Comments from the Public before Adoption of the New Rule.

The Commissioner followed the procedures set forth in Minn. Stat. § 15.0412, Subd. 5 with respect to the original version of the proposed Rule. That version of the Rule was published in the State Register and for at least 20 days thereafter the Commissioner afforded all interested persons an opportunity to submit data and views on the proposed temporary Rule. After the end of the comment period the Commissioner then substantially and significantly revised the proposed Rule. Those revisions include the following:

1. The new Rule applies to all residential units, both old and new, while the original Rule applied only to newly-constructed residential units;

2. The new Rule limits the 0.5 ambient air level standard to formaldehyde which is attributable to building materials, while the old Rule included all formaldehyde emitters;

3. The new Rules specifically provides that formaldehyde emitted from foam insulation and carpetting installed by a mobile home manufacturer is to be included when determining whether a mobile home complies with the 0.5 standard but implies that formaldehyde emitted from these two sources is not to be included when determining whether other types of residential units such as conventional homes meet the 0.5 standard, while the old Rule did not expressly distinguish between mobile homes and other types of residential units;

4. The new Rule prohibits the installation of foam insulation which will cause the ambient air level of formaldehyde in the residential unit to exceed 0.5 ppm of formaldehyde, while the old Rule contained no such provision;

5. The new Rule provides for a different temperature range under which a test may be conducted than that provided in the old Rule and addresses the issue of ventilation during the test which was not addressed in the old Rule;

6. The new Rule contains some interpretation and specification of the remedy provision of the statute, while the old Rule was confined solely to prohibiting the sale of newly-constructed residential units which contained more than 0.5 ppm of formaldehyde in the ambient air and did not in any way address the remedy provision of the statute.

Items 1, 3 and 6 clearly represent vital changes in the Rule which should not be adopted without prior publication and an opportunity for public comment. For example, the expansion of the Rule to include old as well as new residential units brings within the ambient of the Rule a large segment of the population which would have been relatively uneffected by the original version of the Rule, the home owning public. Under the new version of the Rule no home, mobile home, condominium,

or townhouse owner will be permitted to sell his residence if it does not meet the 0.5 standard. Moreover, these owners will be required to have their homes tested prior to sale in order to know whether or not they may legally sell the home. The impact of this change in the Rule on the already serious problem concerning the lack of adequate testing facilities has been discussed earlier in this letter. For all of these reasons, this one change in the Rule alone would be sufficient to require republication and a period for public comment. The other changes found in the new Rule further compel republication and comment.

Although Minn. Stat. § 15.0412, Subd. 5 permits the Commissioner to modify the Rule where such modifications are supported by the data and views submitted to the agency after the initial publication of the proposed Rule, this provision should not be read to permit the type of major changes which have been made here to be incorporated in the Rule without notice and an opportunity to submit comments. Otherwise, the requirement that proposed temporary Rules be published and that the agency afford all interested persons an opportunity to submit data and views on the proposed temporary Rule will be emasculated. The data and views will be submitted on one Rule, but the agency will be able to adopt without notice quite a different Rule. The temporary rule making procedure provides for a bare minimum of public participation, but at least that statutory degree of public participation must be afforded. Administrative agencies must not be permitted to effectively eliminate the public's participation in rule making proceedings.

III.

CONSTITUTIONAL PROBLEMS

A. The Delegation Doctrine.

If the statute is interpreted so as to permit the rule proposed by the Commissioner, both the statute and the rule present several serious constitutional deficiencies. First, the statute as so interpreted would constitute an unconstitutional delegation of legislative authority to the Commissioner. Article III, Section 1 of the Minnesota Constitution distributes governmental authority among the three branches of government. Because of this division of authority, pure legislative power can never be delegated to any other branch of government, including administrative agencies. Lee v. Delmont, 228 Minn. 101, 36 N.W.2d 530 (1939). The Legislature cannot delegate the power to make

a law which necessarily involves a discretion as to what the law shall be. Williams v. Evans, 139 Minn. 32, 165 N.W. 495 (1917). As Justice Rehnquist recently explained, the non-delegation doctrine serves three important functions. First, it ensures that important choices of social policy are made by the Legislature, the branch of government most responsive to the popular will. Second, it guarantees that the recipient of a delegation of legislative authority will also receive an "intelligible principle" to guide it in the exercise of the delegated discretion. Third, it ensures that courts charged with reviewing the exercise of delegated legislative discretion will be able to test that exercise against ascertainable standards. Industrial Union Department, AFL-CIO v. American Petroleum Institute, 48 U.S.L.W. 5022, 5042-43 (July 2, 1980). If the formaldehyde statute permits the Commissioner to promulgate this rule, the legislation fails on all three counts. Aside from its warning and remedy provisions, the statute provides absolutely no guidance for the Commissioner as to what type of rules he is supposed to promulgate. Nothing in the statute even begins to suggest the policy considerations which the Commissioner should take into account, and the weight to be given to each in issuing any rule which bans sales. Nor is there anywhere else for the Commissioner to turn to seek enlightenment from the Legislature. There is no prior history of regulation in this area and the legislative history is sparse. The proposed Rule involves many conflicting policy considerations, including potential health effects, potential employment effects, and definite housing and economic consequences. Any decision to ban sales is the type of determination which should be made by the Legislature itself. Certainly the Legislature might seek the help of the Commissioner in determining the degree of any health problem and the type of testing and standards required to address any such problem, but the final weighing of the conflicting policy considerations must rest with the Legislature.

If the legislature actually intended to authorize the Commissioner to promulgate regulations such as the proposed Rule, then the statute is similar to other delegations struck down by the courts of this state. In Anderson v. Manchester Fire Assur. Co., 59 Minn. 182, 63 N.W. 241 (1895) the Legislature directed the Commissioner of Insurance to adopt a standard fire insurance policy. The only guidance given to the Commissioner was that he refer to the New York standard policy; however he was free to reject portions of that New York standard policy and to incorporate entirely new provisions. The court found

this to be an unconstitutional delegation of legislative power. State v. Great Northern Ry. Co., 100 Minn. 445, 111 N.W. 289 (1907) involved a delegation to the Railroad and Warehouse Commission to allow an increase of the capital stock of a railroad corporation for such purposes and on such terms or conditions as the Commission deemed advisable. The court held that while the Legislature might permit the Commission to allow or refuse an increase of the capital stock based upon a finding of certain facts, it could not commit the whole subject of the increase of capital stock to the judgment and discretion of the Commission. In State v. Oliver Iron Min. Co., 207 Minn. 630, 292 N.W. 407 (1939) the court construed the statute at issue so as not to permit the Tax Commissioner to impose a penalty because the statute did not define the character of any tax evasion for which a penalty might be imposed. To have construed the statute otherwise would have resulted in an unconstitutional delegation of legislative powers.

In the case of the formaldehyde statute, an interpretation which permits the Rule proposed by the Commissioner would necessarily give the Commissioner the discretion to determine whether or not to impose any sales ban and under what conditions to impose such a ban. The only factual determination required by the statute would be that a significant health problem exist, but the relationship between such health problem and any ban remains unstated. There is no requirement that sales be banned only where the ambient air level exceeds the level at which the Commissioner finds a significant health problem. The Commissioner is completely free to do as he chooses. Regardless of the Commissioner's diligence and care in exercising this discretion, the statute unconsitutionally delegates legislative authority to him.

The present statute is easily distinguished from that which was held to properly delegate administrative authority in State v. King, 257 N.W.2d 693 (Minn. 1977). There the State Board of Pharmacy added a drug to the list of controlled substances, thus making it a crime to possess the drug. The delegation of authority to the Board to place drugs on the list was not an unconstitutional delegation because the Legislature had determined as a matter of public policy that it is unlawful to possess drugs that produce certain deleterious effects and lead to psychic and psychological dependence. The statute articulated broad parameters to be used in categorizing the substances in various schedules. The statute also specifically set forth ten standards which the Board was to consider in making

its determination. The Board's function was merely to use its expertise to determine which drugs produce certain harmful effects and thus are to be regulated under the statute. The formaldehyde statute does not ban the sale of any residential unit, nor does it instruct the Commissioner to promulgate such a ban. The statute does not provide any parameters or standards which the Commissioner is to consider in promulgating any rules which go beyond implementing the warning and remedy provisions of the Act. The statute does not even contain a statement of the public policy of the State with regard to urea formaldehyde materials. The Legislature cannot authorize the Commissioner to ban sales with this complete lack of guidance.

B. Substantive Due Process -- Void for Vagueness

The rule banning sales of certain residential units violates the constitutional guarantee of substantive due process.

Substantive due process requires that:

1. the act serve to promote a public purpose,

2. it not be an unreasonable, arbitrary or capricious interference, and

3. the means chosen bear a rational relation to the public purpose sought to be served.

Cantos v. Herbst, 278 N.W.2d 732, 741 (Minn. 1979); Federal Distillers, Inc. v. State, 304 Minn. 28, 46, 229 N.W.2d 144, 157-58 (1975). Even though the rule may have a legitimate public purpose, the rule may not be unreasonable, arbitrary or capricious. In addition, the rule must be sufficiently definite and certain so as not to run afoul of the related "void for vagueness" doctrine. This doctrine applies in the civil as well as the criminal context. Getter v. Travel Lodge, 260 N.W.2d 177 (Minn. 1977). A statute or rule is unconstitutionally vague if it is so imperfect and deficient in its details as to render it impossible of execution and enforcement. Wichelman v. Messner, 250 Minn. 88, 83 N.W.2d 800 (1957).

As previously discussed, the testing procedures set forth in the rule are so vague and indefinite and require such a degree of interpretation on the part of the tester that two different testers may obtain widely divergent results from the

same residential unit. Even more compelling is the fact that perfectly identical tests run on different days or even at different times of the same day may lead to significantly different results. Temperature, humidity, air circulation and a variety of other factors significantly affect the results of this test. The mere passage of time can transform a housing unit from one which complies with the rule's standards to one which violates them and may not be sold. Units that comply with standards when sold to the consumer may no longer meet those standards when they are occupied. Even if there were sufficient facilities available to conduct the tests, manufacturers, retailers, and homeowners would have no way of assuring that subsequent tests might yield entirely different results, either based upon different testing methods or on an actual change of the ambient air level of formaldehyde in the unit itself.

These problems are compounded by the fact that the capacity of existing test facilities is far short of the number of tests which must be conducted to maintain past levels of residential unit sales. The Commissioner's modification of the proposed Rule to provide for the possibility of using test procedures other than that adopted by N.I.O.S.H. does nothing to alleviate the severe shortage of testing laboratories. The 0.5 part per million standard will ban the sale not only of units failing to meet that standard but also of a great many units which comply with the standard but for which testing will be delayed for a period of years.

Combining the above problems with the fact that the proposed Rule is not accompanied by a statement of the factual basis supporting it leads to the inevitable conclusion that the Rule is unreasonable, arbitrary or capricious, that the means chosen by the Commissioner do not bear a rational relation to the public purpose sought to be served, and that the test procedure is unconstitutionally vague. The unreasonableness of the rule is highlighted by comparing its massive and detrimental economic impact with its speculative and theoretical health benefits. The medical evidence does not support a finding that the 0.5 standard will appreciably improve or protect the health of any significant segment of the population.

C. Federal Preemption

Both the statute and the rule violate the Supremacy Clause, Art. VI, cl. 2 of the United States Constitution and the Commerce Clause, Art. I, § 8, cl. 3, because Congress has preempted this field, at least so far as it relates to mobile homes. Federal preemption occurs where Congress has expressly declared that

the authority conferred by it shall be exclusive. Pre-emption may also be implied where so indicated by the following factors:

1. The aim and intent of Congress;

2. The pervasiveness of the federal regulatory scheme;

3. The nature and subject matter regulated and whether it is one which demands exclusive federal regulation in order to achieve uniformity vital to national interests; and

4. Whether the state law stands as an obstacle to the objectives of Congress.

Northern States Power Co. v. Minnesota, 447 F.2d 1143, 1146-47 (8th Cir. 1971), aff'd, 405 U.S. 1035 (1972). Pursuant to Title VI of the Housing and Community Development Act of 1974, 42 U.S.C. § 5401, et. seq., the Department of Housing and Urban Development has promulgated comprehensive mobile home construction and safety standards. 24 C.F.R. § 3280.01 et seq. (1979). These standards cover virtually every aspect of mobile home planning, construction, durability, and safety. In particular, § 3280.303 sets forth general requirements for building materials, and § 3280.304 provides detailed standards for wood and wood based products, including plywood and particle board. § 3280.501 et seq. provide requirements for thermal insulation, air filtration and heat loss. The effect of these requirements is that mobile homes must be tightly constructed and air flow is minimized. As previously mentioned, air flow is a significant factor in the ambient air level of formaldehyde and other indoor air contaminants. Congress has demanded that mobile homes be airtight and this has increased the concentration of formaldehyde in the ambient air.

The statutory preemption and state enforcement provisions provide as follows:

> Whenever a Federal mobile home construction and safety standard established under this chapter is in effect, no State or political subdivision of a State shall have any authority either to establish, or to continue in effect, with respect to any mobile home covered, any standard regarding construction of safety applicable to the same aspect of

> performance of such mobile home which is not identical to the Federal mobile home construction and safety standard.

42 U.S.C. § 5403(d);

> Nothing in this chapter shall prevent any State agency or court from asserting jurisdiction under State law over any mobile home construction or safety issue with respect to which no Federal mobile home construction and safety standard has been established pursuant to the provisions of section 5403 of this title.

42 U.S.C. § 5422(a). Initially, these statutory provisions might suggest that the proposed Rule is not preempted. However, an examination of the impact of the proposed Rule on a mobile home industry which is bound by the pervasive and exacting federal regulations promulgated under the federal statute reveals a substantial conflict between those federal regulations and the proposed Rule. HUD recognized the potential for such conflict in promulgating its own rule regarding federal preemption.

> No state or locality may establish or enforce any rule or regulation or take any action that stands as an obstacle to the accomplishment and execution of the full purposes and objectives of Congress. The test of whether a state rule or action is valid or must give way is whether the state rule can be enforced or the action taken without impairing the federal superintendance of the mobile home industry as established by the Act.

24 C.F.R. § 3282.11(e). This interpretation of the statutory preemption provisions is necessary to assure the efficacy of the comprehensive federal regulation of the mobile home industry.

It is important to note that HUD is investigating air quality in mobile homes, including the matter of formaldehyde concentrations, and that the Consumer Products Safety Commission is studying the health effects of formaldehyde. The proposed Rule clearly impairs the federal superintendance of the mobile home industry and will frustrate manufacturers' efforts to comply with the federal regulations.

By their very nature mobile homes are in the stream of interstate commerce. Homes manufactured in one state may be sold in any one of a number of other states, and resold in still other states. Without uniform, national standards, the mobile home industry will be faced with an insurmountable burden of varying and inconsistent state standards. For these reasons both the statute and the rule must be deemed preempted by the federal legislation and regulations regarding mobile homes.

D. Retroactivity -- Taking Without Just Compensation.

Retrospective legislation in general will not be allowed to impair rights which are vested and which constitute property rights. Wichelman v. Messner, 250 Minn. 88, 83 N.W.2d 800 (1957); Adams Nursing Home of Williamstown v. Mathews, 548 F.2d 1077 (1st Cir. 1977). Earlier this letter considered the problem faced by manufacturers and retailers left with inventories of mobile homes manufactured prior to proposal of the 0.5 formaldehyde standard. The rule has a retroactive effect on those retailers and manufacturers and is thus unconstitutional as a violation of due process. It is also a taking without just compensation in violation of the Fifth Amendment and Article I, § 13 of the Minnesota Constitution. While the state has not physically taken possession of these mobile homes, it has precluded their sale, leaving them with little value. The constitutional right to compensation can arise out of any governmental interference with ownership, possession, enjoyment or value of private property. Johnson v. City of Plymouth, 263 N.W.2d 603 (Minn. 1978). The issue is not whether the state has made reasonable use of the police power, but whether there has been a substantial impairment of property rights. The proposed Rule will work such an impairment entitling the retailers and manufacturers to a hearing and to just compensation prior to the impairment.

E. Equal Protection.

The Rule violates the Equal Protection Clause of the Fourteenth Amendment and the Due Process Clause of the Minnesota Constitution, Article I, Section 7. The Rule imposes unequal burdens in several respects. The Rule covers only residential units and ureaformaldehyde foam insulation, and not the many formaldehyde containing products which are sold for use in housing units. Examples include carpeting, furniture, paneling, draperies, smoking tobacco, air fresheners and personal deodorants. It may be argued that this inequality is justified on

the grounds that the Commissioner may take one step at a time in promulgating regulations.

However, even to the extent that this defense may be valid with respect to that inequality, it cannot possibly suffice to overcome the Rule's inherent discrimination against mobile homes in favor of conventional homes. This discrimination is the result of the adoption of an ambient air standard which expressly includes formaldehyde emitted by foam insulation and carpeting when the test is conducted on a mobile home, but which implicitly excludess formaldehyde emitted by those two items when the test is conducted on a conventional home. This is the effect of the definition of "building materials" found in Section B1 of the Rule. Although the mobile home without foam insulation and carpeting may meet the Rule's standards, the inclusion of these articles may place the ambient air level above the 0.5 level and the unit may not be sold. A conventional home which has the same ambient air level as the mobile home when neither contains foam insulation and carpeting is permitted to be sold. However, when these articles are added to the conventional home by the consumer the ambient air level of formaldehyde may rise above the 0.5 standard. Housing units which will, when finally occupied by the consumer, present identical ambient air levels of formaldehyde are not treated identically under the Rule. This inequality is not rationally related to the statute's objectives and is unconstitutional. See, Clover Leaf Creamery Co. v. State, 289 N.W.2d 79 (Minn. 1979).

This violation of Equal Protection is exacerbated by the fact that conventional homes are typically built by in-state builders while a substantial percentage of mobile homes sold in this state are manufactured by out-of-state businesses. Such a discrimination in favor of in-state businesses violates not only the Equal Protection, but also the Commerce Clause of the federal Constitution. See, City of Philadelphia v. New Jersey, 437 U.S. 617 (1978).

IV.

CONCLUSION

Based on the foregoing, it is obvious that the Rule proposed by the Commissioner of Health is plagued with numerous deficiencies both as to its form and its legality. The proper interpretation of the statute has been offered which allows the Commissioner to carry out the task given him by the Legislature without raising violating either the federal or the state constitutions.

We submit that the Attorney General disapprove the proposed temporary Rule.

Respectfully submitted,

ROBINS, ZELLE, LARSON & KAPLAN

Stephen H. Cohen
Gary J. Haugen
John N. Love

cc: Mr. J. S. Anderson
Special Attorney General

STATE OF MINNESOTA
COUNTY OF HENNEPIN

BEFORE THE MINNESOTA
COMMISSIONER OF HEALTH

In the Matter of Temporary Rules Relating to Formaldehyde * ORDER FOR ADOPTION

Minnesota Laws 1980, Chap. 594, sec. 1 required the Commissioner of Health, hereafter "commissioner," to determine if a significant health problem is presented by the use of building materials that emit formaldehyde gases. The commissioner determined that formaldehyde emitted by building materials does present a significant health problem. This determination was made public in the form of a press release, issued on May 22, 1980, a copy of which is attached hereto and made a part hereof.

Minnesota Laws 1980, Chap. 594, sec. 1, further required the commissioner to promulgate temporary rules pursuant to Minn. Stat. § 15.0412 subd. 5 (1978) establishing standards governing the sale of building materials and housing units that contain products made with urea formaldehyde. Such rules were proposed by publication in the State Register, June 23, 1980, p. 1963. Comments were received thereon until August 1, 1980, and all have been reviewed.

After having afforded interested persons an opportunity to present comments, statements and arguments, having considered all of the submissions and applicable statutory standards and criteria, and having confirmed the need for the above-captioned rules,

NOW, THEREFORE, IT IS ORDERED that 7 MCAR §1.234, a copy of which is attached hereto and made a part hereof, is adopted as a temporary rule, this 8th day of October 1980, pursuant to authority vested in me by Laws, 1980, Chap. 594, sec. 1. The rules will be effective for 90 days from the date of their approval by the Attorney General and may remain in effect for an additional 90 days upon issuance of a new order.

STATE OF MINNESOTA

s/ G.R.P
George R. Pettersen, M.D.
Commissioner of Health

EXHIBIT A

Temporary Rule as Adopted

7 MCAR § 1.234. Formaldehyde in Residential Units.

A. The commissioner of health has determined that a significant health problem is presented by the use of building materials that emit formaldehyde gas.

B. Definitions. For the purpose of this rule the following terms or phrases shall have the meanings given below:

1. "building materials" means any material containing urea formaldehyde which is used in the construction of a residential living unit, including but not limited to particle board, plywood and paneling. The phrase also includes urea formaldehyde foam insulation and carpeting which is installed in a mobile home by the manufacturer during construction of the unit.

2. "commissioner" means the commissioner of health.

3. "residential unit" means any mobile home, single-family residence, or living unit in a multi-unit structure, regardless of type of ownership.

C. Formaldehyde Level. After the effective date of this rule,

1. the ambient indoor air of any residential unit which is sold shall not contain more than 0.5 parts per million (ppm) of formaldehyde which is attributable to building materials, and

2. the installation of urea formaldehyde foam insulation in a residential unit shall not cause the ambient level of formaldehyde in the air of the unit to exceed 0.5 ppm of formaldehyde.

D. For the purpose of this rule, measurements for formaldehyde shall be made according to the method and under the conditions prescribed in parts E and F of this rule.

E. Test Method. Formaldehyde shall be measured according to NIOSH Manual of Analytical Methods, 2nd Edition, NIOSH 77-157-A, 1977, Method # P&CAM 125, as follows:

1. Principle of the Method

a. Formaldehyde reacts with chromotropic acid-sulfuric acid solution to form a purple monocationic chromogen. The absorbance of the colored solution is read in a spectrophotometer at 580 nm and is proportional to the quantity of formaldehyde in the solution (References 11.b, 11.f).

b. The chemistry of this color reaction is not known with certainty (Reference 11.c).

2. Range and Sensitivity

a. From 0.1 μg/mℓ to 2.0 μg/mℓ of formaldehyde can be measured in the color developed solution.

b. A concentration of 0.1 ppm of formaldehyde can be determined in a 25 liter air sample based on an aliquot of 4 mℓ from 20 mℓ of absorbing solution and a difference of 0.05 absorbance unit from the blank.

3. Interferences

a. The chromotropic acid procedure has very little interference from other aldehydes. Saturated aldehydes give less than 0.01 percent positive interference, and the unsaturated aldehyde acrolein results in a few percent positive interference. Ethanol and higher molecular weight alcohols and olefins in mixtures with formaldehyde are negative interferences. However, concentrations of alcohols in air are usually much lower than formaldehyde concentrations and, therefore, are not a serious interference.

b. Phenols result in a 10 to 20 percent negative interference when present at an 8:1 excess over formaldehyde. They are, however, ordinarily present in the atmosphere at lesser concentrations than formaldehyde and, therefore, are not a serious interference.

c. Ethylene and propylene in a 10:1 excess over formaldehyde result in a 5 to 10 percent negative interference and 2-methyl-1,3-butadiene in a 15:1 excess over formaldehyde showed a 15 percent negative interference. Aromatic hydrocarbons also constitute a negative interference (Reference 11.f). It has recently been found that cyclohexanone causes a bleaching of the final color (Reference 11.d).

4. Precision and Accuracy

The method was checked for reproducibility by having three different analysts in three different laboratories analyze standard formaldehyde samples. The results listed in Table 1 agreed within ±5 percent.

TABLE 1

COMPARISON OF FORMALDEHYDE RESULTS FROM THREE LABORATORIES

Micrograms Formaldehyde	Absorbance		
	Lab. 1	Lab. 2	Lab. 3
1	0.057	0.063	0.061
3	0.183	0.175	0.189
5	0.269	0.279	0.262
7	0.398	0.381	0.392
10	0.566	0.547	0.537
20	1.02	0.980	1.07

5. Advantages and Disadvantages

a. Effect of Storage – Disadvantage

(1) The absorbance of the reaction product increases slowly on standing. An increase of 3 percent in absorbance was noted after one day standing and an increase of 10 percent after eight days standing (11.£).

(2) No information is available on the effect of storage on the collected air sample.

b. Precision – Advantage. Results checked for reproducibility agreed within ±5 percent (see Table 1).

6. Apparatus

a. Sampling Equipment. The sampling unit for the impinger collection method consists of the following components:

(1) A graduated midget impinger containing the absorbing solution or reagent.

(2) A pump suitable for delivering flow rates of 1 liter per minute for 24 hours. The sampling pump is protected from splashover or water condensation by an adsorption tube loosely packed with a plug of glass wool and inserted between the exit arm of the impinger and the pump.

(3) An integrating volume meter such as a dry gas or wet test meter.

(4) Thermometer.

(5) Manometer.

(6) Stopwatch.

b. Spectrophotometer or Colorimeter. An instrument capable of measuring the absorbance of the color developed solution at 580 nm.

c. Associated laboratory glassware.

7. Reagents

a. Chromotropic Acid Reagent. Dissolve 0.10 g of 4,5-dihydroxy-2,7-naphthalenedisulfonic acid disodium salt (Eastman Kodak Company, Rochester, New York, Cat. No. P230) in water and dilute to 10 mℓ. Filter if necessary and store in a brown bottle. Make up fresh weekly.

b. Concentrated sulfuric acid.

c. Formaldehyde Standard Solution "A" (1 mg/mℓ). Dilute 2.7 mℓ of 37 percent formalin solution to 1 liter with distilled water. This solution must be standardized as described in Section 9.1. The solution is stable for at least a 3-month period. Alternatively sodium formaldehyde bisulfite (Eastman Kodak Company, Cat. No. P6450) can be used as a primary standard (Reference 11d). Dissolve 4.4703 g in distilled water and dilute to 1 liter.

d. Formaldehyde Standard Solution "B" (10 µg/mℓ). Dilute 1 mℓ of standard solution "A" to 100 mℓ with distilled water. Make up fresh daily.

e. Iodine, 0.1 N (approximate). Dissolve 25 g of potassium iodide in about 25 mℓ of water, add 12.7 g of iodine and dilute to 1 liter.

f. Iodine, 0.01 N. Dilute 100 mℓ of the 0.1 N iodine solution to 1 liter. Standardize against sodium thiosulfate.

g. Starch Solution, 1 Percent. Make a paste of 1 g of soluble starch and 2 mℓ of water and slowly add the paste to 100 mℓ of boiling water. Cool, add several mℓ of chloroform as a preservative, and store in a stoppered bottle. Discard when a mold growth is noticeable.

h. Sodium Carbonate Buffer Solution. Dissolve 80 g of anhydrous sodium carbonate in about 500 mℓ of water. Slowly add 20 mℓ of glacial acetic acid and dilute to 1 liter.

i. Sodium Bisulfite, 1 Percent. Dissolve 1 g of sodium bisulfite in 100 mℓ of water. It is best to prepare a fresh solution weekly.

8. Procedure

a. Cleaning of Equipment. Care must be exercised to ensure the absence of probable contaminants like organic materials that can be charred by concentrated sulfuric acid. Soaking glassware for one hour in a 1:1 mixture of nitric and sulfuric acids, followed by thorough rinsing with double-deionized water will remove all possible organic contaminants.

b. Collection and Shipping of Samples

(1) Pour 20 mℓ of the absorbing solution (distilled water) into each graduated midget impinger.

(2) Connect two impingers in series to the vacuum pump (via the absorption tube) and the prefilter assembly (if needed) with short pieces of flexible tubing. The minimum amount of tubing necessary to make the joint between the prefilter and impingers should be used. The air being sampled should not be passed through any other tubing or other equipment before entering the impingers.

(3) It has been recommended that two impingers must be used in series because under conditions of sampling, the collection efficiency of only one impinger is approximately 80 percent. With two impingers in series the total collection efficiency is approximately 95 percent. The contents of each impinger should be analyzed separately.

(4) Turn on pump to begin sample collection. Care should be taken to measure the flow rate, time and/or volume as accurately as possible. The sample should be taken at a flow rate of 1 ℓpm for one hour. (References 11. a, 11e). These conditions give a total of 60 liters of air that is drawn through the system. However, a shorter sampling time can be used providing enough formaldehyde is collected to be above the lower limit of sensitivity of the method.

(5) After sampling, the impinger stem can be removed and cleaned. Tap the stem gently against the inside wall of the impinger bottle to recover as much of the sampling solution as possible. Wash the stem with a small amount (1-2 mℓ) of unused absorbing solution and add the wash to the impinger. Then the impinger is sealed with a hard, non-reactive stopper (preferably Teflon). Do not seal with rubber. The stoppers on the impingers should be tightly sealed to prevent leakage during shipping. If it is preferred to ship the impingers with the stems in, the outlets of the stem should be sealed with Parafilm or other non-rubber covers, and the ground glass joints should be sealed (i.e., taped) to secure the top tightly.

(6) Care should be taken to minimize spillage or loss by evaporation at all times. Refrigerate samples if analysis cannot be done within a day.

(7) Whenever possible, hand delivery of the samples is recommended. Otherwise, special impinger shipping cases designed by NIOSH should be used to ship the samples.

(8) A "blank" impinger should be handled as the other samples (fill, seal and transport) except that no air is sampled through this impinger.

c. Analysis

(1) Transfer the sample from each impinger to either a 25 mℓ- or 50 mℓ-graduate. Note the volume of each solution.

(2) Pipet a 4 mℓ aliquot from each of the sampling solutions into glass stoppered test tubes. A blank containing 4 mℓ of distilled water must also be run. If the formaldehyde content of the aliquot exceeds the limit of the method, a smaller aliquot diluted to 4 mℓ with distilled water is used.

(3) Add 0.1 mℓ of 1 percent chromotropic acid reagent to the solution and mix.

(4) To the solution pipette slowly and cautiously 6 mℓ of concentrated sulfuric acid. The solution becomes extremely hot during the addition of the sulfuric acid. If the acid is not added slowly, some loss of sample could occur due to spattering.

(5) Allow to cool to room temperature. Read at 580 nm in a suitable spectrophotometer using a 1 cm cell. No change in absorbance was noted over a 3 hour period after color development. Determine the formaldehyde content of the sampling solution from a curve previously prepared from standard formaldehyde solutions.

(6) During the analysis procedure, it is good practice to group together the two impingers from each sampling series and label them as "A" and "B." The formaldehyde content calculated in "A" is added to that calculated in "B" to give the total amount in the sampled atmosphere by the impingers in series.

9. Calibration and Standards

a. Standardization of Formaldehyde Solution

(1) Pipette 1 mℓ of formaldehyde standard solution "A" into an iodine flask. Into another flask pipette 1 mℓ of distilled water. This solution serves as the blank.

(2) Add 10 mℓ of 1 percent sodium bisulfite and 1 mℓ of 1 percent starch solution.

(3) Titrate with 0.1 N iodine to a dark blue color.

(4) Destroy the excess iodine with 0.05 N sodium thiosulfate.

(5) Add 0.01 N iodine until a faint blue end point is reached.

(6) The excess inorganic bisulfite is now completely oxidized to sulfate, and the solution is ready for the assay of the formaldehyde bisulfite addition product.

(7) Chill the flask in an ice bath and add 25 mℓ of chilled sodium carbonate buffer. Titrate the liberated sulfite with 0.01 N iodine, using a microburette, to a faint blue end point. The amount of iodine added in this step must be accurately measured and recorded.

(8) One mℓ of 0.0100 N iodine is equivalent to 0.15 mg of formaldehyde. Therefore, since 1 mℓ of formaldehyde standard solution was titrated, the mℓ of 0.01 N iodine used in the final titration multiplied by the factor, 0.15, gives the formaldehyde concentration of the standard solution in mg/mℓ.

(9) The factor, 0.15, must be adjusted or determined accordingly on the basis of the exact normality of the iodine solution.

b. Preparation of Standard Curve

(1) Pipet 0, 0.1, 0.3, 0.5, 0.7, 1.0, and 2.0 mℓ of standard solution "B" into glass stoppered test tubes.

(2) Dilute each standard to 4 mℓ with distilled water.

(3) Develop the color as described in the analysis procedure (Section 8C).

(4) Plot absorbance against micrograms of formaldehyde in the color developed solution. Note that the microgram concentration of the formaldehyde is determined based on the standardization value of solution A.

10. Calculations

a. Convert the volume of air sampled (V) to the volume of air at standard conditions (V_s) of 760 mm of mercury and 25°C, using the correction formula:

$$V_s = V \times \frac{P}{760} \times \frac{298}{(T + 273)}$$

where:

V_s = volume of air in liters at standard conditions
V = volume of air sampled in liters
P = barometric pressure in mm of mercury
T = temperature of sample air, °C

b. Determine the total concentration (C_t) of formaldehyde present in the two sample impingers in series, A and B.

$$C_t = C_A \times F_A + C_B \times F_B$$

where:

C_t = total μg of formaldehyde in the sample.

C_A and C_B = respective formaldehyde concentration in μg of the sample aliquots taken from impingers A and B as determined from the calibration curve

F_A and F_B = respective aliquot factor; $\frac{\text{sampling soln. vol. in m}\ell}{\text{m}\ell \text{ aliquot used}}$

c. The concentration of formaldehyde in the sampled atmosphere may be calculated by using the following equation, assuming standard conditions are taken as 760 mm of mercury and 25°C:

$$\text{ppm (volume)} = \frac{C_t \times 24.47}{V_s \times \text{M.W.}}$$

where:

V_s = liters of air sampled at standard conditions

M.W. = molecular weight of formaldehyde (30.03)

24.47 = μℓ of formaldehyde gas in one micromole at 760 mm Hg and 25°C.

11. References;

a. Altshuller, A.P.; L.J. Leng; and A.F. Wartburg, "Source and Atmospheric Analyses for Formaldehyde by Chromotropic Acid Procedure," Int. J. Air Wat. Poll, 6, 381 (1962).

b. Eegriwe, E., "Reaktionen and Reagenzien zum Nachweis Organischer Verbindungen IV," Z Anal Chem, 110, 22 (1937).

c. Feigl, F., *Spot Tests in Organic Analysis*, Seventh Ed., American Elsevier Publishing Company, New York, 434, (1966).

d. Feldstein, M. (Bay Area Air Pollution Control District) Personal Communication, March 1968.

e. MacDonald, W.E., "Formaldehyde in Air – A Specific Field Test," Amer Ind Hyg Assoc Quarterly, 15, 217 (1954).

f. Sleva, S.F., "Determination of Formaldehyde: Chromotropic Acid Method. Selected Methods for the Measurement of Air Pollutants," Public Health Service Publication No. 999-AP-11, H-1, 1965.

g. Treadwell and Hall, Analytical Chemistry, Vol. II, Ninth English Edition. John Wiley & Sons, inc., New York, p. 590, 1951.

h. Treadwell and Hall, Analytical Chemistry, Vol. II, Ninth English Edition. John Wiley & Sons, Inc., New York, p. 588, 1951.

12. Alternate test method. Measurements made by an alternate analytical method are deemed to be valid only if the alternate method has been approved by the commissioner. Such approval shall be granted if the proponent of the alternate method can demonstrate that the alternate method results in measurements which have at least the same precision, reliability and accuracy as those obtained with the use of the NIOSH method prescribed above.

F. Testing Conditions. All of the conditions prescribed below must be met before a test result is considered valid. The following conditions are imposed to assure that the amount of formaldehyde measured is that which may be expected to be present when the unit is maintained under normal living conditions, and is that which is reasonably attributable to the building materials.

1. A test shall be performed under the following conditions of temperature, humidity and ventilation:
   a. temperature range: 65 to 80 degrees Fahrenheit;
   b. humidity range: 40 to 60 percent;
   c. normal ventilation rate, or
   d. where a housing unit has a specific provision for dilution of air by mechanical means, such mechanical means shall be operated for one hour prior to the performance of any test, unless the operation of such device would result in the test not being conducted under normal living conditions.
2. Air sampling:
   a. A test shall consist of three different air samples taken in habitable rooms of the residential unit. The test results shall be the average of the measurements of the three samples.
   b. If a consumer has a complaint relating to a single room of a residential unit, then the test shall consist of three air samples taken from that single room. The test result shall be the average of the measurements of the three samples.

3. In order to validly test for formaldehyde which is attributable to building materials, the consumer shall remove from the unit, at least 30 minutes before the air samples are taken, any major source of formaldehyde which was not present in the unit at the time of sale, and cease any activity such as smoking which may contribute significantly to the level of formaldehyde in the air of the unit. Such sources include, but are not limited to the following: draperies or furniture made of plywood or particleboard and upholstered furniture.

G. Consumer Remedy.

1. Because individuals are known to react differently to the same level of formaldehyde, the commissioner hereby declares that the 0.5 ppm level which is prescribed in part C (above) does not constitute a significant ambient air level of formaldehyde for the purpose of Minn. Laws, 1980, Chap. 594, § 2, subd. 4.

2. If a consumer seeks a remedy under § 2, subd. 4 of the law, the following shall be deemed as complying with the medical report requirement of that subdivision:

   a. the consumer may submit to the manufacturer or seller a written medical report prepared by a licensed physician. The report shall specify the nature and degree of the health risks to the consumer which relate to formaldehyde; and

   b. the physician's report shall include a statement that the consumer must vacate the premises.

~~5 MCAR § 1.0105 Capital expenditure aid.~~

~~A. Districts shall be eligible for capital expenditure aid when foundation aid, tuition, and fees, are insufficient to provide for capital purchases.~~

~~B. All equipment not approved in the budget review, purchases at a cost in excess of $4,000.00 must be preapproved by the commissioner of education.~~

~~C. All equipment shall be accounted for by the standard inventory control system.~~

~~D. Repairs on facility, equipment, or improvement of grounds that exceed $4,000.00 and not included in the budget review shall be included in B. for approval.~~

~~5 MCAR § 1.0107 Categorical aid.~~ ~~Categorical aid shall be allocated on the following criteria for districts operating high cost programs which require expenditures in excess of funding available through foundation aid and capital expenditure aid:~~

~~A. Preservation of the present plant and equipment.~~

~~B. Development of programs for emerging business and industry.~~

~~C. Unique programs designed to serve special populations.~~

~~D. Educational services for special populations.~~

~~E. High operating costs.~~

~~F. Rules and regulations imposed by other regulatory bodies which may affect the student teacher ratio as well as operating equipment costs.~~

Department of Health Environmental Health Division

Proposed Temporary Rule Governing the Level of Formaldehyde in Residential Units

Request for Public Comment

Notice is hereby given that the Department of Health has proposed the following temporary rule for the purpose of implementing provisions of Laws of 1980, ch. 594, §§ 1, 2 and 12, relating to formaldehyde.

All interested persons are hereby afforded the opportunity to submit their comments on the proposed rule for 20 days immediately following publication of this material in the *State Register* by writing to Pauline Bouchard, Division of Environmental Health, Minnesota Department of Health, 717 Delaware Street S.E., Minneapolis, Minnesota 55440. The temporary rule may be revised on the basis of comments received. Any written material received shall become part of the record in the final adoption of the temporary rule.

Since temporary rules can remain in effect by law, for no more than 180 days from their effective date, permanent rules will be proposed and a public hearing will be held on the proposed permanent rules at some time in the fall of 1980. A formal Notice of Hearing will appear at the appropriate time in the *State Register*.

June 9, 1980

George R. Pettersen, M.D.
Commissioner of Health

Temporary Rule as Proposed

7 MCAR § 1.234 Formaldehyde levels in residential units.

A. Any newly-constructed residential unit which is sold, rented or leased after the effective date of this rule, shall not contain more than 0.50 parts of formaldehyde per million parts of ambient air.

B. For the purpose of determining compliance with this rule,

1. "Newly constructed" means that the unit has not been previously occupied;

2. "Residential unit" means any mobile home, single-family residence or living unit in a multi-unit structure, regardless of type of ownership.

C. Measurements for formaldehyde shall be made under normal living conditions of temperature, which is defined as 68 degrees Fahrenheit to 75 degrees Fahrenheit; and of relative humidity, which is defined as 40% to 60%.

D. Formaldehyde shall be measured according to NIOSH Manual of Analytical Methods, 2nd Edition, NIOSH 77-157-A, 1977, Method P&CAM 125, as follows:

Formaldehyde in Air—Analytical Method

1. Principle of the method.

a. Formaldehyde reacts with chromotropic acid-sulfuric acid solution to form a purple monocationic chromogen. The absorbance of the colored solution is read in a spectrophotometer at 580 nm and is proportional to the quantity of formaldehyde in the solution (References 11.b. 11.f).

b. The chemistry of this color reaction is not known with certainty (Reference 11.c).

2. Range and sensitivity.

KEY: RULES SECTION — Underlining indicates additions to proposed rule language. ~~Strike outs~~ indicate deletions from proposed rule language. PROPOSED RULES SECTION — Underlining indicates additions to existing rule language. ~~Strike outs~~ indicate deletions from existing rule language. If a proposed rule is totally new, it is designated "all new material."

EXHIBIT B

a. From 0.1 μg/mℓ to 2.0 μg/mℓ of formaldehyde can be measured in the color developed solution.

b. A concentration of 0.1 ppm of formaldehyde can be determined in a 25 liter air sample based on an aliquot of 4 mℓ from 20 mℓ of absorbing solution and a difference of 0.05 absorbance unit from the blank.

3. Interferences.

a. The chromotropic acid procedure has very little interference from other aldehydes. Saturated aldehydes give less than 0.01 percent positive interference, and the unsaturated aldehyde acrolein results in a few percent positive interference. Ethanol and higher molecular weight alcohols and olefins in mixtures with formaldehyde are negative interferences. However, concentrations of alcohols in air are usually much lower than formaldehyde concentrations and, therefore, are not a serious interference.

b. Phenols result in a 10 to 20 percent negative interference when present at an 8:1 excess over formaldehyde. They are, however, ordinarily present in the atmosphere at lesser concentrations than formaldehyde and, therefore, are not a serious interference.

c. Ethylene and propylene in a 10:1 excess over formaldehyde result in a 5 to 10 percent negative interference and 2-methyl-1,3-butadiene in a 15:1 excess over formaldehyde showed a 15 percent negative interference. Aromatic hydrocarbons also constitute a negative interference (Reference 11f). It has recently been found that cyclohexanone causes a bleaching of the final color (Reference 11.d).

4. Precision and accuracy. The method was checked for reproducibility by having three different analysts in three different laboratories analyze standard formaldehyde samples. The results listed in Table 1 agreed within ±5 percent.

TABLE 1
Comparison of Formaldehyde Results from Three Laboratories

Micrograms Formaldehyde	Absorbance Lab. 1	Lab. 2	Lab. 3
1	0.057	0.063	0.061
3	0.183	0.175	0.189
5	0.269	0.279	0.262
7	0.398	0.381	0.392
10	0.566	0.547	0.537
20	1.02	0.980	1.07

5. Advantages and disadvantages.

a. Effect of storage—disadvantage.

(1) The absorbance of the reaction product increases slowly on standing. An increase of 3 percent in absorbance was noted after one day standing and an increase of 10 percent after eight days standing (11.f).

(2) No information is available on the effect of storage on the collected air sample.

b. Precision—advantage. Results checked for reproducibility agreed within ±5 percent (see Table 1).

6. Apparatus.

a. Sampling equipment. The sampling unit for the impinger collection method consists of the following components:

(1) A graduated midget impinger containing the absorbing solution or reagent.

(2) A pump suitable for delivering flow rates of 1 liter per minute for 24 hours. The sampling pump is protected from splashover or water condensation by an adsorption tube loosely packed with a plug of glass wool and inserted between the exit arm of the impinger and the pump.

(3) An integrating volume meter such as a dry gas or wet test meter.

(4) Thermometer.

(5) Manometer.

(6) Stopwatch.

b. Spectrophotometer or colorimeter. An instrument capable of measuring the absorbance of the color developed solution at 580 nm.

c. Associated laboratory glassware.

7. Reagents.

a. Chromotropic acid reagent. Dissolve 0.10 g of 4,5-dihydroxy-2,7-naphtha-lenedisulfonic acid disodium salt (Eastman Kodak Company, Rochester, New York, Cat. No. P230) in water and dilute to 10mℓ. Filter if necessary and store in a brown bottle. Make up fresh weekly.

b. Concentrated sulfuric acid.

c. Formaldehyde standard solution "A" (1 mg/mℓ). Dilute 2.7 mℓ of 37 percent formalin solution to 1 liter with distilled water. This solution must be standardized as described in Section 9.1. The solution is stable for at least a 3-month period. Alternatively sodium formaldehyde bisulfite (Eastman Kodak Company, Cat. No. P6450) can be used as a primary standard (Reference 11d). Dissolve 4.4703 g in distilled water and dilute to 1 liter.

d. Formaldehyde standard solution "B" (10 μg/mℓ). Dilute 1 mℓ of standard solution "A" to 100 mℓ with distilled water. Make up fresh daily.

e. Iodine, 0.1 N (approximate). Dissolve 25 g of potassium iodide in about 25 mℓ of water, add 12.7 g of iodine and dilute to 1 liter.

f. Iodine, 0.01 N. Dilute 100 mℓ of the 0.1 N iodine solution to 1 liter. Standardize against sodium thiosulfate.

g. Starch solution, 1 Percent. Make a paste of 1 g of soluble starch and 2 mℓ of water and slowly add the paste to 100 mℓ of boiling water. Cool, add several mℓ of chloroform as a preservative, and store in a stoppered bottle. Discard when a mold growth is noticeable.

h. Sodium carbonate buffer solution. Dissolve 80 g of anhydrous sodium carbonate in about 500 mℓ of water. Slowly add 20 mℓ of glacial acetic acid and dilute to 1 liter.

i. Sodium bisulfite, 1 Percent. Dissolve 1 g of sodium bisulfite in 100 mℓ of water. It is best to prepare a fresh solution weekly.

8. Procedure.

a. Cleaning of equipment. Care must be exercised to ensure the absence of probable contaminants like organic materials that can be charred by concentrated sulfuric acid. Soaking glassware for one hour in a 1:1 mixture of nitric and sulfuric acids, followed by thorough rinsing with double-deionized water will remove all possible organic contaminants.

b. Collection and shipping of samples.

(1) Pour 20 mℓ of the absorbing solution (distilled water) into each graduated midget impinger.

(2) Connect two impingers in series to the vacuum pump (via the absorption tube) and the prefilter assembly (if needed) with short pieces of flexible tubing. The minimum amount of tubing necessary to make the joint between the prefilter and impingers should be used. The air being sampled should not be passed through any other tubing or other equipment before entering the impingers.

(3) It has been recommended that two impingers must be used in series because under conditions of sampling, the collection efficiency of only one impinger is approximately 80 percent. With two impingers in series the total collection efficiency is approximately 95 percent. The contents of each impinger should be analyzed separately.

(4) Turn on pump to begin sample collection. Care should be taken to measure the flow rate, time and/or volume as accurately as possible. The sample should be taken at a flow rate of 1 ℓpm for one hour. (References 11.a, 11.e). These conditions give a total of 60 liters of air that is drawn through the system. However, a shorter sampling time can be used providing enough formaldehyde is collected to be above the lower limit of sensitivity of the method.

(5) After sampling, the impinger stem can be removed and cleaned. Tap the stem gently against the inside wall of the impinger bottle to recover as much of the sampling solution as possible. Wash the stem with a small amount (1-2 mℓ) of unused absorbing solution and add the wash to the impinger. Then the impinger is sealed with a hard- non-reactive stopper (preferably Teflon). Do not seal with rubber. The stoppers on the impingers should be tightly sealed to prevent leakage during shipping. If it is preferred to ship the impingers with the stems in, the outlets of the stem should be sealed with Parafilm or other non-rubber covers, and the ground glass joints should be sealed (i.e., taped) to secure the top tightly.

(6) Care should be taken to minimize spillage or loss by evaporation at all times. Refrigerate samples if analysis cannot be done within a day.

(7) Whenever possible, hand delivery of the samples is recommended. Otherwise, special impinger shipping cases designed by NIOSH should be used to ship the samples.

(8) A "blank" inpinger should be handled as the other samples (fill, seal and transport) except that no air is sampled through this impinger.

c. Analysis.

(1) Transfer the sample from each impinger to either a 25 mℓ- or 50 mℓ-graduate. Note the volume of each solution.

(2) Pipet a 4 mℓ aliquot from each of the sampling solutions into glass stoppered test tubes. A blank containing 4 mℓ of distilled water must also be run. If the formaldehyde content of the aliquot exceeds the limit of the method, a smaller aliquot diluted to 4 mℓ with distilled water is used.

(3) Add 0.1 mℓ of 1 percent chromotropic acid reagent to the solution and mix.

(4) To the solution pipette slowly and cautiously 6 mℓ of concentrated sulfuric acid. The solution becomes extremely hot during the addition of the sulfuric acid. If the acid is not added slowly, some loss of sample could occur due to spattering.

(5) Allow to cool to room temperature. Read at 580 nm in a suitable spectrophotometer using a 1 cm cell. No change in absorbance was noted over a 3 hour period after color development. Determine the formaldehyde content of the sampling solution from a curve previously prepared from standard formaldehyde solutions.

(6) During the analysis procedure, it is good practice to group together the two impingers from each sampling series and label them as "A" and "B." The formaldehyde content calculated in "A" is added to that calculated in "B" to give the total amount in the sampled atmosphere by the impingers in series.

9. Calibration and standards.

a. Standardization of formaldehyde solution.

(1) Pipette 1 mℓ of formaldehyde standard solution "A" into an iodine flask. Into another flask pipette 1 mℓ of distilled water. This solution serves as the blank.

(2) Add 10 mℓ of 1 percent sodium bisulfite and 1 mℓ of 1 percent starch solution.

(3) Titrate with 0.1 N iodine to a dark blue color.

(4) Destroy the excess iodine with 0.05 N sodium thiosulfate.

(5) Add 0.01 N iodine until a faint blue end point is reached.

KEY: RULES SECTION — Underlining indicates additions to proposed rule language. ~~Strike-outs~~ indicate deletions from proposed rule language. **PROPOSED RULES SECTION** — Underlining indicates additions to existing rule language. ~~Strike outs~~ indicate deletions from existing rule language. If a proposed rule is totally new, it is designated "all new material."

(6) The excess inorganic bisulfite is now completely oxidized to sulfate, and the solution is ready for the assay of the formaldehyde bisulfite addition product.

(7) Chill the flask in an ice bath and add 25 mℓ of chilled sodium carbonate buffer. Titrate the liberated sulfite with 0.01 N iodine, using a micro-burette, to a faint blue end point. The amount of iodine added in this step must be accurately measured and recorded.

(8) One mℓ of 0.0100 N iodine is equivalent to 0.15 mg of formaldehyde. Therefore, since 1 mℓ of formaldehyde standard solution was titrated, the mℓ of 0.01 N iodine used in the final titration multiplied by the factor, 0.15, gives the formaldehyde concentration of the standard solution in mg/mℓ.

(9) The factor, 0.15, must be adjusted or determined accordingly on the basis of the exact normality of the iodine solution.

b. Preparation of standard curve.

(1) Pipet 0, 0.1, 0.3, 0.5, 0.7, 1.0, and 2.0 mℓ of standard solution "B" into glass stoppered test tubes.

(2) Dilute each standard to 4 mℓ with distilled water.

(3) Develop the color as described in the analysis procedure (Section 8c).

(4) Plot absorbance against micrograms of formaldehyde in the color developed solution. Note that the microgram concentration of the formaldehyde is determined based on the standardization value of solution A.

10. Calculations.

a. Convert the volume of air sampled (V) to the volume of air at standard conditions (V_3) of 760 mm of mercury and 25°C, using the correction formula:

$$V_3 = V \times \frac{P}{760} \times \frac{298}{(T+273)}$$

where:

V_3 = volume of air in liters at standard conditions
V = volume of air sampled in liters
P = barometric pressure in mm of mercury
T = temperature of sample air, °C

b. Determine the total concentration (C_t) of formaldehyde present in the two sample impingers in series, A and B.

$$C_t = C_A \times F_A + C_B \times F_B$$

where:

C_t = total μg of formaldehyde in the sample
C_A and C_B = respective formaldehyde concentration in μg of the sample aliquots taken from impingers A and B as determined from the calibration curve
F_A and F_B = respective aliquot factor; $\frac{\text{sampling soln. vol in m}\ell}{\text{m}\ell \text{ aliquot used}}$

c. The concentration of formaldehyde in the sampled atmosphere may be calculated by using the following equation, assuming standard conditions are taken as 760 mm of mercury and 25°C:

$$\text{ppm (volume)} = \frac{C_t \times 24.47}{V_s \times M.W.}$$

where:

V_s = Liters of air sampled at standard conditions
M.W. = molecular weight of formaldehyde (30.03)
24.47 = μℓ of formaldehyde gas in one micromole at 760 mm Hg and 25°C.

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LAW OFFICES

ROBINS, DAVIS & LYONS

33 SOUTH FIFTH STREET

MINNEAPOLIS, MINNESOTA 55402

TELEPHONE (612) 339-4911

TELECOPIER (612) 339 4181

TWX 910-576-2737

SOLLY ROBINS
SIDNEY S. FEINBERG
BERNARD ROSENBERG
JAMES A. KARIGAN
SHELDON W. HALPERN
ELLIOT S. KAPLAN
JAMES L. FETTERLY
STANFORD ROBINS
SIDNEY KAPLAN
STEPHEN A. KRUPP
ALAN R. MILLER
STEVEN L. ROSS
STEPHEN H. COHEN
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JAMES L. HARLOW
JOHN C. HART
ERNEST I. REVEAL III

JULIUS E. DAVIS (1912-1979)
CHARLES H. HALPERN (1911-1965)

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LAWRENCE F. HOFFMANN
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ROBERT W. TICE
JEROME GETTE
DAVID E. BLAND
ELIZABETH H. EISINHART
FREDERICK H. MASTERS
LYNN M. ROBERSON
PARRELL A. [illegible]
[illegible]
JAMES W. [illegible]
WILLIAM H. STANHOPE
GARY J. HAUGEN
ANDREW W. HOUSTMAN
PETER C. MAYRAND
JAN D. HALVERSON
DAVID F. HERR
JOHN N. LOVE
CAROL T. SKLUZACEK
R. LAWRENCE PURDY
MARK L. WILSON
JAMES C. ERICKSON
DAVID S. EVINGER
RITA A. McCONNELL
BETSY HALL

July 15, 1980

Ms. Pauline Buchard
Division of Environmental Health
Minnesota Department of Health
717 S.E. Delaware Street
Minneapolis, Minnesota 55440

RE: Manufacturing Housing Institute
vs. George R. Pettersen
Our File No. 13581-0000

Dear Ms. Buchard:

On behalf of myself and the others in attendance at our meeting of July 11, 1980, we appreciate the opportunity to meet with you and spell out some of our more basic concerns concerning your proposed Regulation 7MCAR Sec. 1.234 prohibiting sale or lease of certain newly constructed residential units which contain ureaformaldehyde. We also appreciate the opportunity to provide you with some of the information available regarding the infeasibility of meeting the standards set forth in the regulation and the consequences of that regulation. We also discussed some of the medical information regarding both the effects of formaldehyde, as well as the need to develop more information in order to fully assess what effects are presented.

As you requested, some of those in attendance at the meeting will be putting together some written material commenting on these and other problems prior to July 30th. As you can also suspect, based on the comments of our meeting, the situation is indeed complex and we anticipate that considerable study will be necessary before the substantial submissions and other information can be assembled, reviewed and studied by you, the commissioner and staff. While we

SAINT PAUL OFFICE
1210 MINNESOTA BUILDING
SAINT PAUL, MINNESOTA 55101
TELEPHONE (612) 224-5884

SOUTHEASTERN REGIONAL OFFICE
SUITE 550
2690 CUMBERLAND PARKWAY
ATLANTA, GEORGIA 30339
TELEPHONE (404) 434-7100

WESTERN REGIONAL OFFICE
SUITE 200
19600 FAIRCHILD DRIVE
IRVINE, CALIFORNIA 92715
TELEPHONE (714) 851-0231

SOUTH CENTRAL REGIONAL OFFICE
SUITE 212
4925 LBJ FREEWAY
DALLAS, TEXAS 75234
TELEPHONE (214) 980-6254

EXHIBIT C

appreciate your extending the comment period to July 30th, we believe additional time will be necessary to fully evaluate the information that will be submitted by those in attendance at our meeting as well as others.

We request that the time for transmittal of the proposed regulation to the Attorney General be extended so that all the information can be thoughtfully considered and evaluated, and alternatives studied before imposing an emergency regulation that will have such extreme consequences as the one now under consideration.

As stated at the meeting, present technology for construction of homes does not permit or allow meeting the proposed .5 PPM level of formaldehyde in newly constructed residential units. While new technology is now being considered, it will still be some time before that technology is perfected and put into practice. This is based upon both the present state of the art, as well as the fact that even after such technology is perfected, there still will be some time lag before that technology can be placed into production due to the need to change production methods, as well as time taken in distribution channels before reaching home builders and manufacturers.

Moreover, there is no assurance based on present technology and the proposed testing method, that any sample testing can truly represent the ambient air level of newly constructed residential units or mobile homes. It will therefore be necessary to test each individual unit to make certain that it complies with the standard set forth in the proposed regulation prior to sale of that unit to assure sellers and manufacturers that they do not risk any penalties. The most accurate information available indicates that for 1979, there were 35,246 conventional and mobile homes sold or manufactured in Minnesota. Each of these units will have to be tested prior to sale under the proposed regulation. Present information demonstrates that the testing capacity for the NIOSH test in Minnesota does not exceed 3,000 units per year. Under the present capacity it will take several years before units constructed in one year can be tested. Even assuming new testing facilities were immediately available, a somewhat dubious assumption, there still will be at least a six month time lag for new testors to become familiar and proficient enough to run the test. Moreover, should the department encourage private laboratories to purchase NIOSH equipment in order to meet this regulatory imposed demand, the net effect may be to

permanently build NIOSH testing methods into this state, although everyone apparently recognizes that the NIOSH method itself is far from perfect. New tests are now being developed which may do a better and more effective job in testing ambient air levels. This regulation may in effect lock the department into ambient air standards as opposed to product test standards due to private expenditure in reliance on the proposed regulation. Many competent experts, such as the Lawrence Berkley Laboratories, are questioning the efficacy of that testing method. However, should the department encourage private labs to purchase NIOSH equipment, at considerable cost, it may be very difficult to later abandon the NIOSH method in favor of a more efficient testing.

Recognizing the inability of many manufacturers and builders to meet the .5 standard and realizing the impossibility of obtaining prompt testing of newly constructed residential units, the effect of the proposed temporary regulation will be to severely damage the conventional and mobile homes industry. The effect of the temporary regulation will be severe, and for many, permanent. If the standards cannot be met, or if the units cannot be tested, they cannot be sold at least until tests are run. Those tests cannot be run in totality for several years. These delays will almost certainly prevent sales, and thus, have a direct impact on the construction industry. Last year alone, residential construction in Minnesota totaled $1,300,000,000. In the Twin City alone, approximately 13,500 employees in residential construction for the entire state with payrolls in excess of $150,000,000. Many of these employees will be precluded from building new residential units because the old units have not been tested or sold. There are approximately 200 mobile home dealers in the State of Minnesota, and 8 plants manufacturing mobile homes in the state who will be unable to manufacture or sell new units. There were mobile home sales in excess of $100,000,000 in Minnesota in 1979.

Moreover, the proposed regulations will have consequences far outside the housing industry. Many persons wishing to purchase private houses will be unable to find or afford the same. Mobile homes generally appeal to segments of the population who cannot afford conventionally built homes, either as a first house or as retirement homes. A prohibition on the sale of new mobile homes will deprive that segment of the population of the opportunity for home ownership. Similar

consequences will be felt by those wishing to purchase conventionally built housing either because the standards cannot be met or, almost certainly, because the housing cannot be tested.

Statistical information on the impact of price rises in mobile homes and the ability of customers to purchase those homes is now being collected and will be provided. However, it is almost certain that the price rises in the area of $1,000 will be necessary to attempt to comply with this standard which will have egregious consequences on the ability of many potential customers to afford mobile homes.

As was also pointed out, regulations causing these consequences are not reasonably necessary in view of the terms of the statutes and the underlying medical situation. As Drs. Lamm and Berger pointed out, there does not exist a reasonable body of medical knowledge defining or establishing a significant health problem to warrant promulgation of this regulation. The data underlying present reports does not demonstrate a significant health problem at the level referred to in the regulation, and even the underlying data needs further control studies before scientific conclusions can safely be drawn. Moreover, a study of the statute reveals that a regulation prohibiting sales was neither contemplated nor intended by the legislature.

The legislation under which this regulation is promulgated calls for a warning to be applied to housing units emitting ureaformaldehyde if the Commissioner of Health finds that a significant health problem is presented. A warning obviously contemplates that sales may be made once the warning is given. A regulation prohibiting sales not only negates the warning, since it prohibits the sales to which the warning is to be attached, but also is contrary to the legislative purpose of allowing sales once a warning in compliance with the statute is given. The severe impact on the general population in Minnesota of any blanket prohibition of sale is so great that if adequate warnings are given and purchasers are given a choice of whether the home should be purchased, there should not be an emergency ban on sales absent the clearest legislative direction. We submit that a regulation prohibiting sales is contrary to the purpose of the statute and, in fact, will negate and overrule the legislature's purpose of requiring a warning, since

there can be no sales to which the warning will attach.

While the commissioner was authorized to promulgate emergency regulations governing sales, that grant of authority must be read consistently with the legislature's purpose. To the extent that the commissioner believes that he has adequate information upon which to propose a regulation, that regulation should relate to the conditions under which and how the statutory warnings should be imposed at the time of the sale and to other determinations effecting the need for such a warning. To the extent that there is substantial evidence to support any emergency regulations, those regulations should be directed to these issues and avoid permanent consequences, under temporary rule making. We do not believe that the commissioner, if required to enter any emergency rules unless he believes there is a substantial basis of support and, in particular, should not now ban sales under emergency rules.

We also should point out we do not believe that the commissioner has made the detailed findings required of him regarding what, if any, significant health problem is presented, the evidence as to the alleged problem, or the level at which it is supposedly presented to the general population, and the need for and effect of a ban on sales. We are hopeful that after consideration of the submission to be presented, the commissioner will be better able to assess all the facts and that his findings will demonstrate that the proposed regulation is not necessary or desirable under all the circumstances.

As you are, of course, aware, we have been retained to provide legal counsel to our principals concerning their rights regarding the statutes and proposed regulation. We are submitting this letter not as a full discussion of the legal arguments available to our principals, but to point out the consequences of the regulation, and the need for such a regulation. We believe there are many other legal problems with the statutes and regulations, and while we would be glad to discuss them with you, we do not include all the legal issues, since we believe it outside the purpose of this submission.

You can anticipate receiving more detailed information prior to the 30th. If there is any particular information you will like, please let us know. However, we have indicated it seems certain that you will need additional time to study the comments that will be submitted and I would appreciate it if you could advise us as to whether the department is willing to defer the transmittal of the proposed regulation to the

Attorney General in order to evaluate and study the information provided.

Very truly yours,

ROBINS, DAVIS & LYONS

Stephen H. Cohen

SHC/jm

Table 2.—DURABILITY OF GLUE-WOOD SAMPLES.

Durability Rank	Adhesive System	Acid-Hydrolysis Half Life at 80°C.	Activation Energy (Kcal/mole)
1	Phenol-formaldehyde glue-wood (most durable)	Much greater than 128 min.	Much greater than 27 Kcal/mole
2	Melamine-formaldehyde glue-wood	128 "	21 "
3	Melamine-urea formaldehyde glue-wood	28 "	19 "
4	Urea-formaldehyde glue-wood (least durable)	8 "	17 "

hydrolysis rates for the phenol-formaldehyde glue and phenol-formaldehyde glue-wood systems were too slow to be measured, even at 100°C., therefore suggesting that the activation energies for their acid-hydrolysis reactions are much greater than 27 Kcal/mole. The low reactivity of the phenol-formaldehyde system can be attributed to the phenol-formaldehyde structure, since the hydrogen ion has no readily available site to attack, unlike the urea and melamine-formaldehyde glues. It is interesting to note that the activation energies measured for the acid hydrolysis of the glue-wood samples were indicative of their durabilities.

Conclusions

A mechanism for the acid hydrolysis formaldehyde glue and formaldehyde g wood samples is proposed and the reacti are shown to follow first-order kine Arrhenius parameters calculated for these actions provide evidence that covalent bo ing takes place between formaldehyde g and wood. The half lives calculated for acid-hydrolysis reactions provided an ind for estimating the durabilities of the gl wood bonds and four formaldehyde glue-wo samples were ranked using this index. T ranking was in good agreement with the s vice lives.

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~~5 MCAR § 1.0105 Capital expenditure aid.~~

~~A. Districts shall be eligible for capital expenditure aid when foundation aid, tuition, and fees, are insufficient to provide for capital purchases.~~

~~B. All equipment not approved in the budget review, purchases at a cost in excess of $4,000.00 must be preapproved by the commissioner of education.~~

~~C. All equipment shall be accounted for by the standard inventory control system.~~

~~D. Repairs on facility, equipment, or improvement of grounds that exceed $4,000.00 and not included in the budget review shall be included in B. for approval.~~

~~5 MCAR § 1.0107 Categorical aid.~~ ~~Categorical aid shall be allocated on the following criteria for districts operating high cost programs which require expenditures in excess of funding available through foundation aid and capital expenditure aid:~~

~~A. Preservation of the present plant and equipment.~~

~~B. Development of programs for emerging business and industry.~~

~~C. Unique programs designed to serve special populations.~~

~~D. Educational services for special populations.~~

~~E. High operating costs.~~

~~F. Rules and regulations imposed by other regulatory bodies which may affect the student teacher ratio as well as operating equipment costs.~~

Department of Health Environmental Health Division

Proposed Temporary Rule Governing the Level of Formaldehyde in Residential Units

Request for Public Comment

Notice is hereby given that the Department of Health has proposed the following temporary rule for the purpose of implementing provisions of Laws of 1980, ch. 594, §§ 1, 2 and 12, relating to formaldehyde.

All interested persons are hereby afforded the opportunity to submit their comments on the proposed rule for 20 days immediately following publication of this material in the *State Register* by writing to Pauline Bouchard, Division of Environmental Health, Minnesota Department of Health, 717 Delaware Street S.E., Minneapolis, Minnesota 55440. The temporary rule may be revised on the basis of comments received. Any written material received shall become part of the record in the final adoption of the temporary rule.

Since temporary rules can remain in effect by law, for no more than 180 days from their effective date, permanent rules will be proposed and a public hearing will be held on the proposed permanent rules at some time in the fall of 1980. A formal Notice of Hearing will appear at the appropriate time in the *State Register*.

June 9, 1980

George R. Pettersen, M.D.
Commissioner of Health

Temporary Rule as Proposed

7 MCAR § 1.234 Formaldehyde levels in residential units.

A. Any newly-constructed residential unit which is sold, rented or leased after the effective date of this rule, shall not contain more than 0.50 parts of formaldehyde per million parts of ambient air.

B. For the purpose of determining compliance with this rule,

1. "Newly constructed" means that the unit has not been previously occupied;

2. "Residential unit" means any mobile home, single-family residence or living unit in a multi-unit structure, regardless of type of ownership.

C. Measurements for formaldehyde shall be made under normal living conditions of temperature, which is defined as 68 degrees Fahrenheit to 75 degrees Fahrenheit; and of relative humidity, which is defined as 40% to 60%.

D. Formaldehyde shall be measured according to NIOSH Manual of Analytical Methods, 2nd Edition, NIOSH 77-157-A, 1977, Method P&CAM 125, as follows:

Formaldehyde in Air—Analytical Method

1. Principle of the method.

a. Formaldehyde reacts with chromotropic acid-sulfuric acid solution to form a purple monocationic chromogen. The absorbance of the colored solution is read in a spectrophotometer at 580 nm and is proportional to the quantity of formaldehyde in the solution (References 11.b. 11.f).

b. The chemistry of this color reaction is not known with certainty (Reference 11.c).

2. Range and sensitivity.

KEY: RULES SECTION — Underlining indicates additions to proposed rule language. ~~Strike-outs~~ indicate deletions from proposed rule language. PROPOSED RULES SECTION — Underlining indicates additions to existing rule language. ~~Strike outs~~ indicate deletions from existing rule language. If a proposed rule is totally new, it is designated "all new material."

a. From 0.1 μg/mℓ to 2.0 μg/mℓ of formaldehyde can be measured in the color developed solution.

b. A concentration of 0.1 ppm of formaldehyde can be determined in a 25 liter air sample based on an aliquot of 4 mℓ from 20 mℓ of absorbing solution and a difference of 0.05 absorbance unit from the blank.

3. Interferences.

a. The chromotropic acid procedure has very little interference from other aldehydes. Saturated aldehydes give less than 0.01 percent positive interference, and the unsaturated aldehyde acrolein results in a few percent positive interference. Ethanol and higher molecular weight alcohols and olefins in mixtures with formaldehyde are negative interferences. However, concentrations of alcohols in air are usually much lower than formaldehyde concentrations and, therefore, are not a serious interference.

b. Phenols result in a 10 to 20 percent negative interference when present at an 8:1 excess over formaldehyde. They are, however, ordinarily present in the atmosphere at lesser concentrations than formaldehyde and, therefore, are not a serious interference.

c. Ethylene and propylene in a 10:1 excess over formaldehyde result in a 5 to 10 percent negative interference and 2-methyl-1,3-butadiene in a 15:1 excess over formaldehyde showed a 15 percent negative interference. Aromatic hydrocarbons also constitute a negative interference (Reference 11f). It has recently been found that cyclohexanone causes a bleaching of the final color (Reference 11.d).

4. Precision and accuracy. The method was checked for reproducibility by having three different analysts in three different laboratories analyze standard formaldehyde samples. The results listed in Table 1 agreed within ±5 percent.

TABLE 1
Comparison of Formaldehyde Results from Three Laboratories

Micrograms Formaldehyde	Absorbance Lab. 1	Lab. 2	Lab. 3
1	0.057	0.063	0.061
3	0.183	0.175	0.189
5	0.269	0.279	0.262
7	0.398	0.381	0.392
10	0.566	0.547	0.537
20	1.02	0.980	1.07

5. Advantages and disadvantages.

a. Effect of storage—disadvantage.

(1) The absorbance of the reaction product increases slowly on standing. An increase of 3 percent in absorbance was noted after one day standing and an increase of 10 percent after eight days standing (11.f).

(2) No information is available on the effect of storage on the collected air sample.

b. Precision—advantage. Results checked for reproducibility agreed within ±5 percent (see Table 1).

6. Apparatus.

a. Sampling equipment. The sampling unit for the impinger collection method consists of the following components:

(1) A graduated midget impinger containing the absorbing solution or reagent.

(2) A pump suitable for delivering flow rates of 1 liter per minute for 24 hours. The sampling pump is protected from splashover or water condensation by an adsorption tube loosely packed with a plug of glass wool and inserted between the exit arm of the impinger and the pump.

(3) An integrating volume meter such as a dry gas or wet test meter.

(4) Thermometer.

(5) Manometer.

(6) Stopwatch.

b. Spectrophotometer or colorimeter. An instrument capable of measuring the absorbance of the color developed solution at 580 nm.

c. Associated laboratory glassware.

7. Reagents.

a. Chromotropic acid reagent. Dissolve 0.10 g of 4,5-dihydroxy-2,7-naphtha-lenedisulfonic acid disodium salt (Eastman Kodak Company, Rochester, New York, Cat. No. P230) in water and dilute to 10mℓ. Filter if necessary and store in a brown bottle. Make up fresh weekly.

b. Concentrated sulfuric acid.

c. Formaldehyde standard solution "A" (1 mg/mℓ). Dilute 2.7 mℓ of 37 percent formalin solution to 1 liter with distilled water. This solution must be standardized as described in Section 9.1. The solution is stable for at least a 3-month period. Alternatively sodium formaldehyde bisulfite (Eastman Kodak Company, Cat. No. P6450) can be used as a primary standard (Reference 11d). Dissolve 4.4703 g in distilled water and dilute to 1 liter.

d. Formaldehyde standard solution "B" (10 μg/mℓ). Dilute 1 mℓ of standard solution "A" to 100 mℓ with distilled water. Make up fresh daily.

e. Iodine, 0.1 N (approximate). Dissolve 25 g of potassium iodide in about 25 mℓ of water, add 12.7 g of iodine and dilute to 1 liter.

f. Iodine, 0.01 N. Dilute 100 mℓ of the 0.1 N iodine solution to 1 liter. Standardize against sodium thiosulfate.

g. Starch solution, 1 Percent. Make a paste of 1 g of soluble starch and 2 mℓ of water and slowly add the paste to 100 mℓ of boiling water. Cool, add several mℓ of chloroform as a preservative, and store in a stoppered bottle. Discard when a mold growth is noticeable.

h. Sodium carbonate buffer solution. Dissolve 80 g of anhydrous sodium carbonate in about 500 mℓ of water. Slowly add 20 mℓ of glacial acetic acid and dilute to 1 liter.

i. Sodium bisulfite, 1 Percent. Dissolve 1 g of sodium bisulfite in 100 mℓ of water. It is best to prepare a fresh solution weekly.

8. Procedure.

a. Cleaning of equipment. Care must be exercised to ensure the absence of probable contaminants like organic materials that can be charred by concentrated sulfuric acid. Soaking glassware for one hour in a 1:1 mixture of nitric and sulfuric acids, followed by thorough rinsing with double-deionized water will remove all possible organic contaminants.

b. Collection and shipping of samples.

(1) Pour 20 mℓ of the absorbing solution (distilled water) into each graduated midget impinger.

(2) Connect two impingers in series to the vacuum pump (via the absorption tube) and the prefilter assembly (if needed) with short pieces of flexible tubing. The minimum amount of tubing necessary to make the joint between the prefilter and impingers should be used. The air being sampled should not be passed through any other tubing or other equipment before entering the impingers.

(3) It has been recommended that two impingers must be used in series because under conditions of sampling, the collection efficiency of only one impinger is approximately 80 percent. With two impingers in series the total collection efficiency is approximately 95 percent. The contents of each impinger should be analyzed separately.

(4) Turn on pump to begin sample collection. Care should be taken to measure the flow rate, time and/or volume as accurately as possible. The sample should be taken at a flow rate of 1 ℓpm for one hour. (References 11.a, 11.e). These conditions give a total of 60 liters of air that is drawn through the system. However, a shorter sampling time can be used providing enough formaldehyde is collected to be above the lower limit of sensitivity of the method.

(5) After sampling, the impinger stem can be removed and cleaned. Tap the stem gently against the inside wall of the impinger bottle to recover as much of the sampling solution as possible. Wash the stem with a small amount (1-2 mℓ) of unused absorbing solution and add the wash to the impinger. Then the impinger is sealed with a hard- non-reactive stopper (preferably Teflon). Do not seal with rubber. The stoppers on the impingers should be tightly sealed to prevent leakage during shipping. If it is preferred to ship the impingers with the stems in, the outlets of the stem should be sealed with Parafilm or other non-rubber covers, and the ground glass joints should be sealed (i.e., taped) to secure the top tightly.

(6) Care should be taken to minimize spillage or loss by evaporation at all times. Refrigerate samples if analysis cannot be done within a day.

(7) Whenever possible, hand delivery of the samples is recommended. Otherwise, special impinger shipping cases designed by NIOSH should be used to ship the samples.

(8) A "blank" inpinger should be handled as the other samples (fill, seal and transport) except that no air is sampled through this impinger.

c. Analysis.

(1) Transfer the sample from each impinger to either a 25 mℓ- or 50 mℓ-graduate. Note the volume of each solution.

(2) Pipet a 4 mℓ aliquot from each of the sampling solutions into glass stoppered test tubes. A blank containing 4 mℓ of distilled water must also be run. If the formaldehyde content of the aliquot exceeds the limit of the method, a smaller aliquot diluted to 4 mℓ with distilled water is used.

(3) Add 0.1 mℓ of 1 percent chromotropic acid reagent to the solution and mix.

(4) To the solution pipette slowly and cautiously 6 mℓ of concentrated sulfuric acid. The solution becomes extremely hot during the addition of the sulfuric acid. If the acid is not added slowly, some loss of sample could occur due to spattering.

(5) Allow to cool to room temperature. Read at 580 nm in a suitable spectrophotometer using a 1 cm cell. No change in absorbance was noted over a 3 hour period after color development. Determine the formaldehyde content of the sampling solution from a curve previously prepared from standard formaldehyde solutions.

(6) During the analysis procedure, it is good practice to group together the two impingers from each sampling series and label them as "A" and "B." The formaldehyde content calculated in "A" is added to that calculated in "B" to give the total amount in the sampled atmosphere by the impingers in series.

9. Calibration and standards.

a. Standardization of formaldehyde solution.

(1) Pipette 1 mℓ of formaldehyde standard solution "A" into an iodine flask. Into another flask pipette 1 mℓ of distilled water. This solution serves as the blank.

(2) Add 10 mℓ of 1 percent sodium bisulfite and 1 mℓ of 1 percent starch solution.

(3) Titrate with 0.1 N iodine to a dark blue color.

(4) Destroy the excess iodine with 0.05 N sodium thiosulfate.

(5) Add 0.01 N iodine until a faint blue end point is reached.

KEY: RULES SECTION — Underlining indicates additions to proposed rule language. ~~Strike-outs~~ indicate deletions from proposed rule language. PROPOSED RULES SECTION — Underlining indicates additions to existing rule language. ~~Strike outs~~ indicate deletions from existing rule language. If a proposed rule is totally new, it is designated "all new material."

(6) The excess inorganic bisulfite is now completely oxidized to sulfate, and the solution is ready for the assay of the formaldehyde bisulfite addition product.

(7) Chill the flask in an ice bath and add 25 mℓ of chilled sodium carbonate buffer. Titrate the liberated sulfite with 0.01 N iodine, using a micro-burette, to a faint blue end point. The amount of iodine added in this step must be accurately measured and recorded.

(8) One mℓ of 0.0100 N iodine is equivalent to 0.15 mg of formaldehyde. Therefore, since 1 mℓ of formaldehyde standard solution was titrated, the mℓ of 0.01 N iodine used in the final titration multiplied by the factor, 0.15, gives the formaldehyde concentration of the standard solution in mg/mℓ.

(9) The factor, 0.15, must be adjusted or determined accordingly on the basis of the exact normality of the iodine solution.

b. Preparation of standard curve.

(1) Pipet 0, 0.1, 0.3, 0.5, 0.7, 1.0, and 2.0 mℓ of standard solution "B" into glass stoppered test tubes.

(2) Dilute each standard to 4 mℓ with distilled water.

(3) Develop the color as described in the analysis procedure (Section 8c).

(4) Plot absorbance against micrograms of formaldehyde in the color developed solution. Note that the microgram concentration of the formaldehyde is determined based on the standardization value of solution A.

10. Calculations.

a. Convert the volume of air sampled (V) to the volume of air at standard conditions (V_3) of 760 mm of mercury and 25°C, using the correction formula:

$$V_3 = V \times \frac{P}{760} \times \frac{298}{(T+273)}$$

where:

V_3 = volume of air in liters at standard conditions
V = volume of air sampled in liters
P = barometric pressure in mm of mercury
T = temperature of sample air, °C

b. Determine the total concentration (C_t) of formaldehyde present in the two sample impingers in series, A and B.

$$C_t = C_A \times F_A + C_B \times F_B$$

where:

C_t = total μg of formaldehyde in the sample
C_A and C_B = respective formaldehyde concentration in μg of the sample aliquots taken from impingers A and B as determined from the calibration curve
F_A and F_B = respective aliquot factor; $\frac{\text{sampling soln. vol in m}\ell}{\text{m}\ell \text{ aliquot used}}$

c. The concentration of formaldehyde in the sampled atmosphere may be calculated by using the following equation, assuming standard conditions are taken as 760 mm of mercury and 25°C:

$$\text{ppm (volume)} = \frac{C_t \times 24.47}{V_s \times \text{M.W.}}$$

where:

V_s = Liters of air sampled at standard conditions
M.W. = molecular weight of formaldehyde (30.03)
24.47 = μℓ of formaldehyde gas in one micromole at 760 mm Hg and 25°C.

11. References.

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c. Feigl, F., *Spot Tests in Organic Analysis*, Seventh Ed., American Elsevier Publishing Company, New York, 434, (1966).

d. Feldstein, M. (Bay Area Air Pollution Control District) Personal Communication, March 1968.

e. MacDonald, W. E., "Formaldehyde in Air—A Specific Field Test," Amer Ind Hyg Assoc Quarterly, 15, 217 (1954).

f. Sleva, S. F., "Determination of Formaldehyde: Chromotropic Acid Method. Selected Methods for the Measurement of Air Pollutants," Public Health Service Publication No. 999-AP-11, H-1, 1965.

g. Treadwell and Hall, Analytical Chemistry, Vol. II, Ninth English Edition. John Wiley & Sons, Inc., New York, p. 590, 1951.

h. Treadwell and Hall, Analytical Chemistry, Vol. II, Ninth English Edition. John Wiley & Sons, Inc., New York, p. 588, 1951.

SF-00006-01

STATE OF MINNESOTA

Office Memorandum

DEPARTMENT HEALTH

TO : Jerry S. Anderson
Special Assistant Attorney General
Department of Administration

DATE: Nov. 12, 1980

FROM : Roger L. DeRoos, Ph.D., Director
Division of Environmental Health

PHONE: 612/296-5320

SUBJECT: Proposed Adoption of Temporary Rule Relating to Formaldehyde.

The temporary rule relating to formaldehyde which you disapproved on October 15, 1980, has been revised and is herewith being resubmitted for review. In accordance with your request, we are submitting as an attachment a new Order of Adoption of rule, including the revised rule being adopted (original plus two copies).

The remainder of this memo constitutes the agency's statement in support of the rule being submitted for review. Every issue raised in your memorandum of October 15, 1980, regarding the earlier version is addressed below in the order in which you raised them.

Most of the substantial changes to which you objected have been eliminated from the revised version.

1. The revised rule being adopted applies to newly constructed residential units only, and uses the same language as that in the rule as proposed.

2. The inclusion of urea formaldehyde foam insulation within the definition of building materials and all references to foam insulation made elsewhere in the earlier version of the rule have been deleted from the revised version.

3. In your memo of October 15, you noted that the rule was not specific to the matter of urea formaldehyde. In subsection B.1. of the revised version, the term formaldehyde is qualified by the phrase "[that] which is attributable to building materials." In section A., the term "building materials" is defined as material containing urea formaldehyde. The net effect of reading the definition of "building materials" into subsection B.1. is that the sentence means "... 0.5 ppm of formaldehyde which is attributable to ..." materials containing urea formaldehyde. This language which is directly interpretable from the words of the rule itself, parrots the language of the last sentence of Section 1 of the law.

As to the second issue raised under #3, it is not necessary nor is it possible to say that only urea formaldehyde will be measured for the purpose of determining compliance with the 0.5 level. It is not necessary because of the characteristics of urea formaldehyde in comparison to formaldehyde released from other sources. Building materials (i.e., plywood and particle board) commonly are bonded with urea formaldehyde resins. Other formaldehyde resins, such as phenol, are used much less frequently. Phenol formaldehyde resins release free formaldehyde very rapidly immediately after curing and then release only minute amounts thereafter. On the other hand, urea formaldehyde resins do not release most of the free formaldehyde at the time of bonding but rather release it at a much slower rate, and over a much longer period of time, i.e., months or years. This is the reason why urea

formaldehyde products are troublesome and this is why the Legislature decided to restrict the legislation to require regulation of urea formaldehyde products. Phenol formaldehyde products do not pose the same risk. This point was made by Blandin Paper Products, Cloquet, Minnesota, both in committee hearings and by letter directly to you after the rule was proposed.

It is not possible to say that only formaldehyde produced from urea-resins will be measured because the analytical methods available can not distinguish formaldehyde arising from urea-resins from that released from other types of resins. But since the only source of free formaldehyde in a newly constructed residential unit will be the urea formaldehyde containing building materials, there is no need to require the use of an analytical method which measures only urea based formaldehyde.

4. The portions of the analytical method which were merely informative and not substantive have been deleted from the revised version.

5. The use of the term "normal ventilation" has been eliminated. The revised rule specifies that windows and doors be closed for one hour prior to the taking of air samples. This interval of time is sufficient to allow the concentration of formaldehyde in the air (which is influenced by temperature, humidity and ventilation rate) to approach a state of equilibrium.

6. The revised rule prescribes the location at which the air sample should be taken. See §1.234 F.2.b.

7. The provision regarding the testing conditions which a consumer would have to use for the purpose of making a complaint has been eliminated in its entirety. The revised rule is limited to procedures related to testing at the time of sale, in accordance with Section 1 of the law.

8. Subdivision G (first version) has been deleted from the rule. That portion which was labelled G.1. has been reproduced as an explanatory footnote on the first page of the rule for the purpose of informing the reader of the limited purpose of the rule. It is a purely advisory statement and neither adds to nor subtracts from the rule.

The rule as adopted is legal.

The following points are made in response to the issues regarding legality of the rule, starting near the bottom of page 2 of your memo.

1. In order to be able to promulgate a rule relating to formaldehyde, the commissioner of health was first required to determine if formaldehyde posses a significant health problem. (Laws 1980, Chap. 594 §1) The commissioner made such a determination within the 30-day interval imposed in the law and announced his decision to the public in a statement issued on May 23, 1980. The statutory provision under which these actions were taken reads as follows:

> "Within 30 days after April 24, 1980 the commissioner of health shall determine if a significant health

problem is presented by the use of building materials that emit formaldehyde gases. If he determines that such a problem exists he shall promulgate rules persuant to chapter 15, including emergency rules, establishing standards governing the sale of building materials and housing units that contain products made with urea formaldehyde." (laws, 1980, chap. 594, § 1).

The commissioner's determination was not promulgated as a rule and need not have been so promulgated for a number of reasons. The Legislature did not intend that the determination should be issued as a rule. Evidence on this point derives from two sources:

a) The Legislature demonstrates that it knows the difference between a rule and a determination of health effects by giving the commissioner authority to adopt rules, as a separate directive from that requiring the commissioner to make a determination.

b) Further evidence of intent can be gleaned from the statement that the determination must be made within 30 days of the effective date of the law. Even if the temporary rule-making procedure were required to be used, the minimum time intervals imposed in §15.0412 subd. 5 would not permit an effective determination to be made within the 30 days allowed in the law. The argument that the determination must be made according to Chapter 15 requires one to assume that the Legislature is unaware

of the time constraints imposed by the administrative procedures act and rules. Such an inference is not proper and ought not be recognized unless there is absolutely no alternative interpretation available. There is a staightforward and reasonable alternative interpretation available here and that is that the Legislature did not intend that the determination would have to be issued or adopted in the form of a rule.

Similarly, lack of notice is not a valid ground for arguing that the determination should have been issued as a rule. Very clear public notice was given, on two separate occasions, to inform the public of the commissioner's determination. Public notice was made in the first instance, by release of statement containing the commissioner's determination to approximately 520 news sources in the State, on May 22, 1980. Notice was given a second time, when the notice of the proposed rule was published in the State Register. The determination itself and the legal authority under which it was made were published in the notice. One can presume that every person who read the published rule also had to read the notice which preceded it, if only to determine how and when the rule might take effect. Even if one had not read the notice it is not necessary for one to have known about the determination in order to be able to read or understand the effect of the rule being proposed.

Based on the foregoing reasons, it is clear that the Legislature did not intend, nor does state law require that the determination required by Section 1 of the 1980 formaldehyde law had to be promulgated as a rule.

2. The specific portion of the rule which raised an equal protection problem for mobile home manufacturers has been eliminated. See § 1.234 B.1.

3. With regard to retroactive effect of the rule in terms of applicability of the 0.5 ppm level to units which may already have been constructed, this problem has been eliminated in the revised version. See § 1.234 A.3. The definition of "newly constructed" has been slightly changed from the definition in the proposed rule in order to eliminate any possible retroactive effect of the rule upon sellers.

4. The rule does not in any way conflict with any existing federal or state standards regarding residential units. We have discussed the matter with building code staff in the Department of Administration who inspect mobile homes for compliance with U.S. H.U.D. standards. Only rates of infiltration (i.e., the rate at which outside air can leak into a unit because of loose contruction) are regulated by H.U.D. mobile home standards. No ventilation rate is prescribed. There are no other state or federal standards which would apply to construction of residential environments. We have had ongoing discussions with the Minnesota Energy Agency regarding overall indoor

air quality problems. They have assured us that the rule does not conflict with any existing or proposed federal or state standards applicable to construction or indoor air quality of residential units.

RECEIVED
MAY 9 1980
Minn Dept of Health
Div of Env Health

AN ACT

S. F. No. 2100
CHAPTER No.
594

E.H. David Bean
Laura Ostrom
5/5/80

relating to trade regulations; providing limits on formaldehyde concentrations emitted from building materials and insulation; prohibiting certain transactions; enacting the uniform trade secrets act; providing remedies; prescribing penalties.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF MINNESOTA:

Section 1. [144.704] [FORMALDEHYDE RULES.] Within 30 days after the effective date of this section the commissioner of health shall determine if a significant health problem is presented by the use of building materials that emit formaldehyde gases. If he determines that such a problem exists he shall promulgate rules pursuant to chapter 15, including emergency rules, establishing standards governing the sale of building materials and housing units that contain products made with urea formaldehyde.

Sec. 2. [325.991] [DUTY OF MANUFACTURER.] Subdivision 1. No manufacturer shall sell any building materials and no builder shall sell or lease a housing unit containing urea formaldehyde unless the manufacturer or builder has made the following written disclosure to any purchaser of

the materials or housing unit or lessee of the housing unit: "WARNING. THIS PRODUCT (HOUSING UNIT) CONTAINS THE CHEMICAL FORMALDEHYDE. FOR SOME PEOPLE FORMALDEHYDE MAY CAUSE HEALTH PROBLEMS, SUCH AS IRRITATION OF THE EYES, NOSE AND THROAT, SNEEZING, COUGHING, HEADACHES, SHORTNESS OF BREATH, OR CHEST OR STOMACH PAINS. CHILDREN UNDER THE AGE OF TWO, ELDERLY PEOPLE, PEOPLE WITH BREATHING PROBLEMS OR PEOPLE WITH ALLERGIES MAY HAVE MORE SERIOUS DIFFICULTIES. IF YOU HAVE QUESTIONS ABOUT PROBLEMS YOU MAY HAVE WITH FORMALDEHYDE, CONSULT A DOCTOR."

Subd. 2. The disclosure required by subdivision 1 shall be made clearly and conspicuously on the label or written warranty of the materials in a manner designed to attract the attention of a prospective buyer or user. If the product or housing unit has neither a label nor a written warranty the disclosure shall be made in a separate writing included with the product or housing unit.

Subd. 3. No person shall sell for use in a dwelling place building materials subject to the written disclosure requirement of subdivision 1 unless the seller has provided to the purchaser a copy of the written disclosure provided by the manufacturer. No person shall for gain install or use in a dwelling place building materials subject to the written disclosure requirement of subdivision 1 unless the installer or user has provided to the person on whose behalf the materials are installed or used a copy of the written disclosure provided by the manufacturer.

Subd. 4. The manufacturer of a product or builder of a housing unit that contains materials made with urea formaldehyde shall pay the reasonable cost of repair or relocation if the consumer can document that the housing unit contains a significant ambient air level of formaldehyde and in addition has documented medical records

of illness related to formaldehyde and a statement from a physician that the consumer must vacate the premises. The party who has received the claim has the right to test the ambient air level of the housing unit at reasonable times.

If within 30 days after the presentation of the items set forth above the manufacturer or builder and the consumer do not agree on a remedy the consumer may bring suit to recover the reasonable cost of repair or relocation plus reasonable attorneys' fees. Notwithstanding the remedy under this subdivision, the consumer may bring an action for personal injury, if any, if the action is commenced within one year from the presentation of the items required by this subdivision.

Subd. 5. If the commissioner of health determines pursuant to section 1 that there does not exist a significant health problem, the provisions of this section are not effective.

Subd. 6. Any person who is found in violation of subdivisions 1 to 3 shall be deemed in violation of section 325.79, subdivision 1, and the provisions of section 325.907 shall apply.

Sec. 3. [DEFINITIONS.] Subdivision 1. As used in sections 3 to 9, the terms defined in these sections have the meanings given them, unless the context requires otherwise:

Subd 2. "Improper means" includes theft, bribery, misrepresentation, breach or inducement of a breach of a duty to maintain secrecy, or espionage through electronic or other means;

Subd. 3. "Misappropriation" means:

(i) acquisition of a trade secret of another by a person who knows or has reason to know that the trade secret was acquired by improper means; or

(ii) disclosure or use of a trade secret of another without express or implied consent by a person who

(A) used improper means to acquire knowledge of the trade secret; or

(B) at the time of disclosure or use, knew or had reason to know that his knowledge of the trade secret was

(I) derived from or through a person who had utilized improper means to acquire it;

(II) acquired under circumstances giving rise to a duty to maintain its secrecy or limit its use; or

(III) derived from or through a person who owed a duty to the person seeking relief to maintain its secrecy or limit its use; or

(C) before a material change of his position, knew or had reason to know that it was a trade secret and that knowledge of it had been acquired by accident or mistake.

Subd. 4. "Person" means a natural person, corporation, business trust, estate, trust, partnership, association, joint venture, government, governmental subdivision or agency, or any other legal or commercial entity.

Subd. 5. "Trade secret" means information, including a formula, pattern, compilation, program, device, method, technique, or process, that:

(i) derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means by, other persons who can obtain economic value from its disclosure or use, and

(ii) is the subject of efforts that are reasonable under the circumstances to maintain its secrecy.

Sec. 4. [INJUNCTIVE RELIEF.] (a) Actual or threatened misappropriation may be enjoined. Upon application to the court, an injunction shall be terminated when the trade

secret has ceased to exist, but the injunction may be continued for an additional reasonable period of time in order to eliminate commercial advantage that otherwise would be derived from the misappropriation.

(b) If the court determines that it would be unreasonable to prohibit future use, an injunction may condition future use upon payment of (1) an equitable royalty for no longer than the period of time the use could have been prohibited; or (2) other compensation.

(c) In appropriate circumstances, affirmative acts to protect a trade secret may be compelled by court order.

Sec. 5. [DAMAGES.] (a) In addition to or in lieu of injunctive relief, a complainant may recover damages for the actual loss caused by misappropriation. A complainant also may recover for the unjust enrichment caused by misappropriation that is not taken into account in computing damages for actual loss.

(b) If willful and malicious misappropriation exists, the court may award exemplary damages in an amount which the court deems just and equitable.

Sec. 6. [ATTORNEY'S FEES.] If (i) a claim of misappropriation is made in bad faith, (ii) a motion to terminate an injunction is made or resisted in bad faith, or (iii) willful and malicious misappropriation exists, the court may award reasonable attorney's fees to the prevailing party.

Sec. 7. [PRESERVATION OF SECRECY.] In an action under sections 3 to 9, a court shall preserve the secrecy of an alleged trade secret by reasonable means, which may include granting protective orders in connection with discovery proceedings, holding in-camera hearings, sealing the records of the action, and ordering any person involved in the litigation not to disclose an alleged trade secret

without prior court approval.

Sec. 8. [STATUTE OF LIMITATIONS.] An action for misappropriation must be brought within three years after the misappropriation is discovered or by the exercise of reasonable diligence should have been discovered. For the purposes of this section, a continuing misappropriation constitutes a single claim.

Sec. 9. [EFFECT ON OTHER LAW.] (a) Sections 3 to 9 displace conflicting tort, restitutionary, and other law of this state pertaining to civil liability for misappropriation of a trade secret.

(b) Sections 3 to 9 do not affect:

(1) contractual or other civil liability or relief that is not based upon misappropriation of a trade secret; or

(2) criminal liability for misappropriation of a trade secret.

Sec. 10. [SHORT TITLE.] Sections 3 to 9 may be cited as the "Uniform Trade Secrets Act."

Sec. 11. [TIME OF TAKING EFFECT.] Sections 3 to 9 of this act take effect on August 1, 1980, and do not apply to misappropriation occurring prior to the effective date.

Sec. 12. [EFFECTIVE DATE.] Section 1 and section 2, subdivisions 4 and 5, are effective the day following final enactment. Section 2, subdivisions 1 to 3 and 6, are effective January 1, 1981.

S. F. No. 2100

Edward J. Gearty
President of the Senate.

Fred C. Norton
Speaker of the House of Representatives.

Passed the Senate this 28th day of March in the year of Our Lord one thousand nine hundred and eighty.

Patrick E. Flahaven
Secretary of the Senate.

Passed the House of Representatives this 10th day of April in the year of Our Lord one thousand nine hundred and eighty.

Edward A. Burdick
Chief Clerk, House of Representatives.

Approved

April 23, 1980

Albert H. Quie
Governor of the State of Minnesota.

Filed April 23, 1980

Joan Anderson Growe
Secretary of State.

Temporary Rule as Adopted

7 MCAR § 1.234. Formaldehyde in Residential Units.

A. The commissioner of health has determined that a significant health problem is presented by the use of building materials that emit formaldehyde gas.

B. Definitions. For the purpose of this rule the following terms or phrases shall have the meanings given below:

1. "building materials" means any material containing urea formaldehyde which is used in the construction of a residential living unit, including but not limited to particle board, plywood and paneling. The phrase also includes urea formaldehyde foam insulation and carpeting which is installed in a mobile home by the manufacturer during construction of the unit.

2. "commissioner" means the commissioner of health.

3. "residential unit" means any mobile home, single-family residence, or living unit in a multi-unit structure, regardless of type of ownership.

C. Formaldehyde Level. After the effective date of this rule,

1. the ambient indoor air of any residential unit which is sold shall not contain more than 0.5 parts per million (ppm) of formaldehyde which is attributable to building materials, and

2. the installation of urea formaldehyde foam insulation in a residential unit shall not cause the ambient level of formaldehyde in the air of the unit to exceed 0.5 ppm of formaldehyde.

D. For the purpose of this rule, measurements for formaldehyde shall be made according to the method and under the conditions prescribed in parts E and F of this rule.

E. Test Method. Formaldehyde shall be measured according to NIOSH Manual of Analytical Methods, 2nd Edition, NIOSH 77-157-A, 1977, Method # P&CAM 125, as follows:

1. Principle of the Method

a. Formaldehyde reacts with chromotropic acid-sulfuric acid solution to form a purple monocationic chromogen. The absorbance of the colored solution is read in a spectrophotometer at 580 nm and is proportional to the quantity of formaldehyde in the solution (References 11.b, 11.f).

b. The chemistry of this color reaction is not known with certainty (Reference 11.c).

2. Range and Sensitivity

a. From 0.1 μg/mℓ to 2.0 μg/mℓ of formaldehyde can be measured in the color developed solution.

b. A concentration of 0.1 ppm of formaldehyde can be determined in a 25 liter air sample based on an aliquot of 4 mℓ from 20 mℓ of absorbing solution and a difference of 0.05 absorbance unit from the blank.

3. Interferences

a. The chromotropic acid procedure has very little interference from other aldehydes. Saturated aldehydes give less than 0.01 percent positive interference, and the unsaturated aldehyde acrolein results in a few percent positive interference. Ethanol and higher molecular weight alcohols and olefins in mixtures with formaldehyde are negative interferences. However, concentrations of alcohols in air are usually much lower than formaldehyde concentrations and, therefore, are not a serious interference.

b. Phenols result in a 10 to 20 percent negative interference when present at an 8:1 excess over formaldehyde. They are, however, ordinarily present in the atmosphere at lesser concentrations than formaldehyde and, therefore, are not a serious interference.

c. Ethylene and propylene in a 10:1 excess over formaldehyde result in a 5 to 10 percent negative interference and 2-methyl-1,3-butadiene in a 15:1 excess over formaldehyde showed a 15 percent negative interference. Aromatic hydrocarbons also constitute a negative interference (Reference 11.f). It has recently been found that cyclohexanone causes a bleaching of the final color (Reference 11.d).

4. Precision and Accuracy

The method was checked for reproducibility by having three different analysts in three different laboratories analyze standard formaldehyde samples. The results listed in Table 1 agreed within ±5 percent.

TABLE 1

COMPARISON OF FORMALDEHYDE RESULTS FROM THREE LABORATORIES

Micrograms Formaldehyde	Absorbance		
	Lab. 1	Lab. 2	Lab. 3
1	0.057	0.063	0.061
3	0.183	0.175	0.189
5	0.269	0.279	0.262
7	0.398	0.381	0.392
10	0.566	0.547	0.537
20	1.02	0.980	1.07

5. Advantages and Disadvantages

a. Effect of Storage – Disadvantage

(1) The absorbance of the reaction product increases slowly on standing. An increase of 3 percent in absorbance was noted after one day standing and an increase of 10 percent after eight days standing (11.f).

(2) No information is available on the effect of storage on the collected air sample.

b. Precision – Advantage. Results checked for reproducibility agreed within ±5 percent (see Table 1).

6. Apparatus

a. Sampling Equipment. The sampling unit for the impinger collection method consists of the following components:

(1) A graduated midget impinger containing the absorbing solution or reagent.

(2) A pump suitable for delivering flow rates of 1 liter per minute for 24 hours. The sampling pump is protected from splashover or water condensation by an adsorption tube loosely packed with a plug of glass wool and inserted between the exit arm of the impinger and the pump.

(3) An integrating volume meter such as a dry gas or wet test meter.

(4) Thermometer.

(5) Manometer.

(6) Stopwatch.

b. Spectrophotometer or Colorimeter. An instrument capable of measuring the absorbance of the color developed solution at 580 nm.

c. Associated laboratory glassware.

7. Reagents

a. Chromotropic Acid Reagent. Dissolve 0.10 g of 4,5-dihydroxy-2,7-naphthalenedisulfonic acid disodium salt (Eastman Kodak Company, Rochester, New York, Cat. No. P230) in water and dilute to 10 mℓ. Filter if necessary and store in a brown bottle. Make up fresh weekly.

b. Concentrated sulfuric acid.

c. Formaldehyde Standard Solution "A" (1 mg/mℓ). Dilute 2.7 mℓ of 37 percent formalin solution to 1 liter with distilled water. This solution must be standardized as described in Section 9.1. The solution is stable for at least a 3-month period. Alternatively sodium formaldehyde bisulfite (Eastman Kodak Company, Cat. No. P6450) can be used as a primary standard (Reference 11d). Dissolve 4.4703 g in distilled water and dilute to 1 liter.

d. Formaldehyde Standard Solution "B" (10 μg/mℓ). Dilute 1 mℓ of standard solution "A" to 100 mℓ with distilled water. Make up fresh daily.

e. Iodine, 0.1 N (approximate). Dissolve 25 g of potassium iodide in about 25 mℓ of water, add 12.7 g of iodine and dilute to 1 liter.

f. Iodine, 0.01 N. Dilute 100 mℓ of the 0.1 N iodine solution to 1 liter. Standardize against sodium thiosulfate.

g. Starch Solution, 1 Percent. Make a paste of 1 g of soluble starch and 2 mℓ of water and slowly add the paste to 100 mℓ of boiling water. Cool, add several mℓ of chloroform as a preservative, and store in a stoppered bottle. Discard when a mold growth is noticeable.

h. Sodium Carbonate Buffer Solution. Dissolve 80 g of anhydrous sodium carbonate in about 500 mℓ of water. Slowly add 20 mℓ of glacial acetic acid and dilute to 1 liter.

i. Sodium Bisulfite, 1 Percent. Dissolve 1 g of sodium bisulfite in 100 mℓ of water. It is best to prepare a fresh solution weekly.

8. Procedure

a. Cleaning of Equipment. Care must be exercised to ensure the absence of probable contaminants like organic materials that can be charred by concentrated sulfuric acid. Soaking glassware for one hour in a 1:1 mixture of nitric and sulfuric acids, followed by thorough rinsing with double-deionized water will remove all possible organic contaminants.

b. Collection and Shipping of Samples

(1) Pour 20 mℓ of the absorbing solution (distilled water) into each graduated midget impinger.

(2) Connect two impingers in series to the vacuum pump (via the absorption tube) and the prefilter assembly (if needed) with short pieces of flexible tubing. The minimum amount of tubing necessary to make the joint between the prefilter and impingers should be used. The air being sampled should not be passed through any other tubing or other equipment before entering the impingers.

(3) It has been recommended that two impingers must be used in series because under conditions of sampling, the collection efficiency of only one impinger is approximately 80 percent. With two impingers in series the total collection efficiency is approximately 95 percent. The contents of each impinger should be analyzed separately.

(4) Turn on pump to begin sample collection. Care should be taken to measure the flow rate, time and/or volume as accurately as possible. The sample should be taken at a flow rate of 1 ℓpm for one hour. (References 11. a, 11e). These conditions give a total of 60 liters of air that is drawn through the system. However, a shorter sampling time can be used providing enough formaldehyde is collected to be above the lower limit of sensitivity of the method.

(5) After sampling, the impinger stem can be removed and cleaned. Tap the stem gently against the inside wall of the impinger bottle to recover as much of the sampling solution as possible. Wash the stem with a small amount (1-2 mℓ) of unused absorbing solution and add the wash to the impinger. Then the impinger is sealed with a hard, non-reactive stopper (preferably Teflon). Do not seal with rubber. The stoppers on the impingers should be tightly sealed to prevent leakage during shipping. If it is preferred to ship the impingers with the stems in, the outlets of the stem should be sealed with Parafilm or other non-rubber covers, and the ground glass joints should be sealed (i.e., taped) to secure the top tightly.

(6) Care should be taken to minimize spillage or loss by evaporation at all times. Refrigerate samples if analysis cannot be done within a day.

(7) Whenever possible, hand delivery of the samples is recommended. Otherwise, special impinger shipping cases designed by NIOSH should be used to ship the samples.

(8) A "blank" impinger should be handled as the other samples (fill, seal and transport) except that no air is sampled through this impinger.

c. Analysis

(1) Transfer the sample from each impinger to either a 25 mℓ- or 50 mℓ-graduate. Note the volume of each solution.

(2) Pipet a 4 mℓ aliquot from each of the sampling solutions into glass stoppered test tubes. A blank containing 4 mℓ of distilled water must also be run. If the formaldehyde content of the aliquot exceeds the limit of the method, a smaller aliquot diluted to 4 mℓ with distilled water is used.

(3) Add 0.1 mℓ of 1 percent chromotropic acid reagent to the solution and mix.

(4) To the solution pipette slowly and cautiously 6 mℓ of concentrated sulfuric acid. The solution becomes extremely hot during the addition of the sulfuric acid. If the acid is not added slowly, some loss of sample could occur due to spattering.

(5) Allow to cool to room temperature. Read at 580 nm in a suitable spectrophotometer using a 1 cm cell. No change in absorbance was noted over a 3 hour period after color development. Determine the formaldehyde content of the sampling solution from a curve previously prepared from standard formaldehyde solutions.

(6) During the analysis procedure, it is good practice to group together the two impingers from each sampling series and label them as "A" and "B." The formaldehyde content calculated in "A" is added to that calculated in "B" to give the total amount in the sampled atmosphere by the impingers in series.

9. Calibration and Standards

a. Standardization of Formaldehyde Solution

(1) Pipette 1 mℓ of formaldehyde standard solution "A" into an iodine flask. Into another flask pipette 1 mℓ of distilled water. This solution serves as the blank.

(2) Add 10 mℓ of 1 percent sodium bisulfite and 1 mℓ of 1 percent starch solution.

(3) Titrate with 0.1 N iodine to a dark blue color.

(4) Destroy the excess iodine with 0.05 N sodium thiosulfate.

(5) Add 0.01 N iodine until a faint blue end point is reached.

(6) The excess inorganic bisulfite is now completely oxidized to sulfate, and the solution is ready for the assay of the formaldehyde bisulfite addition product.

(7) Chill the flask in an ice bath and add 25 mℓ of chilled sodium carbonate buffer. Titrate the liberated sulfite with 0.01 N iodine, using a microburette, to a faint blue end point. The amount of iodine added in this step must be accurately measured and recorded.

(8) One mℓ of 0.0100 N iodine is equivalent to 0.15 mg of formaldehyde. Therefore, since 1 mℓ of formaldehyde standard solution was titrated, the mℓ of 0.01 N iodine used in the final titration multiplied by the factor, 0.15, gives the formaldehyde concentration of the standard solution in mg/mℓ.

(9) The factor, 0.15, must be adjusted or determined accordingly on the basis of the exact normality of the iodine solution.

b. Preparation of Standard Curve

(1) Pipet 0, 0.1, 0.3, 0.5, 0.7, 1.0, and 2.0 mℓ of standard solution "B" into glass stoppered test tubes.

(2) Dilute each standard to 4 mℓ with distilled water.

(3) Develop the color as described in the analysis procedure (Section 8C).

(4) Plot absorbance against micrograms of formaldehyde in the color developed solution. Note that the microgram concentration of the formaldehyde is determined based on the standardization value of solution A.

10. Calculations

a. Convert the volume of air sampled (V) to the volume of air at standard conditions (V_s) of 760 mm of mercury and 25°C, using the correction formula:

$$V_s = V \times \frac{P}{760} \times \frac{298}{(T + 273)}$$

where:

V_s = volume of air in liters at standard conditions
V = volume of air sampled in liters
P = barometric pressure in mm of mercury
T = temperature of sample air, °C

b. Determine the total concentration (C_t) of formaldehyde present in the two sample impingers in series, A and B.

$$C_t = C_A \times F_A + C_B \times F_B$$

where:

C_t = total μg of formaldehyde in the sample.

C_A and C_B = respective formaldehyde concentration in μg of the sample aliquots taken from impingers A and B as determined from the calibration curve

F_A and F_B = respective aliquot factor; $\frac{\text{sampling soln. vol. in m}\ell}{\text{m}\ell \text{ aliquot used}}$

c. The concentration of formaldehyde in the sampled atmosphere may be calculated by using the following equation, assuming standard conditions are taken as 760 mm of mercury and 25°C:

$$\text{ppm (volume)} = \frac{C_t \times 24.47}{V_s \times \text{M.W.}}$$

where:

V_s = liters of air sampled at standard conditions

M.W. = molecular weight of formaldehyde (30.03)

24.47 = μℓ of formaldehyde gas in one micromole at 760 mm Hg and 25°C.

11. References ;

a. Altshuller, A.P.; L.J. Leng; and A.F. Wartburg, "Source and Atmospheric Analyses for Formaldehyde by Chromotropic Acid Procedure," Int. J. Air Wat. Poll, 6, 381 (1962).

b. Eegriwe, E., "Reaktionen and Reagenzien zum Nachweis Organischer Verbindungen IV," Z Anal Chem, 110, 22 (1937).

c. Feigl, F., *Spot Tests in Organic Analysis*, Seventh Ed., American Elsevier Publishing Company, New York, 434, (1966).

d. Feldstein, M. (Bay Area Air Pollution Control District) Personal Communication, March 1968.

e. MacDonald, W.E., "Formaldehyde in Air – A Specific Field Test," Amer Ind Hyg Assoc Quarterly, 15, 217 (1954).

f. Sleva, S.F., "Determination of Formaldehyde: Chromotropic Acid Method. Selected Methods for the Measurement of Air Pollutants," Public Health Service Publication No. 999-AP-11, H-1, 1965.

g. Treadwell and Hall, Analytical Chemistry, Vol. II, Ninth English Edition. John Wiley & Sons, Inc., New York, p. 590, 1951.

h. Treadwell and Hall, Analytical Chemistry, Vol. II, Ninth English Edition. John Wiley & Sons, Inc., New York, p. 588, 1951.

12. Alternate test method. Measurements made by an alternate analytical method are deemed to be valid only if the alternate method has been approved by the commissioner. Such approval shall be granted if the proponent of the alternate method can demonstrate that the alternate method results in measurements which have at least the same precision, reliability and accuracy as those obtained with the use of the NIOSH method prescribed above.

F. Testing Conditions. All of the conditions prescribed below must be met before a test result is considered valid. The following conditions are imposed to assure that the amount of formaldehyde measured is that which may be expected to be present when the unit is maintained under normal living conditions, and is that which is reasonably attributable to the building materials.

1. A test shall be performed under the following conditions of temperature, humidity and ventilation:

   a. temperature range: 65 to 80 degrees Fahrenheit;

   b. humidity range: 40 to 60 percent;

   c. normal ventilation rate, or

   d. where a housing unit has a specific provision for dilution of air by mechanical means, such mechanical means shall be operated for one hour prior to the performance of any test, unless the operation of such device would result in the test not being conducted under normal living conditions

2. Air sampling:

   a. A test shall consist of three different air samples taken in habitable rooms of the residential unit. The test results shall be the average of the measurements of the three samples.

   b. If a consumer has a complaint relating to a single room of a residential unit, then the test shall consist of three air samples taken from that single room. The test result shall be the average of the measurements of the three samples.

"normal" is vague ✓

no indication of place of test w/in room ✓

legal sale

✓ creates potentially illegal sale

shld only create rebuttable

✓ vague; doesn't establish effect of test

does Comm'r have authority to affect a legal sale once the sale is closed?

3. In order to validly test for formaldehyde which is attributable to building materials, the consumer shall remove from the unit, at least 30 minutes before the air samples are taken, any major source of formaldehyde which was not present in the unit at the time of sale, and cease any activity such as smoking which may contribute significantly to the level of formaldehyde in the air of the unit. Such sources include, but are not limited to the following: draperies or furniture made of plywood or particleboard and upholstered furniture.

G. Consumer Remedy.

1. Because individuals are known to react differently to the same level of formaldehyde, the commissioner hereby declares that the 0.5 ppm level which is prescribed in part C (above) does not constitute a significant ambient air level of formaldehyde for the purpose of Minn. Laws, 1980, Chap. 594, § 2, subd. 4.

2. If a consumer seeks a remedy under § 2, subd. 4 of the law, the following shall be deemed as complying with the medical report requirement of that subdivision:

   a. the consumer may submit to the manufacturer or seller a written medical report prepared by a licensed physician. The report shall specify the nature and degree of the health risks to the consumer which relate to formaldehyde; and

   b. the physician's report shall include a statement that the consumer must vacate the premises.

ADMIN 1000 (Rev. 1/78)
SF-00006-01

STATE OF MINNESOTA

DEPARTMENT ATTORNEY GENERAL - Health

Office Memorandum

TO : Jerry S. Anderson
Special Assistant
Attorney General

DATE: November 13, 1980

FROM : William G. Miller
Special Assistant
Attorney General

PHONE: 341-7272

SUBJECT: Proposed Adoption of Temporary Rule
Relating to Formaldehyde

Enclosed and resubmitted for your review is the re-adopted language of the temporary rule related to formaldehyde. Also included is a statement from Roger DeRoos, Director of the Division of Environmental Health of the Minnesota Department of Health, and a copy of a memorandum prepared for me by John Burman, a law clerk on our staff, relating to some of the legal issues raised in your memorandum of October 15, 1980.

As far as I can determine, all of the issues you raised in objection to the prior submission of this rule have been addressed in this resubmission. The Department and I appreciate your efforts to assist us in coming up with the best possible rule to effectuate the language of the statute.

Please inform me or Pauline Bouchard if representatives of the industry contact you again with regard to this rule. It may be possible to address any concerns that the industry might express to you prior to your determination regarding the form and legality of this temporary rule.

Thank you for your assistance in this matter. If you have any questions or comments, please contact me.

WGM:sd

Enclosures

RECEIVED
NOV 1 3 198
ATTORNEY GENERAL
ADMINISTRATIVE AGENCIES

ADMIN 1000 (Rev. 1/78)
SF-00006-01

STATE OF MINNESOTA

DEPARTMENT ATTORNEY GENERAL - Health

Office Memorandum

TO : William G. Miller
Special Assistant
Attorney General

DATE: October 31, 1980

FROM : John M. Burman
Law Clerk

PHONE: 341-7272

SUBJECT: Formaldehyde Rules

You asked that I research the question of whether the Commissioner of Health should have followed the rulemaking procedures of the Minnesota Administrative Practices Act in determining that urea-formaldehyde constitutes a significant health problem. The Commissioner does not possess authority to promulgate rules stating that formaldehyde constitutes a health danger. Further, the Legislature did not intend that the Commissioner go through the rulemaking procedures in determining that formaldehyde presents a health hazard. Accordingly, Minnesota law precludes the Commissioner from adopting a rule in this matter.

Minn. Stat. § 15.04441, subd. 3 (1978) defines a "rule" as any "[A]gency statement of general applicability and future effect . . . made to implement or make specific the law enforced or administered by it . . . ." Such rules must be promulgated under the provisions of the APA. Minn. Stat. § 15.0412, subd. 1 (1978), however, expressly requires that agencies adopt rules "[O]nly pursuant to authority delegated by law . . . ." (Emphasis added.) The statute further notes that the APA "[S]hall not be authority for an agency to adopt, amend, suspend, or repeal rules." Id. (Emphasis added.) Therefore, the crucial prerequisite to the adoption of rules pursuant to the APA is the express delegation, by the Minnesota Legislature, of authority to adopt such rules

Minn. Laws 1980, ch. 594, § 1 provides as follows:

> Within 30 days after the effective date of this section the commissioner of health shall determine if a significant health problem is presented by the use of building materials that emit formaldehyde gases. If he determines that such a problem exists he shall promulgate rules pursuant to chapter 15, including emergency rules, establishing standards governing the sale of building materials and housing units that contain products made with urea-formaldehyde.

(Emphasis added.)

The language of the section clearly distinguishes between the threshold determination that the use of formaldehyde in building materials constitutes a health hazard, and the promulgation of rules to regulate the use of formaldehyde,

"If [the Commissioner] determines that such a problem exists . . . ." Id. (Emphasis added.) Conversely, if the Commissioner had determined that no such health problem existed, the provisions of the statute relating to formaldehyde would have become inoperative. Id. at section 2, subdivision 5. In short, the Legislature delegated to the discretion of the Commissioner the initial determination of the relative health danger presented by the use of formaldehyde in building materials.

In addition, the Legislature specifically ordered the Commissioner to reach a determination "within 30 days after the effective date of this section . . . ." Minn. Laws 1980, ch. 594, § 1. The section became effective April 24, 1980, "the day following enactment." Id. at section 12. The rulemaking procedures of MAPA require considerably larger than 30 days under the best of circumstances.*/ Surely, the Legislature did not intend that the Commissioner follow the MAPA procedures, and, at the same time, order him to disregard its notice and timing features.

Finally, when a problem of statutory construction arises, courts give "great weight" to an agency's interpretation of its own statutes. E.g., Krumm v. R. K. Nadeau Company, 276 N.W.2d 641, 644 (Minn. 1979), Knopf v. Gutterman, 258 Minn. 33, 41, 102 N.W.2d 689, 695 (1960). In Udall v. Tallman, for example, the United States Supreme Court stated:

> When faced with a problem of statutory construction, this court shows great deference to the interpretation given the statute by the officers or agency charged with its administration. . . . Particularly is the respect due when the administrative practice at stake 'involves a contemporaneous construction of a statute by the men charged with the responsibility of setting its machinery in motion, of making the parts work efficiently and smoothly while they are yet untried and new.' Power Reactor Co. v. Electricians, 367, U.S. 396, 408.

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*/ Minn. Stat. § 15.0412, subd. 4 (1978), for example, provides, inter alia, that:

> No rule shall be adopted by any agency unless the agency first holds a public hearing thereon, affording all affected interests an opportunity to participate, and given notice of its intention to hold such a hearing at least 30 days prior to the date set for the hearing. . . . After allowing written material to be submitted and recorded in the hearing record for five working days after the public hearings ends. . . . The report shall be available to all affected persons upon request for at least five working days before. . . . The attorney general shall, within 20 days, either approve or disapprove the rule . . . rule shall become effective . . . five working days after publication . . . .

(Emphasis added.)

October 31, 1980

380 U.S. at 11.

Here, the Commissioner interpreted the legislation as requiring an immediate determination of the danger presented by formaldehyde used in building materials. His interpretation is supported by both statutory language and common sense, and would not be overturned by a court.

If you have any questions or require additional information, please let me know.

JMB:sil

Bouchard
5331

Department of Health

Division of Environmental Health

Adopted Temporary Rules Regarding Formaldehyde in Residential Units.

Order of Adoption

Minnesota Laws 1980, Chap. 594, sec. 1 required the Commissioner of Health, hereafter "commissioner," to determine if a significant health problem is presented by the use of building materials that emit formaldehyde gases. The commissioner determined that formaldehyde emitted by building materials does present a significant health problem. This determination was made public in the form of a press release, issued on May 22, 1980, a copy of which is attached hereto and made a part hereof.

Minnesota Laws 1980, Chap. 594, sec. 1, further required the commissioner to promulgate temporary rules pursuant to Minn. Stat. § 15.0412 subd. 5 (1978) establishing standards governing the sale of building materials and housing units that contain products made with urea formaldehyde. Such rules were proposed by publication in the State Register, June 23, 1980, p. 1963. Comments were received thereon until August 1, 1980, and all have been reviewed.

After having afforded interested persons an opportunity to present comments, statements and arguments, having considered all of the submissions and applicable statutory standards and criteria, and having confirmed the need for the above-captioned rules,

NOW, THEREFORE, IT IS ORDERED that 7 MCAR §1.234, a copy of which

is attached hereto and made a part hereof, is adopted as a temporary rule, this 8th day of October 1980, pursuant to authority vested in me by Laws, 1980, Chap. 594, sec. 1. The rules will be effective for 90 days from the date of their approval by the Attorney General and may remain in effect for an additional 90 days upon issuance of a new order.

STATE OF MINNESOTA

s/ G.R.P

George R. Pettersen, M.D.
Commissioner of Health

This rule was approved by the Attorney General on October , 1980.

7 MCAR §1.234 Formaldehyde Levels in Residential Units.

A. ~~Any newly-constructed residential unit which is sold, rented or leased after the effective date of this rule, shall not contain more than 0.50 parts of formaldehyde per million parts of ambient air.~~ relabelled as C.1.

The commissioner of health has determined that a significant health problem is presented by the use of building materials that emit formaldehyde gas.

B. ~~For the purpose of determining compliance with this rule,~~

~~1. "Newly constructed" means that the unit has not been previously occupied;~~ deleted completely

Definitions. For the purpose of this rule the following terms or phrases shall have the meanings given below:

1. "building materials" means any material containing urea formaldehyde which is used in the construction of a residential living unit, including but not limited to particle board, plywood and paneling. The phrase also includes urea formaldehyde foam insulation and carpeting which is installed in a mobile home by the manufacturer during construction of the unit.
2. "commissioner" means the commissioner of health.
3. "residential unit" means any mobile home, single-family residence, or living unit in a multi-unit structure, regardless of type of ownership.

C. ~~Measurements for formaldehyde shall be made under normal living conditions of temperature, which is defined as 68 degrees Fahrenheit to 75 degrees Fahrenheit; and of relative humidity, which is defined as 40% to 60%.~~ relabelled as F.1.a & b.

Formaldehyde Level. After the effective date of this rule,

1. the ambient indoor air of any residential unit which is sold shall not contain more than 0.5 parts per million (ppm) of formaldehyde which is attributable to building materials, and

2. the installation of urea formaldehyde foam insulation in a residential unit shall not cause the ambient level of formaldehyde in the air of the unit to exceed 0.5 ppm of formaldehyde.

D. For the purpose of this rule, measurements for formaldehyde shall be made according to the method and under the conditions prescribed in parts E and F of this rule.

E. Test Method. Formaldehyde shall be measured according to NIOSH Manual of Analytical Methods, 2nd Edition, NIOSH 77-157-A, 1977, Method # P&CAM 125, as follows:

Formaldehyde in Air -- Analytical Method

1. Principle of the Method

. . . .

12. Alternate test method. Measurements made by an alternate analytical method are deemed to be valid only if the alternate method has been approved by the commissioner. Such approval shall be granted if the proponent of the

alternate method can demonstrate that the alternate method results in measurements which have at least the same precision, reliability and accuracy as those obtained with the use of the NIOSH method prescribed above.

F. Testing Conditions. All of the conditions prescribed below must be met before a test result is considered valid. The following conditions are imposed to assure that the amount of formaldehyde measured is that which may be expected to be present when the unit is maintained under normal living conditions, and is that which is reasonably attributable to the building materials.

1. A test shall be performed under the following conditions of temperature, humidity and ventilation:
   a. temperature range: 65 to 80 degrees Fahrenheit;
   b. humidity range: 40 to 60 percent;
   c. normal ventilation rate, or
   d. where a housing unit has a specific provision for dilution of air by mechanical means, such mechanical means shall be operated for one hour prior to the performance of any test, unless the operation of such device would result in the test not being conducted under normal living conditions.
2. Air sampling:
   a. A test shall consist of three different air samples taken in habitable rooms of the residential unit.

The test results shall be the average of the measurements of the three samples.

b. If a consumer has a complaint relating to a single room of a residential unit, then the test shall consist of three air samples taken from that single room. The test result shall be the average of the measurements of the three samples.

3. In order to validly test for formaldehyde which is attributable to building materials, the consumer shall remove from the unit, at least 30 minutes before the air samples are taken, any major source of formaldehyde which was not present in the unit at the time of sale, and cease any activity such as smoking which may contribute significantly to the level of formaldehyde in the air of the unit. Such sources include, but are not limited to the following: draperies or furniture made of plywood or particleboard and upholstered furniture.

G. Consumer Remedy.

1. Because individuals are known to react differently to the same level of formaldehyde, the commissioner hereby declares that the 0.5 ppm level which is prescribed in part C (above) does not constitute a significant ambient air level of formaldehyde for the purpose of Minn. Laws, 1980, Chap. 594, § 2, subd. 4.

2. If a consumer seeks a remedy under § 2, subd. 4 of the law, the following shall be deemed as complying with the medical report requirement of that subdivision:

a. the consumer may submit to the manufacturer or seller a written medical report prepared by a licensed physician. The report shall specify the nature and degree of the health risks to the consumer which relate to formaldehyde; and

b. the physician's report shall include a statement that the consumer must vacate the premises.

Effective Date: October , 1980.

STATE OF MINNESOTA
COUNTY OF HENNEPIN

BEFORE THE MINNESOTA
COMMISSIONER OF HEALTH

In the Matter of Temporary Rules Relating to Formaldehyde * ORDER FOR ADOPTION

Minnesota Laws 1980, Chap. 594, sec. 1 required the Commissioner of Health, hereafter "commissioner," to determine if a significant health problem is presented by the use of building materials that emit formaldehyde gases. The commissioner determined that formaldehyde emitted by building materials does present a significant health problem. This determination was made public in the form of a press release, issued on May 22, 1980, a copy of which is attached hereto and made a part hereof.

Minnesota Laws 1980, Chap. 594, sec. 1, further required the commissioner to promulgate temporary rules pursuant to Minn. Stat. § 15.0412 subd. 5 (1978) establishing standards governing the sale of building materials and housing units that contain products made with urea formaldehyde. Such rules were proposed by publication in the State Register, June 23, 1980, p. 1963. Comments were received thereon until August 1, 1980, and all have been reviewed.

After having afforded interested persons an opportunity to present comments, statements and arguments, having considered all of the submissions and applicable statutory standards and criteria, and having confirmed the need for the above-captioned rules,

NOW, THEREFORE, IT IS ORDERED that 7 MCAR §1.234, a copy of which is attached hereto and made a part hereof, is adopted as a temporary rule, this 8th day of October 1980, pursuant to authority vested in me by Laws, 1980, Chap. 594, sec. 1. The rules will be effective for 90 days from the date of their approval by the Attorney General and may remain in effect for an additional 90 days upon issuance of a new order.

STATE OF MINNESOTA

George R. Pettersen M.D.

George R. Pettersen, M.D.
Commissioner of Health

Summary

LIST OF COMMENTS RECEIVED REGARDING
PROPOSED FORMALDEHYDE RULE

	COMMENTS
1. Jerome D. Ciresi (7/1/80)* 3 p.	1. Dismayed by 0.5 level, as too high; finds it contrary to all medical and other evidence which writer has been able to ascertain; there are numerous cases of certain persons affected by levels of a considerably lower amount; refers to articles and studies: 1. Transcript of 12/1/78 workshop from Oakridge National Laboratory to Mass.; 2. Regs, 105 CMR 650 (11/14/79) children may be affected at much lower levels than 0.5; 3. MDH formaldehyde facts brochure; 4. Eye irritation response at low concentrations, Arch. Environmental Health v. 13, 1166; 5. Russian Study by A.D. Shibneb, 70 Chem. Abst. 1969, page 214; 6. U.S. C.P.S.C. (1978) investigations of foam insulation; 7. Dr. Westgate, Warning, (3/19/79); 8. Testimony, C.P.S.C. hearings (2/80); 9. N.A.S. Study (5/80); 10. Env. Health and Safety News, U. of Wash. v. 26; 11. Numerous other articles not cited. Levels should begin at no higher than .01 and go downward from there, anything higher constitutes a health hazard; home exposure is for longer time than exposure in work place; objects to application of .5 level to newly constructed units only.
2. Lee Greenfield (6/24/80) 1 p.	2. Grateful for Commissioner's determination that formaldehyde can be significant health problem; objects to application only to new construction; objects to very high level; cover letter to Commissioner including letter to P. Bouchard.
3. Lee Greenfield (6/25/80) 2 p.	3. He finds detrimental to the Legislative intent the fact that level applies only to newly constructed units and the level 0.5 is too high; cites press release which refered to remodeled residential environments; says legislative testimony showed there was need to regulate resale of homes also; citing NAS study and Commissioner's press release; 0.5 level is much too high, citing testimony by MDOE (testimony before Minn. Legislature in 1980) that .3 ppm is probably too high, citing NAS statement "lowest practical concentration" and referencing levels set elsewhere, such as .02 in Netherlands, .01 in Soviet Union and .0 in Germany; citing other testimony before Minn. House Commerce Committee in 1980, families with small children being made to move out if level is .1 ppm or more; this rule should be made to apply to all housing units and maximum allowable level be lowered to .01 ppm.

* Date Document Received by MDH

4. Ron W. Carey (6/25/80) 2 p.

4. Lawyer involved in suits regarding formaldehyde; experts retained on behalf of his clients have stated that .5 is totally unacceptable, particularly because standard does not take into account susceptibility and sensitivity; persons subject to the level will be living in the environment 24 hours a day; citing agreement with Dr. Cronn's letter; would like standard to apply to all construction.

5. Dr. Michael B. Ainsliy, (6/23/80) 1 p.

5. .5 ppm is an unacceptably high level; agrees with Dr. Westgate that levels should be at .1 with a recommendation for a .0 level; he has four patients who have suffered various respiratory ailments in mobile homes that have fairly high levels of formaldehyde; would not want a SIDS death among his patients because of formaldehyde levels.

6. Mike and Kathy Gilliland (7/3/80) 3 p.

6. Describes problems experienced after having moved into a new mobile home in July 1979, youngest of four children was 8 weeks old; moved out on Dr.'s advice; although they have been out of the home for approximately three months they are still experiencing symptoms; spent several houndred dollars on medical bills and lost savings; concerned about permanent effects of exposure to baby. MDH test was .38, feel that level measured did not accurately reflect maximum level that would be found under different conditions; .5 level is too high; level satisfies manufacturers, implying that Dept. of Health is not concerned with welfare of the public it is supposed to protect; implore Dept. to reconsider safe limits and to be more sensitive to needs of people who have suffered consequences from formaldehyde.

7. Dr. Fredrick T. Strobel (7/3/80) 1 p.

7. Level should not be limited to newly constructed unit; .5 ppm is too high, citing NAS study 1980; as there is currently no safe level known and whereas it is known there is a wide level of individual variance, suggests level be no higher than .25 and perhaps consider level as low as .1 ppm which have been considered in European countries; also suggests annual formal review of levels until permanent level can be established.

8. Stephen A. Patterson (6/16/80) 2 p.

8. As victims they are gravely concerned about consequences of action taken by Commissioner; standard is arbitrarily set; impression is given to public that .5 is significant and anything less is not; rule manages to change a simple law designed to protect the consumer into a tool that could be used by industry against the very consumer the law was originally intended to protect; letters to SUFFER proposing immediate retraction; favoring a much lower level or they would rather prolong the standard setting until public hearings if the only alternative is the .5 level; ask appointment of hearing officer and set hearing date for before June 16, 1980.

9. Judith Ulseth (7/22/80) 1 p.

9. Protest standard of 0.5 ppm; stating documented death of infant at .23 ppm, MDH pamphlet states .25 ppm is eye irritant; NAS has linked formaldehye with cancer and birth defects; been known for 15 years that formaldehyde causes sensitization to itself and other chemicals; writer herself has been sensitized to formaldehyde and other chemicals due to growing up in home where mother had beauty shop; her home tested out at .1 ppm on cool May morning yet she suffers a variety of symptoms; daughter must consume prescription cough medicine in winter because of constant bronchial congestion; she could write more but correction fluid she uses while typing is making her ill and confused.

10. Mr. and Mrs. Leonard Kelley (7/21/80) 1 p.

10. .5 ppm is very hazardous to health of Minn. citizens; do not allow formaldehyde industry to ruin our health.

11. Mrs. Nancy Clay (7/10/80) (Iowa SUFFER Coordinator) 1 p.

11. .5 ppm is not acceptable, tolerable level in home; though her mobile home far exceeded that level during summer months (3 ppm) infant daughter was hospitalized (home was .29 mg/m^3); a home goes through cycling phase each year, resulting in different readings; there is actually no amount safe; as Iowa SUFFER coordinator she wants to see an end to those "horror stories"; NAS backs her reasoning; they propose the original safe level the entire population can tolerate; think of health of babies living in affected homes; they are struggling for the right to breathe; shouldn't the air be pure and as formaldehyde-free as possible?

12. Joan and Roger Oien (7/18/80) 1 p.

12. By citing a .5 ppm level the writer wonders if MDH is deserving of responsibility for protecting health of the people of the state, apparently MDH not concerned in least about health, only seem to be working in industries behalf; .5 ppm level absolutely devastating, implying it is safe for people for 24 hours a day when research has shown that to be a very unhealthy and extremely dangerous situation; MDH will be creating a "formaldehyde epidemic" by setting such an unrealistic level; giving building industry "green light" to go ahead and use all the formaldehyde containing products they want to; wonders why only newly constructed residential units will be affected; building industry should be held responsible for health problems they have created in the past; victims of formaldehyde poisoning should not be left "holding the bag"; set a reasonable level or no level.

13. Joan Kiser (7/21/80) 1 p.

13. .5 ppm level is ridiculously high since people must live in that environment 24 hours a day, 7 days a week; worked in plastics factory for one year and is extremely ill which she believes is due to the high level of formaldehyde; recently had miscarriage which she believes caused by chemical environment at work, laid off but notices she has become sensitive to cigarette smoke, some plastics and other items that contain formaldehyde; reminding MDH that she was only in working environment for 40 hours a week; since research has shown that formaldehyde is serious health hazard, why include only newly constructed residential units, why can't Minn. be first state to set realistic level, perhaps .01 ppm.

14. Larry M. Buttler (7/10/80) 1 p.

14. Thinks level should apply to existing construction also, because these people have no legal recourse to get out of these health hazards; thinks .5 ppm would in no way remedy problems suffered by families with severe adverse health problems at much lower levels; recently printed research papers (no reference) show readings lower than .5 have caused great variety of adverse effects, also show no threshold for population irritant effects; writer feels MDH should immediately retract proposed setting at .5 to a lower level or withhold standard until after public hearings.

15. Mr. and Mrs. Wayne Thomas (7/9/80) 1 p.

15. MDH taking formaldehyde matter too lightly; .5 level is too high; should not limit application to newly constructed units; citing MDH "Formaldehye Facts brochure - After Effects" which states that eye irritation may occur at .05 and upper respiratory irritation can happen at .3; writer feels Health Dept. doing inadequate job to people it serves and is intended to protect.

16. Kathy Huston (7/7/80) 4 p.

16. .5 is way too high, level should apply to all mobile homes; lived in 1977 in mobile home with children, home measured at .41 and .43 at request of son's Dr.; writer suffered severe symptoms during pregnancy, child never slept at night for two years; describes a long series of problems with inability to work and Dr.'s bills, her experience was a nightmare; don't make any other families go through this; let's do something about the dangers we can control; protect the American family.

17. Barbara Raymond (7/16/80) 2 p.

17. Relates experience of friend from Maryland visiting them in Minn.; formaldehyde level in their new carpeting was causing them serious problems; writer worries that her own children will experience similar difficulties when they are first married and purchase their first home; "because it seems almost impossible to "put the finger" on formaldehyde gas as the problem to many so-called "stress" symptoms, I can understand the reluctance to ban this product from the market.

(cont.)

17. However, this seems to be the only safe measure in order to protect the people." Asks reconsideration of .5 level; infants are in home 24 hours a day; their tolerance level can not be that of an adult; if it can't be banned at least lower the level so that infants can safely live in their homes.

18. Karen Orth (7/16/80) 2 p.

18. .5 ppm level should be greatly reduced; writer works in fabric store and notices many people being affected by formaldehdye vapors in the store; it is her opinion that many more people are sensitized to formaldehyde than know it; these people may not be able to withstand .5 ppm levels in their home; building industry will find a replacement if they are forced to; MDH should not let gas sensitize people in their homes; it's enough that other products they acquire are already sensitizing them; MDH should not allow formaldehyde industry to invade homes at levels of .5; this would be a crime.

19. Connie Smrecek (7/14/80) 2 p.

19. Shocked at .5 level for newly constructed units; asks if Commissioner ever read testimony of victims before 1980 legislative hearings or CPSC hearings; knows of many families with illness where formaldehyde level is below .5; inconceivable that person with power to set air limits is incapable of understanding extent of harm which this poisonous, sensitizing gas is imposing upon unborn and newly born infants etc.; writer lived in home tested as .81 ppm which had been remodeled using particle board; family developed sensitivity; they now can not go into many places without becoming sick; inconceivable that person with power can allow formaldehyde gas to continue to make sick more children and possibly sensitize their being; concludes that MDH is not concerned with protecting the health of State's consumers, giving rise to question "who is the Minn. State Health Dept. protecting?" is State protecting "big money"? If so, when and where does human life enter into the picture; writer demands answers to these questions; demands immediate action to correct the injustice.

20. Peter A. Breysse (7/7/80) 2 pages plus 2 enclosures. Formaldehyde Exposure in Mobile Homes, October 1979 presentation to 39th annual AMA Congress on Occupational Health, University of North Carolina (10/79) 17 pages including references; proceedings of 43rd annual Educational Conference of the National Environmental Health Association (6/23/79) presentation by Breysse, 15 pages.

20. .5 ppm level much too high; writer has been researching the problem for more than three years, has documented many complaints and physical symptoms; majority of concentrations have been less than .5; their reports to home owners indicate that levels above .1 are considered excessive; special conditions such as pregnancy or SIDS warrant further consideration of level; possibly cause permanent damage to young children; and recent indication that formaldehyde may be carcinogen; cites recent NIOSH proposed level

(cont.)

20. of 1 ppm for 30 minute sampling period and action level of .5 ppm the same value as recommended by MDH; industrial standards cannot be related to home environment;

referring to CPSC, NAS report and statement that formaldehyde be kept at lowest practicle level; would be desireable to ban the use of materials which release formaldehyde; their assessment of control measures indicates that attempts to seal particle board are not adequate to reduce formaldehyde concentrations; after writer's contact with significant number of Washington State people with symptoms associated with living in formaldehyde contaminated environments as well as approximately 500 letters and phone calls from people in other parts of the country suffering similar problems, the writer states that it would be imperative that materials releasing formaldehyde be banned.

21. Alan R. and Ann M. Miller (5/28/80) 1 p.

21. Wants reconsideration of .5 ppm level; their entire family suffered serious health problems while in a home which measured .18 ppm; after moving out they were all feeling well except when they come in contact with formaldehyde or articles taken from the home; MDH jeopardizing health and welfare of citizens by setting such unrealistic level; "as we see it (according to Minn. Stat. 144), you are not carrying out your duties as the Commissioner of Health". Sending copy of letter to Governor in hopes that he will ask for resignation because Commissioner not "protecting, maintaining and improving health of citizens". It is a shame decision making people in MDH do not have formaldehyde problems so they would understand serious magnitude of .5 ppm level.

22. Mr. and Mrs. William L. Miller (6/6/80) 1 page, letter to Governor Quie.

22. Two grandchildren almost died from living in home with levels of .15 and .18 and now are so sensitive to fumes that for the rest of their lives they will not be able to tolerate even the smallest amount; one grandchild almost totally deaf now which is additional burden for him; asks Governor that Commissioner be removed if he can't do a better job.

23. Mr. and Mrs. William L. Miller (6/2/80) 1 page, letter to Dr. Pettersen.

23. .5 ppm is safe level only for places like death row at San Quentin Prison; almost lost two grandchildren in home with .18 and .15; whole family has been sick as result of it and are unable to live in their new home; sensitive to fumes and clothing or items from home; reconsideration in lowering of .5 amount or ban use of formaldehyde for everything except embalming.

24. Mary Jane Binsfeld (Mrs.) (6/3/80) 1 page, letter to Commissioner.

24. .5 ppm level is very hazardous to health of citizens; please reconsider; persons living in .5 ppm environment will develop severe hypersensitivity that could permanently affect their health; knows of young couple who developed severe hypersensitivity at .18 ppm who have not been able to live in new home for 3 months now; .18 ppm was too high for that family therefore .5 is very unrealistic and could cause considerable health problems to hundreds of others; understands why manufacturers and formaldehyde industry were so pleased with recommendation; maybe MDH is more concerned about economic impact to building industry than of health of Minnesotans; Commissioner should be concerned solely with health of citizens; does Commissioner deserve the trust citizens put in him, saying copy of letter going to Governor.

25. John C. Cronn, Ph.D. (5/29/80) 2 pages, letter to Commissioner.

25. 0.5 ppm levels does great disservice to people whose health Commissioner is entrusted with protecting; reasons are: a) long lag between time symptoms are noticed and time when MDH can come out to measure means damage to resident's health may already have occurred; b) .5 ppm does not take into account sensitivity of immune system of infants and children, dwellings with formaldehyde problems are mobile homes and pre-fabs, mainly purchased by young couples with young children, effects can affect these children for life; c) neurological hypersensitivity can be developed at levels much lower than .5, "by your standards, people with these induced hypersensitivities would be denied the help and protection of the State Health Dept. when they need it most"; d) .5 ppm level does not take into account variability of individual tolerance; level should apply to people in existing dwellings; procedures should be set up to immediately remedy a problem situation or remove people from dwellings where formaldehyde problem exists; present slowness of resolution prolongs exposure of effected for weeks and months sometimes no resolution is satisfactory.

26. E. Keyes (8/4/80) 1 page, letter on behalf of Insulation Contractors Association Northwest (members include installers of urea formaldehyde foam insulation).

26. The standard of .5 ppm is too low when considering ambient air quality; controls should involve element of fresh air exchange rate; enforcement should require precise determination of all sources of possible contamination and contribution of each to the problem.

27. John T. Farmer (7/30/80) 2 pages, comments from Minnesota Manufactured Housing Association.

27. Preface expresses pledge to cooperate as process of adoption of rule continues; rule should apply only to "unit which is constructed after the effective date" to eliminate applicability to units already manufactured sitting on dealers lots; many questions regarding measurement

conditions, where are units tested, who does the testing; what about environmental conditions; points should all be clarified; would like to see provision that if and when U.S. HUD sets standard nationally that Minn. rule will be terminated.

28. R. Bruce Griffin (8/1/80) submission on behalf of Wick Building Systems, Inc., letter plus 4 page proposal.

28. (The proposal will be discussed separately.)

29. H. E. Blomgren (7/31/80) telegram.

29. Comments of National Manufactured Housing Federation are being mailed for filing, hope they will be received in time and considered.

30. James E. Toepel (7/30/80) 1 page, letter on behalf of Northwestern Lumberman's Association.

30. Proposed maximum level must specify fresh air change rate and deduct amount of formaldehyde in outdoor air; air change rate must be at least one air change per hour; residential housing and the products therein are regulated by an infinate number of local building codes and some State and Federal safety standards and are controlled by a whole variety of other institutional groups; punitive sanctions provided by the underlying statute are totally inappropriate to apply during the period covered by the temporary rule; the temporary rule should expressly negate any intention of establishing legal rights and obligations among private parties.

31. W. John Licke (7/30/80) letter on behalf of Blandin Wood Products Company, 3 pages.

31. Wants the proposed and any other rule based on legislation to restrict itself specifically to urea formaldehyde; gives background of company and its products; company uses phenol formaldehyde resins which do not off-gas the way urea formaldehyde does, new law specifically addressed urea only.

32. William J. Groah & Charles R. Morschauser (7/29/80) letter on behalf of Hardwood Plywood Manufacturers Association, including 5 page additional commentary.

32. Submitting written information providing assessment of cost of modified and alternative products perceived as being able to meet .5 level; believe temporary rule requiring industry and suppliers to industry to modify their products, on short notice, will be difficult to achieve; report titled "Cost Impact of Proposed Minnesota Formaldehyde Standards"; statement does not address conventional construction.

33. William J. Groah (7/30/80) letter on behalf of Hardwood Plywood Manufacturers Association, 1 page.

33. HPMA has been working to develop product test methods cooperation with National Particle Board Assoc., and Formaldehyde Institute; HPMA has tentatively adopted a desiccator test; confident that an interim product standard can be formulated within 3 to 4 months; a better technical based permanent standard will evolve as experience is obtained with interim standard; HPMA not taking position on type of standards

appropriate for living spaces; HPMA recognizes need for product test methods and standards, in order to asses improvements; because of need to notify SE Asia manufacturers and to allow for production with reduced levels, HPMA requests 6 to 9 months delay in effectiveness of standard; this is minimum time required for hardwood plywood to move through supply chain.

34. George E. Ranault, Jr. (7/28/80) letter on behalf of Manufactured Housing Institute, 2 p.

34. Industry has several grave concerns about proposal; economic impact on Minn. industry will be catastrophic, more unemployment, increased welfare rolls and denying affordable housing to those most in need; not currently possible for industry to attain 0.5 ppm; completely unreasonable to unilaterally establish rule on indoor air quality without considering all major contributing air pollutants, citing recent Supreme Court ruling on benzene; writer certain that letter will provide sufficient information to have Commissioner withdraw action in pursuit of rule; urges awaiting results of numerous on-going research projects and completion of federal agencies' involvement in indoor air quality area.

35. Sheryl Komestakes (7/28/80) 1 p.

35. Children started being sick after moving into newly built house; always seem to have cold; area doctors could not treat them; rectal bleeding with one six month old child; no answers; decided to take chilren out of house for a week; many symptoms were relieved; house tested by MDH at levels of .33 and .29 ppm; children got sick again shortly after moving back into house; hopes that level will be lowered before other children and families are bothered by formaldehyde.

36. Mary J. Miranowski (7/30/80) letter on behalf of Minnesota Multi Housing Association, 3 pages.

36. Description of organization and membership, MHA supports proposed rule; .5 ppm is achievable level in newly constructed multi-family units; MHA urges adoption of product quality control standards for particle board, plywood, insulation, cabinets, carpeting, etc.; presently manufacturers do not have enough information on these to be able to choose which can be used; responsibility belongs with manufacturer of product; urging that temporary rules preempt any local laws, to have levels uniform state-wide; recommends adoption of rules to take affect 60 days following publication; believes if the effective date is too soon, severe hardship on owner of building nearing completion; owner of unit which tests in excess of level should be given opportunity to retest unit because results vary widely; if second test shows less than .5, owner should have good case for stating that in good faith he has complied, units should be tested exclusive of any furnishings brought in by resident.

37. SUFFER (8/1/80) collective comment prepared by SUFFER, 55 pages containing 19 letters, 4 reprints of newspaper articles, a memo from someone at the University of Minnesota, and a copy of testimony given March 11, 1980 to the Minnesota Senate by Dr. Westgate plus one more reprint of a newspaper article.

37. Transmittal letter comments, questions whether limitation to newly constructed home is authorized in statute, stating that a family whose house was measured at just under 0.2 ppm felt better when they were outside the house than in it, people continued living in their home because it was considered "safe" having been misled by the State Health Dept. for another month during which their hypersensitivity blossomed; the Commissioner has misled people into thinking that .5 is a safe level; a family with seven years of symptoms were alerted to the problem by Larry Schmidt on TV and not the State Health Dept; How can MDH let such injustice continue; victims go to physicians who know nothing about the chemical and are advised to get therapy; after victim learns problem is formaldehyde and returns to physician, physician wants to know nothing about it because he fears a lawsuit; doctor ignores patients and Health Dept. sets level of .5; victims turn to SUFFER who understand; therefore Health Dept should release names and addresses of all victims to SUFFER, they should also receive financial assistance as they cannot continue without help; public has no way of connecting health problems to formaldehyde; MDH would be deluged with calls, statistics of complaints versus installation of foam insulation are unrealistic because they include garages, commercial and partial installations; refers to Richfield Environmental Health Director stating in letter 5 years ago that formaldehyde fumes in home were dangerous, home must be vacated at once and not occupied again, writer recently read that particle board will be the wonder wood of the future, asks if inhabitants will have to wear wonder suits to protect their skin and helmets to allow breathing; refers to brochure showing there is a new safe product to remove formaldehyde from mobile home (unclear); asks reader to imagine life after having had both feet cut off and refers to an attached letter from family who are victims of formaldehyde; writer of the attached letter states his wife had to have both feet amputated because of gangrene caused by formaldehyde, attributing various other bodily numbness to formaldehyde; original letter writer charges MDH with responsibility for continuing to expose people as human guinea pigs to formaldehyde; refers to upcoming national network and magazine reports from formaldehyde victims;

37. asks if we've read reviewed testimony of CPSC hearings; refers to attached letters from victims across the country; the public did not know that MDH de isions would rely on "public comment"; heat and high humidity increase levels of formaldehyde in air and victims who breathe it day after day can't seem to get it out of their systems; victims have a very hard time handling even trivial problems in this weather; requests we put aside temporary level of .5; formaldehyde should be banned from materials which release formaldehyde in living spaces: (Comments will be reproduced and summarized elsewhere.)

38. **James L. Carlson (7/31/80) letter on behalf of Jimco, Inc., 2 pages plus 4 page newsletter entitled "Quality Assurance Program for the Insulation Industry", July 1980: vol. 1.**

38. Jimco, Inc., distributes insulation materials including urea formaldehyde resin; most homes contain formaldehyde whether walls are foamed or not; most frequently abetted by concentrations in outside atmosphere which can themselves exceed proposed levels; U.F. foam prop erly applied is not contributor to ambient residential environment; outgassing migrates to outside because external wall is more porous and air pressure inside house is generally greater than outside; proposed .5 level of free aldehydes is unrealistic, unmeasureable and unworkable concept; urges MDH to establish specific levels at HUD and Federal Dept. energy levels; U.F. foam has too long been made scapegoat for overly publicized negative situation; newsletter addresses applicator training manual in preparation; CIIT findings released; CPSC complaints are questioned; CPSC proposed consumer warning notice; Maryland defeats bill to ban foam; statu of DOE standard; NICI to require testing of products including foam; insurance committee established; government agency assails NAS (this last has little relationship to formaldehyde).

39. **Cheryl Whitney (7/31/80) telephone call.**

39. She and family are victims of formaldehyde; want to go on record as one who would like to change level of .5.

40. **Mrs. Wayne J. Miller (7/31/80) 2 p.**

40. Resident vacationed in Minn. and read of proposed level; has had many health problems which she now thinks may be attributable to formaldehyde; her symptoms disappeared when she stopped using shampoo which contained formaldehyde; as a result of this she thinks .5 ppm in home environments seems outrageously high; hopes Minn. will set a reasonable level.

41. **Mrs. Stan Karlgaard (7/31/80) 7 pages.**

41. Purchased new mobile home in 1977; had 10 month old child who suffered symptoms 2 weeks after moving into home; writer and husband also

41. suffering problems; with second pregnancy writer was very ill for several months; newborn had reaction to silver nitrate then suffered symptoms within a week of being home in mobile home; both children very irritable and had poor appetites; newest child hospitalized for a week and became well became ill upon coming home again; forced to move into older mobile home; where both children became very ill after 3 weeks so they moved into old farm house, but couldn't use their old furniture; house has paneling in it; has been told that family now has formaldehyde in system and are all hypersensitive, home was tested in Feb. (?1980) measured a .14; levels from May testing were .16 and .22; feel that .5 level would make them even more unhealthy; urges reconsideration of .5 level and that it be lowered to at least .05 or better yet 0.

42. Holt Blomgren (7/31/80) letter on behalf of the National Manufacturing Housing Federation, 7 pages.

42. Description of Federation and its membership; organization speaks primarily for retail and park segments of the industry; 22-state members of NMHF generally supports concept of establishment of ambient air level with reservations; an appropriate standard would be product standard; ambient standard is probably the most viable alternative, although difficult to implement and enforce in fair and equitable manner; public has definite interest in good air quality in residential living environment; equally important is need for affordable housing; to ignore this interest while considering indoor air quality exclusively would be ludicrous; people must have housing at affordable prices; there is an over riding public interest in energy conservation which is integrally related to indoor air quality; there would be no indoor quality considerations if energy conservation features of today's housing were ignored and if the various agencies and construction code groups would allow substantial numbers of air changes in residential housing; there must be some kind of balance of the relative priorities of the public interest in energy conservation and in air quality; energy conservation is important to all Americans while few have complained about residential air quality problems, there is a strong public interest in providing jobs; National Academy of Science report recommends levels be kept at "lowest practical" concentrations; totally risk our free society is not practical,

42. NMHF believes .5 ppm level is extremely low, perhaps too low to be "practical"; standard of 1.0 ppm would more nearly reflective of lowest practical concentration when considering all aspects of public interest; standard should relate only prospectively to housing units on which construction is commenced following effective date of rule; units presently under construction should be specifically excluded; measurements should be made under normal living conditions of temperature, humidity and ventilation and prohibit certain contributing factors such as smoking, cooking, use of aerosols, and eliminate contribution by outdoor air; rule should provide for reasonable correction procedures for those units which might not meet the low standard; rule should provide for recognized alternative test procedures and allow prototype testing of housing units and building materials on which builders could rely for compliance; NMHF believes formaldehyde is a "problem" which is "perceived and not "real"; NMHF has not discovered any hard evidence that formaldehyde is a significant health problem; effect of substantial publicity about "perceived problem" results in numerous complaints.

43. Formaldehyde Institute, (7/30/80) 54 pp. plus exhibits A through X.	43. summarized separately
44. Manufactured Housing Institute and Others, (7/30/80) 128 pp., including several attachments, 2 pp letter and 38 pp. legal argument.	44. summarized separately
45. Manufactured Housing Institute, (7/30/80), 257 pp. plus 25 appendices, submitted by Professional Consultants on Occupational Health	45. summarized separately
46. Manufactured Housing Institute, (7/16/80) 6 pp. letter	46. summarized separately
47. Wisc. Dept. of Justice, (7/24/80) 1 p. plus 10 pp. testimony of Wisc. Dept of L.I.& H.R. before Wisc. legislative committee.	47. not summarized.
48. Copy of letter on behalf of Blandin Paper (8/6/80)	48. Rule must apply only to urea formaldehyde products because statute specifies urea formaldehyde.
49. Marc Kurzman, (8/13/80) 2 pp.	49. Proposed 0.5 level is being used by manufacturer to deny remedy to comply with lower level.
50. Wisc. Dept.of H. and Soc. Servcs. (8/13/80), cover letter plus 11 enclosures	50. Wisc. Dept. statements re HHS's position on need for control, plus several comments of support from outside experts.
51. Wisc. Dept. of Justice, Bruce Craig, letter (8/18/80) 2 pp.	51. Recommends that Minn. not adopt 0.5 ppm level but follow Wisc. Dept. of HSS and impose 0.2 ppm as level.

#28

Submission* made by Wick Homes, Inc., July 31, 1980.

SUMMARY

Cover letter sent with proposed alternative rule language;

A. No unit may be sold, etc., if it exceeds 0.5 ppm.
(same as MDH proposal)

B. Definitions.
(defines many more terms than MDH proposal, but this does not pose any problems.)

C. Complaints; procedure is specified very precisely, MDH to receive copy of complaint and to investigate or merely receive copy of seller's investigation report; specifies how corrective action is to be undertaken; allows 30 days for correction.
(something like this could be worked into MDH rule)

D. Testing Conditions; MDH may do random testing of units;
(it is not necesary to specify this in rule)
manufacturer required to test prototype models and send copy of results to MDH;
(what would we do with this onformation?)
building materials manufacturer also required to test prototype of materials and submit results to MDH;
(this goes to the crux of mobile home manufacturers' argument, that they are unable to control materials' manufacturers, and want us to do it)
test procedures and conditions are given
(these are much more specific and comprehensive than MDH proposal, but not unreasonable).

General Comments: the Wick proposal specifies in great detail the responsibilities of the respective parties and eliminates much of the doubt expressed by most of the industry spokesmen. It would not be difficult for us to work in most of Wick's suggestions, except for those which require specific MDH involvement.

SUFFER Complaint letters attached to organization's submission

SUMMARY

Writer ill since formaldehyde came into his environment; takes allergy shots for allergies to foods; bad heartbeat; series symptoms appeared upon moving into new home.

Writer's home was insulated with foam, writer became terribly affected, must take allergy needles?; has all sorts of symptoms, lawsuit is pending.

Writer's home was insulated with foam; has variety of symptoms; had blood tests for formaldehyde which show condition is not good.

Writer has health problems since foam insulation in house, other incidental complaints.

Writer's home was foam insulated; writer had bad experiences.

Writer's case in litigation; has health problems.

Both writer and spouse are now incapable of functioning.

Writer has series of unspecified symptoms.

Writer's friend has series of unspecified symptoms.

Writer's was insulated with foam; has had many problems since.

Writer's home was insulated with foam; family member;s cancer condition was aggaravated, person had seizures, stopped breathing, thiamine helped, writer allergic to food.

Writer lived in mobile home; family became misearble.

Someone is hospitalized, unclear is hospitalization is related to formaldehyde complaint, lawsuit in progress.

Writer's spouse lost both feet because of gangrene caused by formaldehyde; various other symptoms and numbness are experienced by both writer and spouse which they attribute to formaldehyde.

Writer became very ill upon moving into mobile home, felt better upon moving out for a week, levels were .25 and . .29, unit was detoxified, resamples at .49 and 1.56 and detoxified again; CPSC retested unit and got .2 and .3 so writer had to settle for less damages.

Writer had family home insulated with foam; 10 yr. old daughter became so ill that she had to be hospitalized almost immediately after the installation of the insulation.

Writer's home was insulated with foam; some time thereafter, a child of the family suffered cardiac arrest on a vacation elsewhere; there's a long series of complaints by various people who visited at the house or spent unspecified amounts of time there.

Response to question"Whether there is formaldehyde in children's vaccine material?" Answer: Yes. Then the writer states that her child who had been exposed to formaldehyde in the home broke out in a rash after a DPT injection and the child has since developed numerous other symptoms.

Dr. Westgate: statement before Minn. Sen. committee hearing, refers to 130 families he knows of with formaldehyde problems, describes a variety of symptoms, cites the SIDS death of an infant which he thinks was attributable to formaldehyde level which was later measured at .22, cites several other examples of illness.

Copy of newspaper article (no source) physician writer describes case of woman allergic to formaldehyde, citing role of CPSC regarding foam insulation.

Letter from Indiana Health Dept. stating the levels they had measured in a particular home were .033 and .014, and recommending sealing of underlayment.

Newspaper article: Houston Post, 5/22/78, on child care, describing problem of 12 yr. old female with illness.

Newspaper article: New Haven Register, 12/15/77, title "Probe of Complaints of Foam Insulation Poisoning".

Article: Moody Magazine, Apr. '80, story of a woman allergic to everything.

Article: Wall St. Journal, 7/14/80, describing action by Massachusetts against foam insulation.

Submission made on behalf* of the Formaldehyde Institute to the Minnesota Department of Health, July 30, 1980.

SUMMARY

Formaldehyde Institute - description of its composition and activities.

Formaldehyde as a Substance - its occurrence, uses and properties.

Health Effects of Formaldehyde - with respect to transitory irritation, no dose response relationship has been shown to exist in either controlled animal or human studies at levels below 0.8 ppm. Clinical data apart from the controlled human studies, shows no irritation relationship below 0.5 ppm. (see Clary's "Review of Health Effects of Formaldehyde" Exhibit B).

Mutagenicity - currently under study (see Exhibits B and C).

Teratogenicity - (Exhibit D) no demonstrated need for regulatory action.

SIDS - relationship has been alleged (Westgate) but see Valdes-Dapena letter (Exhibit E). Lamm statement before C.P.S.C. hearings (Exhibit F). Existing information does not indicate a special risk exists for either pregnant women or newborn children, comparing SIDS deaths in 1979 in Minnesota to total number of mobile homes sold, shows no relationship.

Carcinogenicity - CIIT Study of extremely high concentrations (15 ppm) of formaldehyde may be cancer-causing to rats, but no incidence of cancer in mice (Phase I, early report of study) see also Exhibit G. Formaldehyde Institute observations on preliminary report of CIIT Study, virus infection in rat population, squamous cell carcinomas attributable to formaldehyde may have resulted from two-stage process in which only second stage is carcinogenic,

*submitted by Faegre & Benson Law Firm, Minneapolis, 54 pp. plus exhibits listed on separate attachment.

rat breathes only through nose, FDA has similarly found no basis for regulatory action against the use of formaldehyde (Exhibit I). National Cancer Institute conducting epidemiological study of industrial workers exposed to formaldehyde for at least 15 years. Study will take about two years to complete.

Irritation - Formaldehyde known transitory irritant, irritation will not be experienced by any but the most highly sensitive individuals at ambient levels in the range of 0.5 to 0.8 ppm.

Summary of Scientific Research and Literature to Date - (see Exhibit J) reference made to NIOSH (1 ppm) NAS - no specific level recommended, Sweden threshold limit of 0.7 ppm., Dr. Lamm (Wisconsin DILHR hearings) recommends adopting interim standard of 0.5 ppm. Based on Breysse Study in Washington State. (Exhibit K) (Tabershaw review of formaldehyde problems in mobile homes, Exhibit). Reference here to Table 2, listing other irritant chemicals in the indoor environment. Reference to European "standards" (see Table 3). Citing Skiest memo and Exhibits L and M, more discussion on European standards, reference to Dr. Anderson, Denmark (see paper by Professional Consultants in Occupational Health, Exhibit) reference to ACGIH statement that industrial limits should not be applied in non-industrial settings, 0.5 ppm formaldehyde level proposed in Minnesota is extremely stringent.

Propriety of Regulatory Action by Minnesota's Commissioner of Health - (page 21) mention is made ofseveral federal agencies which have expressed interest in the regulation of formaldehyde,

reference made to federal law of preemption noting specifically U.S. HUD regulations and standards for mobile homes, stating that formaldehyde problem in mobile homes is direct result of more stringent federal requirements for air-tightness for conservation of energy in mobile homes, discussing two U.S. HUD requests for proposals to study the matter (Exhibits N and O). States should defer to federal government, comment that U.S. DOE and EPA have recently agreed that to preserve a health indoor air quality, residential housing should be constructed so as to permit at least one air change per hour (Exhibit P).

Product Standards - Formaldehyde Institute strongly urges the adoption of product standard in lieu of ambient air standard. If the Commissioner decides to regulate, citing a state statute requiring establishment of standards governing sale of building products, ambient air tests could not be conducted under uniform conditions (see Exhibit Q). Testing conditions which are not uniform could never give rise to enforceable measurement levels. Ambient air levels in residential dwellings result from many lifestyle variables and outdoor ambient air conditions, all of which vary from unit to unit. Formaldehyde Institute test methods subcommittee recommendations to industry regarding sampling methods and techniques (Exhibit R). Testing facilities available in Minnesota are not adequate. Ambient air standard is inherently unfair, to hold a manufacturer potentially liable for circumstances and actions by consumers over which he has no control (citing Howlett, Particle Board Symposium in Pullman). Preference for product standard, because it can be applied at the manufacturing source, lessens substantially the cost and time involved in

testing. Product standard because it fixes responsibility for controlling levels at the source of production is inherently more fair. Reference to European countries moving in direction of product standards. Reference to Table 4, on use of European standards and testing methods. Statement that while Institute does not support either a West German-type standard or testing procedure, the point is made that a product standard is far more equitable as well as less costly and more workable than the ambient air standard which may relfect emissions not related to the product (page 30). Formaldehyde Institute working toward development of product standards and its own test method (Exhibit T). Formaldehyde Institute recommending that dessicator test method be used by manufacturers of wood products. Institute sets November 1, 1980 as target date by which it will announce specific product standards (Exhibit T).

Ambient Air Standard and Test Conditions - recommendations for changes in proposed rule if ambient air standard will be adopted, requiring at least one air change per hour, citing DOE and EPA recent statement in "Inside EPA" July 4, 1980. Citing also Lawrence, Berkeley Laboratory Report of October 22, 1979, titled "Impact of Energy Conservation in Buildings on Health", also citing another Lawrence Laboratory paper "Indoor-Outdoor Measurements of Formaldehyde and Total Aldehydes" contained in memo from Groah to Howlett, dated July 1, 1980 (Exhibit U).

Time of Testing - testing has to occur prior to initial occupancy. Rules should establish minimum length of time to elapse after production and before manufacturer can be held liable for meeting specified standard...at least a week and preferably

longer should elapse before liability under temporary regulation may attach.

NIOSH Testing Procedure - procedure is unworkable and inappropriate for measuring formaldehyde in residential units, citing the memo from Groah to Howlett dated July 1, 1980 (Exhibit U) which states that implementation of the rule as presently drafted will be virtually impossible to accomplish within 20 to 25 days. If an ambient air level is to be imposed the Formaldehyde Institute urges that alternatives to the NIOSH method that are more appropriate for field use be permitted. Urging authorization to use portable monitors such as the CEA-555 air monitor (Exhibits V and W).

Effective Date for Standard Implementation - Commissioner must consider both the technical feasibility and economic impact of achieving the proposed standard, otherwise action is subject to challenge as being arbitrary and capricious, citing a 1977 federal case. Compliance with 0.5 ppm standard for newly constructed homes cannot be met overnight using present technology. New technology is being developed; however, even that which is available today requires a lead time within which to alter production methods. A number of approaches are under active consideration, all will take time to implement and involve significant lead time, there is no proven existing technology which would permit the industry to meet a standard of 0.1 ppm and at the same time allow for the continued use of existing construction materials. Discussion of the use of phenol-formaldehyde as an alternative to urea. Problems associated with delay in getting phenol-formaldehyde products from manufacturers in

South East Asia (Exhibit X). Retrofitting existing homes with formaldehyde fumigation, process is still experimental. The Commissioner should provide that the standard set as part of any temporary rule be phased in over a period of time calculated to reasonably permit necessary adjustments by the industry.

Economic Considerations - Commissioner should consider not only technical feasibility but also economic burden on residential home industry. See economic projections (Exhibit X) stating that costs to consumers of meeting 0.5 ppm standard in a single width mobile home could run anywhere from a minimum of $217 to a maximum of $690 (footnote 5, page 39). If the standard is made to go into effect on short notice the first-built mobile homes designed to meet 0.5 ppm standard would have projected cost increase of $1,200 or more rather than $217 to $690. Reference to hearings in Wisconsin where a manufacturer testified that end cost to consumer of achieving a 0.2 ppm standard would be approximately $2,500 (refering to Table 5). Concluding that a 0.5 ppm standard would reduce demand for mobile homes in Minnesota by a minimum of 3.7%, while a 0.2 ppm standard would reduce demand in Minnesota by 43% using the Wisconsin figures, citing that a $2,500 increase in the cost of a mobile home would result in a $33 per month cost increase to the purchaser. The cost impact is sizable at 0.5 ppm, and increases almost geometrically as one approaches 0.2 or 0.1 ppm. For these reasons the Commissioner must give close and detailed study to the incremental health benefits and economic significance of the various standards. There is absolutely no assurance that any expenditure by the wood products industry could achieve a standard of 0.1 ppm given the

numerous factors, aside from construction materials, which contribute to formaldehyde concentration in the average home.

The Need for Additional Statutory Elaboration - the private remedy portion of the statute is so ambiguous and imprecise as to be unconsitutional for failure to provide manufacturer with advance notice of forbidden acts, citing three elements which plaintiff must show as prescribed in the law, citing guarantees of due process contained in the 5th and 14th amendments to the U.S. Constitution. Minnesota's formaldehyde statute, absent any guidelines as to documentary or testamentary proof required to warrant consumer recovery of costs, leaves potential defendants totally in the dark as to their exposure to liability. Statute therefore violates notice aspect of due process clause. Statute could be saved by agency regulation implementing statute if regulation sufficiently set forth specific standards to permit effective judicial review of statutes application and to afford requisite notice to the public. Commissioner should specify at a minimum, (1) what constitutes significant ambient air level testing method, (2) level of expertise necessary to qualify a physician to determine when formaldehyde is significant enough a threat to an individual to warrant vacating home, (3) documentation required to support conclusion that an individual must vacate, nature of test performed by physician and results gained should be required in physician's report enabling opinion to be independently verified. Report should contain level of formaldehyde measured, background levels, test conditions and substantiate causal relationship of formaldehyde to effects reported.

Conclusion - Research is being carried out which will leave us in a much better position to address the alternate actions that may be taken to aleviate the problems. Imperative that regulatory action procede upon reasoned and reasonable scientific approach. Commissioner has responsibility to analyse all the materials filed with the agency. Scientific community does not know whether formaldehyde, as opposed to other pollutants, is causing the problems that are being reported. Formaldehyde Institute urges Commissioner to stay enforcement of any proposed standard for a reasonable period. Fomaldehyde Institute believes Commissioner must consider adoption of a "product standard" approach which is more workable and more equitable than the presently proposed ambient air approach.

Table 1. Estimated consumption of formaldehyde for end uses of urea formaldehyde resins, 1977.

Table 2. Some selected chemicals identified as being present in the inside environment.

Table 3. International standards (threshold limit values unless otherwise indicated).

Table 4. Product specifications, West Germany.

Table 5. Projected cost to consumer of achieving 0.2 ppm standard.

List of Exhibits
from
Submission Made on Behalf of the Formaldehyde Institute
to the Minnesota Department of Health
on July 30, 1980*

Exhibit A
"A Review of the Formaldehyde Problems in Mobile Homes"
Tabershaw Occupational Medicine Associates, P.A.
Rockville, Maryland 20852; 19 pages plus cover.

Exhibit B
"Review of Health Effects of Formaldehyde"
Dr. John J. Clary; Formaldehyde Institute
presented at Pullman, Washington; April 2, 1980
16 pages plus 15 tables plus cover.

Exhibit C
"Formaldehyde Institute, Medical Committee Status Report"
Dr. John J. Clary; Formaldehyde Institute Medical Committee
presented at Hartford, Connecticut; February 26, 1980
15 pages plus cover.

Exhibit D
"Influence of Formaldehyde and Sonacide (Potentiated Acid Glutaraldehyde)
on Embryo and Fetal Development in Mice"
Marks, Worthy, and Staples; Research Triangle Institute
Research Triangle Park, N.C. 27709; Submitted to Teratology
20 pages including tables plus cover.

Exhibit E
"Letter from Dr. Maria Valdes-Dapena, to Dr. Steven Lamm
dated January 28, 1980; plus 7 page curriculum vita
plus letter from Dr. Hugh Westgate, to Jean Heilman
dated March 23, 1979.

Exhibit F
"Urea Formaldehyde Foam Insulation"
Transcript of U.S. Consumer Product Safety Commission hearings
February 5, 1980; Statement of Dr. Steven Lamm; pages 189 through 211.

Exhibit G
"Overview of Studies to Evaluate the Carcinogenic Potential of Formaldehyde"
Formaldehyde Institute; July 1980; 7 pages.

Exhibit H
"Interim Pathology Report, Inhalation Toxicity Study of Formaldehyde
in the Monkey, Rat and Hamster"
with cover letter from Rusch, to Clary; March 10, 1980
115 pages plus cover letter.

Exhibit I
"Talk Paper-Formaldehyde"
May 21, 1980; U.S. Department of HEW; 2 pages.

* Submitted by Gordon G. Busdicker, Jerry W. Snider and Elizabeth L. Taylor,
Faegre & Benson Law Firm, Minneapolis, Minnesota.

Exhibit J

"A Report on Human Health Effects from Low-Dose Exposures to Formaldehyde Gas"
Prepared for the Formaldehyde Institute by Professional Consultants in Occupational Health, Inc.; April 1980; 22 pages plus cover.

Exhibit K

"Testimony Presented Before the Wisconsin Department of I.L. and H.R."
February 18, 1980; on behalf of Tabershaw Occupational Medicine Associates, P.A. at the request of the Formaldehyde Institute; 9 pages plus cover.

Exhibit L

"European Standards-Formaldehyde"
Memo from Skiest, Borden Company to all interested persons
May 22, 1980; 35 pages plus cover.

Exhibit M

"An Assessment of the Regulation of Indoor-Air Quality"
Clifford T. Howlett; for the 1980 Symposium on Particle Board
Washington State University, Pullman, Washington; April 2, 1980
25 pages.

Exhibit N

"Request for Proposals-An Evaluation of Formaldehyde Problems in Residentual Mobile Homes"
U.S. Department of H.U.D.; July 25, 1979; 34 pages plus cover.

Exhibit O

"Requests for Proposals-An Evaluation of Formaldehyde Problems in Residential Mobile Homes--Testing and Analysis"
U.S. Department of H.U.D.; March 31, 1980; 33 pages plus cover.

Exhibit P

"Inside EPA, Weekly Report"
Volume 1, No. 18; July 4, 1980; 8 pages.

Exhibit Q

"A Study of Humidity Variations in Canadian Houses"
Kent, Handgord, and Robson; Transactions of A.S.H.R.A.E.
Volume 72; 1966; 11 pages plus cover.

Exhibit R

"Recommended Procedure for Monitoring Air-Borne Formaldehyde"
Report No. 1 of the Test Methods Subcommittee, Formaldehyde Task Force of the Synthetic, Organic Chemicals Manufacturer's Association
17 pages plus cover.

Exhibit S

"Test Methods for Measuring Formaldehyde Emmissions in Wood Products"
HPMA/NPA; September 4, 1979; 36 pages plus cover.

Exhibit T

"Products Standards"
Formaldehyde Institute; no date; 6 pages.

Exhibit U

"Notes on Proposed Temporary Rule Governing the Level of Formaldehyde on Residential Units As Appearing in the Minnesota State Register, Monday June 23, 1980"
Memo from Groah (HPMA), to Howlett; July 1, 1980; 14 pages plus cover Including additional memo dated July 31, 1979.

Exhibit V

"CEA-555 Air Monitor Versus Chromotropic Acid-Air Test--A Direct Comparison"
Memo from L. Newton (Georgia Pacific), to R. Moir; September 11, 1979
12 pages.

Exhibit W

"HCHO Emmission-Comparison of Test Methods, CEA-555 Versus Chromotropic Acid-Air Test"
Project report, R.P. Bourne (Georgia Pacific) Report No. 1
May 2, 1980; 6 pages.

Exhibit X

"Proposed Temporary Rule Relating to Formaldehyde in Accordance with Laws 1980, Chapter 594"
Letter to Bouchard (MDH) from Groah (HPMA); July 22, 1980
5 pages plus cover.

Submission* made by Manufactured Housing Institute and Others to Minnesota Department of Health, July 30, 1980.

#44

OUTLINE

Background Information
HUD Research Activities

Impact of Rule on Manufactured Housing Industry in Minnesota
Production System
Distribution System
Park System
Supplier System
Transportation System

Economic Impact on Manufactured Housing & Related Industries in Minnesota

Impact on Low and Moderate Income Residents; Ability to Purchase Housing in Minnesota

Attch. A. Manufacturers in Minnesota (1 p.)
Attch. B. Sellers & MHPs in Minnesota (12 p.)
Attch. C. 1975 MHP Directory (7 p.)
Attch. D. Suppliers in Minnesota (2 p.)
Attch. E. MHP Production in Minnesota (70-80) (1 p.)
Attch. F. Transporters (1 p.)
Attch. G. MH Shipments into Minnesota (1 p.)
Attch. H. Price Dependence of Minnesota Demand (MHI:1979) by Gates; (15 p. plus cover)

B. Review of NAS Report

1. Introduction to charts on Exposure & Responses
2. Relevance of Excerpts in the Official Case
3. Occupational Reports on Chronic Low Dose Exposures
   - Lack of Adequate Controls
4. Three Studies on Chronic Low Dose Exposures in Occupational Settings
5. Kerfoot & Mooney
6. Schoenberg & Mitchel (Variables not Controlled)
7. Bourne & Seferian
8. Controlled Human Low Dose Exposure
9. Interlinear Explication
10. Triviality of Response in Studies
    - Trivial Responses in Andersen's Studies & Acclimatization
    - Lack of Adequate Controls for Full Exposure Period
    - Trivial Responses in Weber-Tschopp, et. al.
    - Speculations on Responses: Schuck, et. al.
11. NAS Chart III
12. When is Perception "Irritation"?
13. NAS Executive Summary: Their Conclusions
14. Critique of Their Conclusions
15. Complaint-Generated Data

* 128 pages, including attachments.

C. Critique of Breysse Report
   1. Summary
      Clinical
      Epidemiology
      Significance
   2. Contents
   3. Case Selection
   4. Age of Home
   5. Formaldehyde Levels
   6. Persons Affected
   7. Symptoms

D. Critique of CPSC Complaint File
   Attch. 1. NAS Report: Table 3 Summary of Data on Human Inhalation of Formaldehyde.

Manufactured Housing Institute, Legal Argument, (7/30/80)
submitted by Robins, Davis and Lyons

Rule Exceeds Statutory Authority of Commissioner;
Ban on sale of units exceeding 0.5 ppm is not authorized and statute provides no enforcement for the proposed rule.

Statute must be construed to avoid unreasonable results (achieving the 0.5 level may be impossible)

Stat. must be construed so as to avoid constitutional questions. It should apply only prospectively, and commssioner should play substantial role in making findings regarding degree of eisk and determining what is a significant ambient air level. Remedy provision of statute is unconstitutional.

Rule Was Not Properly Promulgated:
in violation of state APA, Commissioner's determination of significant health problem was not adopted as "rule" and should have been, even under emergency rule provisions. Proposed rule lacks statement of supporting factual basis. There should be a formal hearing first. Environmental consequences must be considered. Under state EPA laws, and rules, and EIS should have been prepared and review before the EQB was necessary. Rule fails to consider relevant facts and lacks substantial evidence to support 0.5 level.

Constitutional Problems:
There has been an improper delegation made to the commissioner, there is a lack of standards, The ban denies the industry due process (substantive) and the rule is void for vagueness. Testing conditions are too vague and manufacturers can't comply because testing facilities in the state are insufficient. Federal preemption applies, since several federal agencies are studying the matter and particularly since HUD has set ventilation standards for mobile homes. The rule would have retroactive effects, resulting in taking without just compensation and a substantial impairment of property rights. Equal protection is denied the industry, unequal burdens are created under the rule, only new units are affected,(and only residential units). Rule affects mobile homes more adversely than conventional homes since mobile homes are sold with all furniture and drapes (which contain formaldehyde too) in place, while this is not so with conventional homes at time of sale. There is also discrimination in favor of in-state conventional builders, against out-of-state mobile home builders who sell in state.

#45

Submission* on behalf of the Manufactured Housing Institute, by Professional Consultants on Occupational Health, Inc., to the Minnnesota Department of Health, July 31, 1980.

FOREWORD

Div. of Env. Health

This Report addresses itself to the Formaldehyde issue, especially the issue as it has been raised in Minnesota with reference to indoor air quality in mobile homes. On the other hand, it has been prepared as a comprehensive document, in order to crystallize out the relative but interfering turbities of the background obscuring the clearer elements central to the issue. Cloudiness and suspended misconceptions had made it so very difficult for officials to come to grips with the concept that while the public has been inflammed, nevertheless the evidence for adverse health effects from formaldehyde exposure at 3.0 ppm F (formaldehyde) or below has arisen from the media and superficial or premature speculation.

Misquoted or misconstrued studies, as well as recondite or generally unobtainable studies have been used to support a recommended standard of 1.0 ppm F (NIOSH, 1976). The Manufactured Housing Institute, its Director Walter Benning, and its Counsel, Mr. Edward F. Canfield, Esq. of the law firm of Casey, Scott, and Canfield have concluded the need for a comprehensive document to clarify the state of knowledge on human exposure to formaldehyde, in order to assist State Commissioners of Health and Regulatory Agencies in coming to intelligent conclusions, since any standard below 3 ppm F appears to be an arbitrary point, one which could not be scientifically justified.

Professional Consultants on Occupational Health, Inc. of Bethesda, Maryland had been requested to prepare

* 257 pp. plus 25 appendices (list attached).

this comprehensive report for The Manufactured Housing Institute, the State of Minnesota and concerned individuals. It would be our further hope that this work in their hands and through their minds might be applied effectively to assist in the dissipation of pollution engendered by so many widely held misconceptions about formaldehyde, its effects, and its purported toxicity at very low levels. At this time it is not known whether formaldehyde is a proxy for a wide variety of indoor pollutants generated by human activity or whether the public scrutiny on formaldehyde has some other basis. It is our belief, however, that future study will show that the problem area was more generally related to the way we organize and contribute to our own indoor milieux, and the unfortunate complication of the energy "crisis" which has not yet come to terms with an appropriate form of conservational air turnover in the indoor environment.

In its organization, except for articles from the general scientific literature, pertinent documents critiqued are to be found, for the convenience of the readers, in the Appendix.

PROFESSIONAL CONSULTANTS IN OCCUPATIONAL HEALTH, INC.

per J. M. Berger, PhD, MD
S. H. Lamm, MD

July, 1980
Bethesda, Maryland

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* All Tables specially prepared for this report by Professional Consultants in Occupational Health , Inc.

EXECUTIVE SUMMARY

This comprehensive submission on formaldehyde deals with the following principal controversies: historical development of concepts of irritation and toxicities of formaldehyde; the possible role of formaldehyde in hypersensitivity; the knowledge and misconceptions produced by controlled human exposure studies; the alleged role of formaldehyde in the production of lower respiratory symptoms (asthma); the large body of complaint-generated data in the North-Western and North-Central States; and the present views of Dr. Ib Andersen, and ourselves, with relationship to indoor air pollution. These have been prepared by Professional Consultants on Occupational Health, Inc., at the request of the Manufactured Housing Institute, Mr. Walter Benning, Mr. Edward Canfield, Esq., Staff of the Attorney-General's Office of the State of Minnesota, and Staff of the Commissioner of Health of the State of Minnesota, in order to assist the Commissioner of Health of the State of Minnesota and associated official parties in determining what, if any, evidence exists in the scientific literature or in local mobile home complaint-generated data to set an acceptable indoor standard for formaldehyde levels.

In order to accommodate and to serve as a source for clarification of the manifold misconceptions and misinterpretations on the subject of possible adverse health effects from Formaldehyde; it became necessary to critically analyze much of the literature ordinarily holding formaldehyde as a particularly irritant or toxic agent at almost any level, even in trace amounts (in parts per million or less). Critical analysis of the historical evidence, both experimentally and empirically available data, as well as current material with reference to the needs of the State of Minnesota, and interested Parties, clearly showed that

there was not a shred of substantial evidence in the widely quoted material that formaldehyde gas by itself in concentrations less than 3.0 ppm F (of formaldehyde) produced significant toxic or irritant effects on humans of any age. This means that a review of the bodies of evidence indicated that a standard could be arbitrarily set at any point below 3.0 ppm F with probably equivalent, safe results for human health.

Controlled human studies from two sources (Andersen and Weber-Tschopp) which are critically reviewed in Section B, have shown trivial or insignificant differences, amounting to mere threshold emergences of awareness, over the ranges of about 0.25 ppm F to about 4.0 ppm F. The work of Schuck et al. which is critically reviewed in Section B of this report, may be entirely disregarded as non-contributory element in the controversy.

The occupational reports rarely showed acceptable evidence of linkage of health effects to formaldehyde. When they did show some evidence, adverse health effects were not shown. The work of Schoenberg and Mitchell (Section A) which purported to show an effect in filter workers exposed to low levels of formaldehyde appeared to show an effect, but not one significantly related to low levels of formaldehyde. The work of Gamble et al. showed that the effect seen in the pilot study of Schoenberg and Mitchell could not be reproduced. In fact, an adverse pulmonary effect was not present at all, when a detailed and specific study was done on workers by Gamble et al. for lower respiratory effects to low levels of formaldehyde. The paper of Kerfoot and Mooney showed that in workers chronically exposed to levels of formaldehyde from formalin vapors in the range of 1.34 ppm F and below, an excess of prevalences of respiratory and skin disease (and other irritations), were not present. The latter authors also produced findings to

suggest strongly that with or without ventilation present in the workplace of the embalmers studied, significant differences did not emerge under the different circumstances of exposure to formalin and other vapors.

The important paper of Morrill which had been widely quoted as an occupational study showing upper respiratory, sleep, and thirst effects from formaldehyde exposures, measured to be 0.9 to 1.6 ppm, appeared to amount to nothing more than anecdotal report on two workers exposed to temperatures of about 104°F and relative humidities of about 95% and a variety of irritant pollutants in the air. Morrill did not show a linkage between the symptoms reported and the presence of formaldehyde. The oft quoted paper of Bourne and Seferian appeared highly over-rated, being merely the report of symptoms of persons within a single dress shop and measurements made elsewhere, without an attempt to link the two scientifically.

Most important, the reports of Shipkovitz and that of Blejer and Miller, which constituted the in-house governmental documents, largely based on which NIOSH made the recommendation of 1 ppm F, were finally obtained, almost snatched from the edge of oblivion, and critically assessed. The paper of Blejer and Miller made an occupational assessment of formaldehyde exposure and did not find a single case of workers with objective symptoms or signs related to ambient levels of formaldehyde measured. Shipkovitz found levels of formaldehyde less than 1.0 ppm in a variety of perma-press, textiles factories in Georgia, but was unable to establish a link in any factory between the levels of formaldehyde found and a specific complaint or symptom in a single worker. Nevertheless, Shipkovitz, based largely on his personal speculations, produced a report which appeared misinterpreted to show that some sort of linkage to formaldehyde irritation actually existed in

the extremely hot, humid environments of the noisy, unpleasant plants amongst workers with bitter and low morale for a variety of reasons.

Accordingly, with respect to the above occupational studies which have provided for governmental regulatory agencies (and for many interested Parties), an important body of evidence implicating formaldehyde at low levels as a factor in producing adverse health effects in humans appeared to have no basis, nor a single consistent piece of hard evidence. This raised the question whether there was a shred of scientific evidence in 1976 for NIOSH to have originally made a recommendation to OSHA that the formaldehyde standard in the workplace be lowered from 3 ppm F to 1 ppm F; and whether the process by which that inconceivable formulation was produced should not be reviewed at this time. It raised the further question why reports such as those of Shipkovitz and Blejer and Miller, which have remained secreted for the most part within government archives (until they were recently lost) should not have been first allowed to be critically reviewed, either in the referee journals or by the scientific community, before they were accepted at face value on the basis of speculations rather than hard scientific evidence, available through the technology of the times.

In order to assist the Staff of the Commissioner of Health of the State of Minnesota and interested Parties; individual, detailed critiques of these above-mentioned occupational studies have been presented in Section A of this comprehensive report together with the copies of the originals of these papers in the Appendix, in order that our critical assessment of these papers may be compared with the originals, both by officials of the State of Minnesota and other interested Parties, particularly in the scientific community, to establish whether or not their views in relationship to these critiques differ, and in what specific ways.

In section B of this report, we have prepared three detailed critiques of the papers widely held to be the best relevant evidence by the National Academy of Sciences of controlled Studies on Human Exposures to Low Levels of Formaldehyde Vapors. These are the papers of Andersen, Weber-Tschopp et al., and Schuck et al. The paper of Andersen, which was uncontrolled actually in its most important aspects, showed over the range of 0.5 to 1.6 ppm F, only trivial insignificant responses ("slight discomfort"), in some subjects. This response of "slight discomfort" did not differ significantly from baseline values in pure air.

The work of Weber-Tschopp et al., which was partly controlled, studied the responses to specific questions about the quality of indoor air in rooms crowded with 33 to 48 students, in the progressive ranges of 0.03 to about 4.0 ppm F. Remarkably little difference in response over that range was found; and the response found, while of borderline significance during a few minutes at each exposure, was basically trivial and did not differ substantially from controls or from expectations of the quality of air in rooms crowded with students, as described.

The paper of Schuck et al. exposed the eyes of test subjects through a porthole in a chamber of artificial smog both to products of various smog compositions and to extremely bright artificial sunlight, equivalent to the noonday sunlight over Pasadena, and measured eye blink rates. Much of the paper is devoted to speculation, and presents a single experiment on a single individual without evidence of having measured either the fluctuations of formaldehyde nor of having established the presence of it during the experimental procedure.

In summary, all three of the above papers, commonly referred to as the "controlled human exposure studies",

were either uncontrolled or did not establish exposure to formaldehyde, or to formaldehyde alone, or part or all of these. As a group, in portions where there may be some scientific validity to the conduct or design of the experiment, the only response shown is either a trivial one or a trivial threshold emergence, but not a response which could be termed either irritant, or toxic in the sense of an adverse health effect.

In Section C, entitled, Hypersensitivity, Professional Consultants have summarized their review of the individual papers on the subject from the Scandinavian, Western European, and North American literature with respect to a possible role of formaldehyde as a "strong sensitizer", a characterization that has been traditionally but uncritically made in a wide number of scientific reviews. The concept of a role for impurities in formalin, which was the usual vehicle for testing formaldehyde, is presented with special reference to the possible role of methanol and other short-chain alcohols used to stabilize formaldehyde in solution. Correspondence with Dr. Alexander Fisher, the Chief proponent of the view that formaldehyde is a strong sensitizer, is appended to this section. The correspondence sets out the details of the hypothesis and provides the reply produced by Dr. Fisher's follow-up letter.

The concept of possible "hypersensitive population with respect to formaldehyde gas" is dealt with. The available evidence from North American and Scandinavian studies indicate that, if such a population were conceived to exist, it would appear to amount to less than 1% or even as low as less than 1/10th of 1%. This means that the overwhelming majority of complaint-generaged data is not likely to be based on a foundation of hypersensitivity mechanisms, but has its source in some other causes. A hypothesis to explain the complaint effect is discussed later

and elaborated upon in Section E.

Professional Consultants made enquiries of an official in NIOSH in order to ask whether to their knowledge there was any evidence of a phenomenon of formaldehyde gas hypersensitivity. We have been told that they were not able to provide documentation of a single occupational case of hypersensitivity to formaldehyde gas. Dr. Andersen has stated in his paper (1976) that he was not aware of a single documented case in a non-occupational setting of this phenomenon.

The evidence that formaldehyde is a strong skin sensitizer or a cause of allergic asthma is dealt with more fully in Section D. At the present state of the art, the views prevailing in the 1940's, the 1950's and 1960's of a phenomenon called formaldehyde dermatitis, or "textile dermatitis", has been found by Scandinavian and Western European investigators to be either of trivial, secondary or of no importance with relationship to the sensitizers in textiles and other worn articles. A large group of other chemicals present in textiles have now been scientifically documented to produce dermatitis on contact in certain "dermal" persons.

The occasional case report has arisen in the literature as an anecdote concerning possible sensitivity caused by formaldehyde or formaldehyde resins in tissue paper, plaster casts used to treat fractures, leather goods, nail hardeners or other chemical preparations or impregnations. These reports reoly on a discredited, but traditional body of evidence that identifies formaldehyde regardless of absence of scientific evidence of linkage or causality. Several of these anecdotal cases have been presented and critically analysed in scientific conferences. The inconsistencies or lack of supporting evidence have usually undermined the impact of the original speculations. This leaves approximately 6 to 7 cases in the literature

which have not been supported by consistent or collateral observations since their original publication. In our opinion, this only serves to show that, since these isolated anecdotal reports were unsubstantiated, they are in print, but are non-contributory.

In this connection, formaldehyde has been incorrectly implicated by association with a number of compounds with which it has either been mixed or associated by means of a chemical bonding. Para-tertiarybutylphenol (PTBP) was complexed into a PTBP-formaldehyde resin. It was believed that formaldehyde was the sensitizer. Further studies however showed that PTBP was on its own a potent sensitizer. Facilitation of irritation reactions mistaken for hypersensitivity appeared to be the underlying mechanism in certain nail hardeners. Methylethyl ketones were just such a facilitating agent. Doubtless, with time the rest of the facilitating agents or other sensitizers for which formaldehyde has been the proxy in the past will be identified.

From complaint-generated data and from several sources in literature, there has risen the misconception that formaldehyde vapors cause at low or at brief exposures acute <u>lower</u> respiratory symptoms, particularly asthma. Much has been made in the past of a formaldehyde-induced asthma on a hypersensitive basis. In Section D, we have reviewed in detail the four chief papers, which have been considered to contain the substantial evidence for such a phenomenon. Two of these papers, that of Porter (1975) and Sakula (1975) both represent anecdotal reports about single individuals. Porter presents an accident which happened to him; Sakula makes some remarks about a laboratory technician who is his employee. Both refer to chemical pneumonitis or bronchitis as "asthma".

Porter, who had an allergic history, merely raised the speculation whether a hypersensitivity reaction had occurred. His laboratory investigations, the course of his clinical convalescence, and other medical evidence offered in his paper not only failed to provide a basis for "asthma", but served also to eliminate the possibility of an acute hypersensitivity reaction. The remarks made by Sakula do not appear supported by the descriptions given of his lab technician, who had a history of advanced pulmonary tuberculosis and smoker's bronchitis. Medical evidence to exclude the latter were not presented, and no evidence of asthma was presented; nor was there any evidence presented of hypersensitivity.

The papers of Hendrick and Lane, in 1975 and 1977, essentially presented the same co-operative nursing sister, a 41 year old staff member, who was termed to have "asthma" because she had a cough and a wheeze, but stated that she was "not unduly troubled" by the condition. On two occasions, she spilled some formalin from a bottle and had some respiratory discomfort from the fumes. The authors were unable to establish that her pulmonary function tests (FEV) supported an obstructive, asthmatic condition. In 1977, they published a series of cases again including the 41 year old nursing sister, and an allergic individual who appeared to have upper respiratory irritation from an allergy to house dust.

Three other cases presented (of 28 total surveyed) did not show a positive reaction to provocation-inhalation tests to low or even extremely high doses of formalin vapors in an enclosed experimental condition. In fact, the staff member who was allergic to house dust

and house mites, while not reacting to formalin vapors, showed some alterations in respiration at night at home. This is not formalin hypersensitivity asthma. Accordingly, both papers of Hendrick and Lane appeared to present the same anecdotal report of the same individual served up in two different ways. These papers have been critically analysed in detail, in order to indicate that the phenomenon of "formalin asthma" has not been substantiated in the literature.

Professional Consultants does not believe that current data show any significant, meaningful, and consistent pattern that relates symptoms of mobile home residents to their formaldehyde exposure. Within each study, stratification of symptoms by exposure did not reveal a consistent pattern. Exposure levels in complaint homes were no greater than for non-complaint homes. Symptom prevalence did not appear to relate to formaldehyde exposure level.

The Minnesota data showed a slight but negligible drop in average number of symptoms at increasing exposure levels. Each major symptom was analyzed to determine whether the prevalence was greater above some exposure level than that among the lowest exposure level group, but no significant differences were found. Minnesota did not report formaldehyde levels of non-complaint homes.

The Wisconsin investigators state that eye and nose irritation symptoms showed a significant dose-response relationship, but they have not released their data yet for external review. Their study of formaldehyde levels in non-complaint mobile homes, randomly selected, showed no different exposure levels

than do similarly aged mobile homes of complainants.

The Washington State reported a slightly different triad of symptoms than did the other states. None of these symptoms increased in prevalence with increased exposure level, except for nose irritation which was an infrequent symptom. Their medical data had no physician review. They did not systematicly report levels in non-complaint homes.

The Connecticut study, on the other hand, found no difference in prevalence of nose irritation symptoms in those residents whose homes had detectable levels of formaldehyde vapor in a screening test compared with those whose homes had undetectable levels. Although eye irritation symptoms were more frequent in those with detectable formaldehyde levels, on the average more symptoms were reported by those with undetectable formaldehyde levels. Thus, no consistent pattern of symptoms with respect to formaldehyde levels is apparent. The Connecticut data refered to homes that had UFFI installed, rather than mobile homes. Their formaldehyde levels were performed with a Draeger screening apparatus rather than using the NIOSH analytic method.

In the critical analysis of Dr. Ib Andersen's March 1980 lecture it became apparent that he now finds formaldehyde only a proxy for a number of indoor pollutants. These pollutants and the adverse quality of indoor air in many Danish homes seemed to have resulted from regulations requiring "tighter" thermal envelopes, and less air turnover. Modifications peculiar to Danish construction, such as thicker walls, less window space

etc. produced alarming decreases in indoor air turnover in newer dwellings. For that reason, Danish indoor air standards for formaldehyde may not be comparable with U.S. ones, but in Denmark are considered ideal for construction which is quite costly.

Finally, the health of individuals must be one of the bottom lines in health regulatory decision-making. The power to permit people to live in well-ventilated housing of reasonable cost provides a positive health contribution to the general lifestyle, nutrition, growth and development of the nuclear family unit. Costlier housing, with its mortgage-poor resident families, may find that the savings and attendant family resource depletion derived from housing with lower fuel bill produce worse total health problems than those postulated for trace vapors almost instantly dispersed through a crack in the wall or by adequate ventilation. Health authorities appear only one factor in the influences balancing the scales of these health alternatives.

PROFESSIONAL CONSULTANTS IN OCCUPATIONAL HEALTH, INC.,

Bethesda, Maryland
July 1980.

#46

Manufactured Housing Institute, letter (7/16/80)
submitted by Robins, Davis and Lyons

Present technology for construction of mobile homes does not permit or allow meeting the proposed 0.5 level. No assurance that any sample testing can be truly representative of actual levels. Choice of NIOSH method may lock the state into this single testing method.

Inability of nanufacturers to meet the 0.5 level will severely damage the industry (both conventional and mobile) Proposed regulations will have consequences far outside housing industry. People who can't afford conventional housing will be deprived of home ownership. Proposed ban on sales will affect these people.

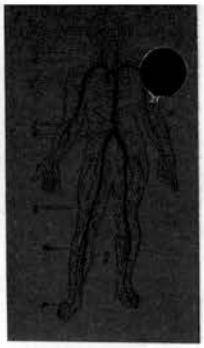
Compliance with proposed level may cost as much as $1,000 per unit.

Regs causing these consequences are not necessary based on the fragmentary evidence on health effects which exists. There does not exist a reasonable body of medical knowledge defining or establishing a significant health problem. REg prohibiting sales was not intended by legislation. Fact that law calls for warning means ban on sales was not intended.

Rule should address only warning. Ban on sales should not be ordered through emergency rule.

Comm issioner has not made sufficiently detailed findings.

YOUR HEALTH



NEWS RELEASE FROM THE MINNESOTA DEPARTMENT OF HEALTH

May 22, 1980
FOR IMMEDIATE RELEASE

Contact: Pauline Bouchard
(612) 296-5331

State Health Commissioner George R. Pettersen, M.D., has declared that the use of building materials which give off formaldehyde vapor can be a "significant health problem" under certain circumstances.

In accordance with Minnesota Laws of 1980, Chapter 594, a bill on formaldehyde passed during the last session of the state legislature, Dr. Pettersen issued the following statement:

> "Persons in newly constructed or remodelled residential environments may be exposed to the formaldehyde gas released from such materials as particle board, plywood, and recently installed foam insulation. We have determined that a significant health problem is presented by the use of building materials that emit formaldehyde gases. This determination is consistent with the recent findings of the committee on Toxicology of the National Academy of Sciences that:
>
> a. The first level of response to low airborne concentrations of formaldehyde appears to be irritational effects;
> b. Possible revised assessments of health implications need to await the results of ongoing and planned toxicologic studies; and
> c. At present, with all the uncertainties and variabilities of response of humans to low

- MORE -

airborne concentrations of formaldehyde which are attributable to building materials in residential environments, the formaldehyde should be maintained 'at the lowest practical concentration.'"

Resins manufactured with formaldehyde have been used to make building materials for several years, Dr. Pettersen said. Large amounts of the resins are used in products like plywood, particle board, insulation cloth and adhesives, and formaldehyde gases given off by these materials have been blamed for a variety of health problems.

Government officials nationwide report that they have received many complaints about the problem, Dr. Pettersen said. The reported symptoms range from eye and skin irritation to breathing difficulties, nosebleed and nausea.

Dr. Pettersen said that the Minnesota Department of Health investigated complaints about possible formaldehyde exposure in 486 homes during a 15 month period ending April 30. The air inside those homes was found to contain formaldehyde vapor in amounts ranging from undetectable to 3.29 parts per million. After conducting a similar investigation, Wisconsin proposed regulations which would limit levels of formaldehyde vapor inside new mobile homes.

Dr. Pettersen also noted that the Massachusetts Department of Health completely banned the sale of urea formaldehyde foam insulation in that state after holding public hearings on health problems allegedly caused by the insulating materials. The U.S. Consumer Products Safety Commission held a series of public hearings on the possible health effects of formaldehyde after receiving over 1600 complaints about products containing urea formaldehyde. Last December the U.S. Department of Energy proposed standards for making and installing urea formaldehyde foam insulation.

Dr. Pettersen said that, as soon as possible, he plans to issue temporary rules limiting the permissible amount of formaldehyde vapor inside newly constructed dwelling units. These rules will establish a maximum limit of 0.5 parts per million for the air inside these dwelling units.

- MORE -

Permanent rules will be adopted only after the state health department holds public hearings on the formaldehyde issue, sometime later this year. Dr. Pettersen said evidence presented at the hearing may justify provisions in the permanent rules which would gradually lower the permissible level of formaldehyde.

SF-00006-01

STATE OF MINNESOTA

DEPARTMENT HEALTH

Office Memorandum

TO : Gerry Anderson
Special Assistant Attorney General
Department of Administration

DATE: October 8, 1980

FROM : Roger L. DeRoos, Ph.D., Director
Division of Environmental Health

PHONE:

SUBJECT: Temporary Rule Relating to Formaldehyde

The accompanying documents constitute the entire record in this matter which is herewith submitted to you for review, pursuant to Minn.Stat. § 15.0412 s.5(1978).

The documents are the following:

Temporary rule as proposed and published in the State Register;

Notice of Extension of Comment Deadline, as published;

Comments received in response to the proposal;

Commissioner's Order of Adoption;

Temporary rule, revised and adopted.

In addition, we have included additional materials which should assist you in your review. These are:

Formaldehyde Report to the Commissioner of Health, August 23, 1979 (prepared by departmental staff);

Revisor's version, copy of Laws, 1980, Chapter 594;

Copy of Press Release, notifying public of Commissioner's determination, dated May 22, 1980;

Numbered list of all comments received and brief summary of each comment;

Copy of the National Academy of Sciences Report, Committee on Toxicology, March, 1980.

BACKGROUND

In late 1978, the Minnesota Department of Health (MDH) became interested in the matter of possible health effects associated with certain levels of formaldehyde, and particulary in mobile homes and in homes which had been insulated with urea

formaldehyde foam. The Department initiated a testing service, as an aid to physicians whose patients manifested symptoms which might be caused by formaldehyde. This was done because at that time there was only one commercial testing laboratory in the State which could conduct such tests. The Commissioner of Health was urged to adopt a standard setting a maximum level for formaldehyde. At that time the only enforceable level in existence in the US was that used by O.S.H.A.: 3.0 parts per million for eight hours of exposure per day. Although many other levels (most of which were much lower) were and are being discussed for implementation in European countries, it is not clear which of these are actually being enforced and which are merely recommendations or goals to be acheived in the future.

None of the scientific evidence which has been reported to date shows any causal relationship between the symptoms being reported by patients and the relatively low levels of formaldehyde which are being measured in the complainants homes. When we say relatively low, we mean less than 0.5 ppm. For this reason the various state and federal agencies which have examined the issue have been very cautious in their approach to the regulation of formaldehyde at low levels. The National Academy of Sciences report of March 1980 which is cited in the Commissioner's press release is the most recent comprehensive and critical evaluation of the research which has been done on human response to formaldehyde. The report is attached.
cf. particularly pp. 13-19, 29.

The position of the Department with regard to formaldehyde and its regulation is stated in the Formaldehyde Report to the Commissioner of Health (August 23, 1979) (copy attached). That document reflects the agency's position prior to passage of the 1980 legislation.

The air testing program undertaken by the MDH demonstrates that persons who experienced symptoms may inhabit dwellings which contain much less than 0.5 ppm. In the MDH investigations there seems to be no correlation between severity of symptoms and level of formaldehyde particularly in the range of 0.1 - 0.5 ppm. [1]

MINNESOTA LEGISLATION

During the 1980 session a bill which passed the House Commerce Committee set a maximum level at 0.1 ppm, based on the testimony of individuals who claimed to have been made ill by low levels of formaldhyde. The counterpart Senate Committee refused to pass a bill which specified such a low level (after some industry opposition to the level in the House version) and the compromise which resulted in Chapter 594 left it to the Commissioner of Health to set a level. The bill requires first that the Commissioner determine whether or not formaldehyde presents a "significant health problem" (cf. attached Revisor's version, Section 1). The Commissioner made such a determination and notified the public of his action in a press release on May 22, 1980 (copy attached).

Chapter 594 further requires that the Commissioner adopt emergency rules establishing standards governing the sale of building materials and housing units containing products made with urea formaldehyde.

The department staff initiated the process to adopt temporary (emergency) rules according to the procedure prescribed in Minnesota Statute §§ 15.0412 Subdivision 5(1978). The temporary rule was published for comment in the State Register of June 23, 1980 (copy attached). At the request of a number of interested persons, the comment period was extended through July 31, 1980 (copy attached). The comments were reviewed by the Commissioner and staff. Based upon the comments made by the public, the rule as proposed has been revised for final adoption (attached copy "Temporary Rule as Adopted").

PUBLIC COMMENTS

The persons submitting comments can be roughly separated into three groups: individual private citizens who are personally acquainted with health problems allegedly caused by formaldehyde; physicians and other public health professionals who have dealt with affected individuals and families; and representatives of industries which would be affected by the rule.

Of the 22 comments received from private citizens, one came from a couple who had made the same or similar comment to both the Governor and to the Commissioner (comments #6, 8, 9, 10, 11, 12, 13, 14 , 15, 16, 17, 18, 19, 21, 22, (same as 23), 24, 35, 37, 39, 40, 41). All of these argued that the 0.5 level was much too high; most argued that whatever level was proposed should be made to apply to existing housing and not only to newly constructed units. Several of these argued that foam insulation should also be regulated. Several writers urged a complete ban on the use of formaldehyde. Comment #37 contained 20 letters from citizens with complaints regarding formaldehyde. However, since these were not submitted as comments specific to the content of the rule as proposed, these were treated as a single comment from the S.U.F.F.E.R. group.

All of the twelve comments submitted by professionals (legislator, physicians, attorneys and public health officials) objected to the 0.5 level as being too high. Suggestions for alternate levels ranged from 0.25 to 0.01 ppm. Most of these commentors also argued that any level should apply to both existing and newly constructed housing. These comments were submitted by persons who had had contact with affected individuals but none of the commentors had taken part in or could report on results of controlled studies to support their recommendations. (#1, 2, 3, 4, 5, 7, 20, 25, 47, 49, 50, 51).

The third group of comments were submitted by industry representatives. Seventeen comments were submitted by or on behalf of eleven individuals or groups. (#26, 27, 28, 29 (same as 42); 30, 31 (similar to #48); 32 (same organization as #33); 34 (same organization as #44, 45, 46); 36, 38, 43). Of these, four commentors (#27, 28, 30, 36) thought their industry could probably comply with the 0.5 level, although each of them had serious reservations about other portions of the rule and as to its date of effectiveness. One commentor (#31, and 48) reminded the agency that the law was written to regulate only products containing

urea formaldehyde and not all formaldehyde containing products. Four commentors (#26, 34, (44, 45, and 46); 38, 42, (29)) claimed it would be impossible for their industries to comply with the 0.5 level. The remaining two commentors (#32 (33); 43) recommended that a product standard be adopted rather than an ambient air standard as proposed.[2] Most of the industry comments were generally concerned with: 1) testing methods, (NIOSH method is expensive and can only be done by skilled personnel) and requested that they be allowed to use alternatve methods; 2) testing conditions should be such that occupants' behavior or furnishings are not contributing a significant amount of formaldehyde at the time of the test; 3) effective date, most hoped this date would be postponed and the standard would not apply for approximately 60 days; 4) fear that the standard would be made to apply to existing housing or to units manufactured (but, not sold) by the effective date. In addition, those voicing the greatest opposition predicted that severe economic consequences would result from imposition of the rule. Legal arguments in opposition to the enabling legislation and the proposed rule were also made (#43, 44, and 46).

Agency Response to Public Comments:

In response to the various public comments, the proposed rule has been revised. The two sets will be referred to as "proposed", that which appeared in the State Register, and "adopted", that which is submitted for final approval.

7 MCAR § 1.234.A. In the adopted version this portion restates the commissioner's determination regarding the health significance of formaldehyde. This statement was not included in the proposed rule.

7 MCAR § 1.234.B.1. and 2. contain definitions which were not given in the proposed rule. "Building materials" is defined so that anyone who reads the rule will know what is the meaning and scope of the phrase as it is used in the rule. The term was so defined as a result of a number of industry comments and questions. The term "commissioner" is defined for convenience, to eliminate the need to repeat--of health--every time reference is made to the title of the agency head.

"Residential unit" was so defined in the proposed rule. (B.2).

The phrase "newly constructed" was deleted from the definitions section because the phrase is not used in the adopted rule. A majority of the individuals who commented on the 0.5 ppm level objected to its application to "newly constructed" housing, pointing to the fact that the enabling legislation contained no similar restriction.

7 MCAR § 1.234.C.1. is similar to part A of the proposed rule with the following changes: the 0.5 level in the rule as adopted is not restricted to newly constructed residential units, and the 0.5 level must be that which is attributable to building materials. The former change was made at the request of the individual citizen commenters who argued that the restriction was not required by the enabling legislation. The second change was made at the request of industry spokesmen who argued that they ought not have to make corrections for sources of formaldehyde being emitted by other sources.

7 MCAR § 1.234.C.2. is a new provision which sets the same maximum level for the installation of urea formaldehyde foam insulation. This was done to satisfy a number of individual citizen commenters who claimed they had encountered severe health problems after foam insulation had been installed in their homes. The law does provide for the regulation of the sale of building materials containing urea formaldehyde. The installation of foam insulation can be viewed as the last element (i.e., delivery of goods) in the closing of the sale. Therefore it is appropriate to impose a maximum ambient air standard on the "sale" of urea formaldehyde foam. It is reasonable to assume that the Legislature intended that foam insulation which is known to emit formaldehyde gas should be regulated in the same manner as are other building materials.

7 MCAR § 1.234.D. is a new section which directs the reader to those portions of the rule which have to be followed whenever any test for formaldehyde is conducted. The provision was included for the purpose of clarity and is not substantially different from the prescriptions given in the proposed rule, sections C. and D.

7 MCAR § 1.234.E.1-11. is the same as that which was contained in the proposed rule, section D.

7 MCAR § 1.234.E.12. is a new provision allowing for the use of an alternative test method. The provision was added at the request of industrial representatives who argued that the use of such an alternative should be permitted. The conditions which must be met before approval is given will assure that results based on different methods will be reasonably comparable.

7 MCAR § 1.234.F.1. The conditions which must be met before a test is considered valid have been elaborated and made more explicit than those which were contained in the proposed rule, part C. The temperature range has been broadened to acknowledge the recommended temperatures contained in the President's energy conservation guidelines. The specification for a ventilation rate was made at the suggestion of industry spokesmen who argued that they would be unfairly disadvantaged if testing could be done when a residential unit had been sealed shut for a prolonged

7 MCAR § 1.234.F.2. is a new provision which requires that three different air samples be taken, analyzed and averaged to produce a single test result. This requirement assures that sampling error is minimized and that the final level is broadly representative of the concentrations which exist in the unit. This provision was suggested by an industry spokesman. The additional provision that three air samples are to be taken when a customer has a complaint arising from a single room assures that sampling error can be kept to a minimum.

7 MCAR § 1.234.F.3. is a new provision which is included at the request of industrial representatives. They argued that they ought not have to make corrections unless the level which is measured is truly attributable to material over which the manufacturer or seller has control. Such assurances can be made only if other contributing sources of formaldehyde are removed from the environment before air samples are taken.

7 MCAR § 1.234.G. is a new provision. The first sentence in G.1. declares that no significant ambient air level is being set. This was included to address one of the comments which argued that absent any other statement, the level of 0.5 would be used as a "significant level" by the industry in defending against actions brought by plaintiffs whose homes measured less than 0.5 ppm.

The language contained in G.2. essentially repeats some of the language contained in § 2, subd. 4 of the law. It is included primarily for the purpose of informing the reader, who may not have a copy of the law in hand, of the kind of medical information which may be required in a remedy action.

FOOTNOTES

1. The N.I.O.S.H. method for analysis of formaldehyde does not yield reproducible results at levels below 0.1 ppm, so measurements made below that level are of questionable value.

2. On Thursday, October 2, 1980, the Wisconsin Department of Industry, Labor and Human Relations (D.I.L.M.R.) recommended to the Wisconsin Legislature that it approve a maximum level of 0.4 ppm for mobile homes sold in Wisconsin. The administrative rulemaking procedure is likely to take at least two months before a final decision is reached.

3. While there has been much discussion urging the adoption of a product standard, the plywood and particle board industry has not yet agreed on a single product standard which would have industry-wide acceptance.

FORMALDEHYDE REPORT
TO THE COMMISSIONER OF HEALTH
Minnesota Department of Health
August 23, 1979

Introduction

Recently, there has been a large increase in the number of complaints concerning formaldehyde vapors in homes. Domestic sources of formaldehyde include emissions from particleboard, plywood, chipboard, paneling, and urea-formaldehyde foam insulation. In response to this increase of health complaints, the Minnesota Department of Health began a service in February, 1979, to measure the level of formaldehyde in complainant's homes.

Standards

The only standard the United States currently has for formaldehyde exposure is that for occupational exposure. The Occupational Safety and Health Administration (OSHA) ruled that airborne formaldehyde levels cannot exceed an average of three parts per million (ppm) during an eight-hour workday (1). The American Conference of Governmental Industrial Hygienists (ACGIH) has recommended lowering the ceiling limit to two ppm (2). The National Institute for Occupational Safety and Health (NIOSH) recommends no exposures greater than one ppm during any 30-minute period. NIOSH has also recommended that a respirator should be worn if levels of formaldehyde exceed one ppm (1).

Animal Data

Animal studies have shown that the inhalation of high levels of formaldehyde vapors may cause lung injury and damage to other organs. The concentration lethal to 50 percent of the test animals, based upon a 30-minute inhalation exposure, has been determined to be 800 ppm for rats (3). Most rats showed signs of kidney and liver damage, and pulmonary edema. In another

study mice, guinea pigs, and rabbits were exposed to 16 ppm for ten hours (4). Autopsies showed enlarged livers, distended aveoli and hemorrhagic lungs. Chronic exposure to formaldehyde has been studied by continuously exposing rats, rabbits, monkeys and dogs to 3.8 ppm for 90 days. One rat died, but all other animals appeared normal. However, the lungs of all species showed differing amounts of interstitial inflammation.

During an inhalation study, pregnant rats were continually exposed to 0.1 ppm and 0.83 ppm of formaldehyde (5). The mean duration of pregnancy for the exposed rats increased 15 percent, and at 0.83 ppm there was decrease in the number of fetuses per female. The lungs and livers of the exposed offspring weighed less than those of the control offspring. Experiments using insects and in vitro studies have demonstrated that formaldehyde can cause DNA mutations (6). To date formaldehyde has not been shown to be carcinogenic, but more research is planned (7).

Epidemiology

The symptoms of exposure to formaldehyde include eye irritation; nose, throat irritation; sneezing; coughing; headaches; shortness of breath; and skin irritation. The lowest level of formaldehyde that has caused eye irritation is 0.01 ppm (8), and 0.05 ppm is the lowest level that has been reported for odor detection (9). Noticeable nasal and eye irritation, and lachrymation occurred when men were exposed to 13.8 ppm for 30 minutes. Eye irritation wore off after ten minutes of exposure (10). Breathing becomes difficult at exposures between 10 and 20 ppm. Nose and throat irritation may continue for an hour after removal from exposure (11).

Chronic exposure to formaldehyde levels below three ppm may

cause health problems. Embalmers exposed to levels varying from 0.25 to 1.30 ppm had a high incidence of symptoms including eye and nose irritation, headaches, coughing and sneezing (12). Formaldehyde is used in the manufacture of permanent press clothes, and complaints of irritation have come from fabric shops where the concentration of formaldehyde ranged from 0.13 to 0.45 ppm (13). A Russian study examined workers continually exposed to levels of 0.48 ppm and found hypotonicity, chronic anxiety neurosis, and neurocirculatory asthenia (14). The most thorough review of the health hazards of formaldehyde is a NIOSH publication entitled "Criteria for a Recommended Standard--Occupational Exposure to Formaldehyde" (1). Considerable evidence is presented to suggest that below levels of 1.0 parts per million in air, formaldehyde does not represent a serious hazard for adult factory workers. The data cited includes human volunteer and animal studies and a sizeable study of perma-press fabric workers exposed to levels between two and three ppm, the latter being the current industrial standard for the United States.

Since these studies were completed, the question of adverse effects of lower levels of formaldehyde in private homes has been raised. The main sources are urea formaldehyde foam insulation in frame houses and particleboard resin in mobile homes. Levels of formaldehyde measured in 106 Minnesota dwellings by the Minnesota Department of Health ranged from .01 to 3.10 ppm and averaged .55. All but eighteen were under one ppm. In 76 mobile homes the average level was 0.64 ppm. These homes were sampled because the occupants complained of symptoms possibly compatible with formaldehyde effects. Levels in nine control homes, whose owners did not complain of such

symptoms, ranged from .04 to .36 and averaged .18. The difference between this group and 18 complainant homes sampled during the same month is not statistically significant by the usual standards due to the small number of control homes tested.

Interviews by the Minnesota Department of Health with 342 members of families complaining of possible formaldehyde problems showed the presence of reported symptoms as follows:

List of Symptoms	Percent of people with symptoms
Eye Irritation	63
Nose-Throat Irritation	46
Cough	38
Headache	37
Runny Nose	37
Frequent Colds	32
Diarrhea	29
Diarrhea (children under 2 years)	51
Coughed up Sputum	25
Skin Rash	24
Shortness of Breath	22
Abdominal Pains or Cramps	19
Nausea	17
Vomiting	13
Chest Pains	12

Since the complainers almost by definition had to have at least one symptom which prompted their complaint, no totally convincing proof of association between formaldehyde and the symptoms is possible. It does seem clear that a large number of

individuals have symptoms related to being inside their homes, which are relieved by leaving the home. Possible causes other than formaldehyde are allergies to dust, pets or molds, or effects of other irritant chemicals in the household air--from carbon monoxide to various hydrocarbons emitted by synthetic materials.

The question of formaldehyde as a possible contributing cause of sudden infant death syndrome (SIDS) has been raised. However evidence to date regarding this possible association is inconclusive. Available evidence suggests that SIDS has been present for more than 20 years in the United States, well prior to widespread use of urea-formaldehyde. Close to 80 cases of SIDS were studied by Coe (15) in Hennepin County, in 1959 with visits to each household by a public health investigator. Most of the cases were in Minneapolis where mobile homes were illegal and no mention was made of an excess of mobile homes being involved outside the city. Further evidence will accumulate on this point now that the Minneapolis Children's Hospital SIDS Registry is recording the type of housing in which Minnesota SIDS deaths occur.

Available evidence and physiological theory suggest that prudent parents would avoid exposing newborn and particularly premature infants to respiratory irritants. Tightly sealed rooms in mobile homes could contain a number of substances other than formaldehyde and provision of adequate ventilation seems appropriate.

Possible Solutions

Until recently, few attempts have been made to determine if people are affected by formaldehyde products in the home. Two methods can be used to measure the existing problem: epidemiology investigations, and environmental studies. An epidemiology study would determine if there is an excess of mortality and morbidity

in people that are being exposed to formaldehyde in the home. The environmental studies would characterize the formaldehyde levels and other parameters in a random sample of homes. Environmental and epidemiological studies could then be combined to establish the relationship between exposure and response.

Laboratory studies can also be used to increase our knowledge of formaldehyde exposure. Lab studies can be used to find biological parameters in humans which are indications of exposure to formaldehyde. An example would be a test to measure the level of formaldehyde in peripheral blood.

The investigations described above may identify formaldehyde as the source of the health complaints, but other approaches will be required to solve the problem. Several states have already issued consumer warnings. The warnings are used to inform the public that a particular product contains formaldehyde and may cause health problems for certain individuals. Other legal remedies are also available. States can require the installers of urea-formaldehyde foam insulation to be licensed. Standards for residential formaldehyde exposure can be written for new homes or for future installation of foam insulation. If studies show formaldehyde can cause serious health problems, a ban on formaldehyde foam and resins may be required.

The construction regulations for mobile homes require that only outside air be used as the combustion air for furnaces. During cold weather this results in the recirculation of all the air in the home increasing the concentration of pollutants. A change in the ventilation system in mobile homes may prevent the buildup

of formaldehyde in the home.

Air cleaning devices, such as activated charcoal filters, have been successful in removing formaldehyde from the air.

Formaldehyde Investigations - Other Organizations

During July the Health Department contacted several state, federal and private organizations to discuss any current or proposed investigations concerning formaldehyde. A summary of these contacts is listed below.

1. Wisconsin Department of Health and Social Services, (Mary Ann Woodbury). On August 1, 1979, Wisconsin began a three year epidemiology study which focuses on formaldehyde in mobile homes. The study is funded by the EPA.

2. Massachusetts Department of Public Health, (Barbara Newman). Massachusetts is measuring the level of formaldehyde in homes insulated with Urea-Formaldehyde foam. By August 31, 1979, their Department of Public Health will decide whether to ban U-F foam insulation.

3. Dr. Keith Long, University of Iowa. Dr. Long is under contract to the Department of Energy. Phase I of his work consists of laboratory studies to determine the kinetics of the release of formaldehyde from U-F foam. Phase II will examine the home situation to see if the results from Phase I apply to homes.

4. Center for Disease Control, (Kathleen Kreiss). CDC has a protocol for an epidemiology study in Massachusetts. The study has been delayed pending results of the August 31st decision of the Massachusetts Department of Public Health.

5. Environmental Protection Agency, Office of Toxic Substances, (Roman Kuchkuda). The EPA is funding the Wisconsin study.

6. Consumer Product Safety Commission, (Marylin Talarico). The CPSC is collecting information from other agencies. This information is being used for statistical purposes to determine if there is a problem with formaldehyde, and possibly for issuing a warning and/or numerical standard.

7. Department of Housing and Urban Development, (Maynard Curry). The Mobile Home Advisory Council of HUD has established an Air Quality Subcommittee to study the state of art of formaldehyde in mobile homes.

8. Formaldehyde Institute, (Kip Howlett). The Formaldehyde Institute is an organization comprised of manufacturers that make or use formaldehyde. The institute did a literature

search to determine where information on formaldehyde was limited. They felt there was very little information on the long term health effects of low level exposure to formaldehyde. To supply this data the Institute is currently conducting a six month inhalation study of formaldehyde vapors using experimental animals. Next year the institute funds will go into technical research.

9. National Particleboard Association, (Charles Morschauser). The Particleboard Association is looking at the use of filters to lower the level of formaldehyde in existing homes.

10. Department of Energy, (Ernie Freeman). Mr. Freeman was responsible for establishing the adhoc committee to develop a national epidemiology study to investigate indoor pollutants. The study would look at all sources of formaldehyde emissions. There is also an inter-agency committee consisting of DOE, CPSC, and industry representatives that is just concerned with Urea-Formaldehyde foam insulation.

MDH Future Activities

Investigations

As a diagnostic aid to physicians, the Department will continue our environmental investigations in the homes of complainants. This service is also available from private laboratories.

Ventilation Study

The purpose of a ventilation study is to find a low cost remedy for homes that are already occupied. The particleboard industry has used portable filter units equipped with activated charcoal filters to remove formaldehyde from the air. This has reportedly been successful in a number of problem homes. The Department is planning to test the effectiveness of these units by placing a unit in a home with a high level of formaldehyde, and measuring the subsequent decrease in formaldehyde concentration over a period of several days.

Epidemiologic and Environmental Study

At the present time, it appears that a large, expensive epidemiologic and environmental study would be required to prove

firmly and scientifically that formaldehyde levels in homes do or do not correlate with the presence of serious disease in children and adults. This would be particularly true when trying to establish potential association with formaldehyde as a contributing cause to SIDS. There is reasonable evidence that the irritant effect will warn and repel adults before a dangerous level of formaldehyde is reached.

The Department of Health will focus its efforts on practical effects of enhanced ventilation in mobile homes since further epidemiologic and environmental studies would be long and complicated, requiring considerable resources. It may be that mobile homes designed for zero air intake, however energy efficient, may tend to accentuate air contamination problems of many types--including formaldehyde. A solution which resulted in a reasonable compromise between air change rates and energy loss might prevent symptoms due to a number of toxic or allergy-producing substances.

Public Information

The Health Department plans to streamline its effort when handling public information phone calls. The Department plans to write a brochure that will answer many of the general questions about formaldehyde. This brochure will be sent to people that call our Department for information, to physicians, and to local health officials.

Lab Studies

Laboratory studies may be able to develop screening tests to determine if a person with symptoms is suffering from exposure to formaldehyde. Dr. Vincent Garry of the Health Department has been involved with the University of Minnesota in the development and

submission of a grant proposal to the Environmental Protection Agency for development of this test.

Summary

A great number of investigations are now being carried out in various parts of the country to measure the scope and seriousness of man's exposure to formaldehyde. At this time the data is incomplete, and no accurate conclusions can be made. The potential exists for adverse effects on public health. As further studies are completed, one can make responsible decisions based on accurate information.

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PROPOSED RULES

Pursuant to Minn. Stat. § 15.0412, subd. 4, agencies must hold public hearings on proposed new rules and/or proposed amendment of existing rules. Notice of intent to hold a hearing must be published in the *State Register* at least 30 days prior to the date set for the hearing, along with the full text of the proposed new rule or amendment. The agency shall make at least one free copy of a proposed rule available to any person requesting it.

Pursuant to Minn. Stat. § 15.0412, subd. 5, when a statute, federal law or court order to adopt, suspend or repeal a rule does not allow time for the usual rulemaking process, temporary rules may be proposed. Proposed temporary rules are published in the *State Register*, and for at least 20 days thereafter, interested persons may submit data and views in writing to the proposing agency.

Public Hearings on Agency Rules
July 28-August 3, 1980

Date	Agency and Rule Matter	Time & Place
July 28	MN Higher Education Coordinating Board Scholarships and Grants-in-aid; Private College Contract; State Work-study; MN Medical and Osteopathic Loan; MN Foreign Student Assistance; Veterans' Dependents Student Assistance; Part-time Student Grant; Private Institution Registration; Vo-tech Institution Tuition Subsidy Hearing Examiner: Peter C. Erickson	8:30 a.m., Conference Rm. A, Capitol Square Bldg., 550 Cedar St., St. Paul, MN 55101
July 28	Public Welfare Department Services to Mentally Retarded People by Community Mental Health, County Welfare and Human Service Boards Hearing Examiner: Richard Luis	9:00 a.m., Conference Rm. D, Veterans Service Bldg., 20 West 12th St and Columbus Ave., St. Paul, MN

Department of Health
Environmental Health Division

Extension of Comment Period on Temporary Rules Relating to Formaldehyde

Notice is hereby given that comments relating to proposed temporary rules on formaldehyde levels in ambient air (published at *State Register*, June 23, 1980, p. 1963) may be submitted for consideration and entry into the official record, until 4:30 p.m., on Wednesday, July 31, 1980. Such comments should be submitted in writing to:

Ms. Pauline Bouchard
Department of Health
Division of Environmental Health
717 Delaware Street S.E.
Minneapolis, Minn. 55440

October 17, 1980

Mr. Bill Trottier
Wisconsin Manufactured Housing
Association
621 N. Sherman Avenue
Madison, Minnesota 53704

Re: In the Matter of the Proposed Adoption of
Temporary Rules Relating to Formaldehyde

Dear Mr. Trottier:

Enclosed is a copy of the Rule and my disapproval memorandum in the above-entitled matter.

I will appreciate your sending to me whatever your board comes up with in this regard.

Very truly yours,

JERRY S. ANDERSON
Special Assistant
Attorney General

JSA:bw
enc.

ROBERT J. CHRISTIANSON
GEORGE D. McCLINTOCK
EVERETT A. DRAKE
DONALD L. ROBERTSON
WRIGHT W. BROOKS
ROGER L. NORDBYE
GEORGE E. HARDING
JOHN S. HOLTEN
G. ALAN CUNNINGHAM
ROBERT W. OELKE
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THOMAS L. KIMER
JOSEPH M. PRICE
W. SMITH SHARPE, JR.
PHILIP S. GARON
JOHN F. BEUKEMA
WALTER J. DUFFY, JR.

FAEGRE & BENSON

1300 NORTHWESTERN BANK BUILDING

MINNEAPOLIS, MINNESOTA 55402

612/371-5300

TELEX 29-0034

J. B. FAEGRE (RETIRED)

JOHN C. BENSON
PAUL CHRISTOPHERSON
JOHN B. FAEGRE, JR.
COUNSEL

JAMES P. STEPHENSON
F. REID CARRON
A. DAVID KELLY
JOHN K. STEFFEN
CHARLES E. BOHLEN, JR.
JOHN B. GORDON
THOMAS M. MAYERLE
THOMAS G. MORGAN
EDWARD G. HEILMAN
JOHN H. HINDERAKER
ROBERT L. SCHNELL, JR.
RICHARD A. NELSON
BRIAN B. O'NEILL
THOMAS J. MOORE
WILLIAM R. BUSCH, JR.
BONNIE M. FLEMING
HENRY F. FRISCH
RANDY L. MILLER
JACK M. FRIBLEY
JOHN S. JAGIELA
DAVID B. DEAN
STEVEN C. SCHROER
JOHN P. BORGER
HEIDI M. HOARD
JAMES G. RAY
RICHARD A. HELDE

MARGARET S. ANGLE
STEVEN R. ANDERSON
JAY D. CHRISTIANSEN
CHARLES S. FERRELL
DAVID B. MILLER
JAMES E. NICHOLSON
REBECCA L. ROM
NICHOLAS J. SPAETH
MARK F. ENGEBRETSON
JAMES A. O'NEAL
RICHARD T. THOMSON
MICHELE M. MIELKE
BETSY TAYLOR
ROBERT L. COLLINS
MARC J. DETTMANN
BRUCE M. ENGLER
SUSAN L. JACOBSON
WALTER A. PICKHARDT
ANNA W. SHAVERS
DONALD C. SHEPARD
WENDY J. WILDUNG

October 9, 1980

The Honorable Warren Spannaus
Attorney General
State Capitol
St. Paul, Minnesota

Dear Attorney General Spannaus:

On behalf of the 66 member companies which comprise the Formaldehyde Institute, we submit the following comments with respect to the proposed temporary rule, 7 MCAR § 1.234, (the "Rule") promulgated by the Commissioner of Health to regulate formaldehyde levels in residential units. The Institute believes that the Rule as promulgated is both procedurally and substantively flawed and, accordingly, must be set aside pursuant to the authority vested in the Attorney General under Minn. Stat. § 15.0412(4).

I. Procedural Defects

A. The Commissioner failed to follow statutory rulemaking procedures in connection with his finding of a significant health problem.

Under Section 1 of the Minnesota formaldehyde statute, Minn. Stat. § 144.704 (the "Statute"), the Commissioner of Health

was authorized to promulgate rules establishing standards governing the sale of building materials and housing units containing products made with urea formaldehyde only if he first determined that there was presented a "significant health problem." The Institute submits that the threshold finding of a significant health problem was itself a "rule" within the meaning of the Minnesota Administrative Procedure Act (MAPA), Minn. Stat. § 15.0411 et seq.; thus obligating the agency to follow the rulemaking procedures set forth in MAPA. Section 15.0411, subdivision 3 of MAPA, Minn. Stat. § 15.0411, subd. 3, defines "rule" to include:

> "every agency statement of general applicability and future effect, . . .made to implement or make specific the law enforced or administered by it or to govern its organization or procedure, . . ."

The term "rule" has been read broadly by the Minnesota Supreme Court. See, e.g., Can Mfgrs. Institute, Inc. v. State, 289 N.W.2d 416 (Minn. 1979); Minnesota-Dakota Retail Hardware Association v. State, 279 N.W.2d 360 (Minn. 1979). Moreover, courts interpreting analogous language in the Federal Administration Procedure Act have held that fact finding determinations such as that here at issue constitute rulemaking. See Lewis-Mota v. Secretary of Labor (certification by Secretary of Labor under the Immigration Act that employment of certain classes of aliens would not adversely affect the wages and working conditions of workers similarly employed in the United States constituted rulemaking for purposes of the APA).

In the context of Minnesota's statute, it is clear that the Commissioner's determination that a significant health problem exists was an agency statement of general applicability made to implement the Statute within the meaning of Minn. Stat. § 15.0411, subd. 3. Because none of the exceptions to the definition of "rule" set forth in MAPA apply, the Commissioner was required to promulgate his rule in accordance with the procedures set forth in Minn. Stat. § 15.0412. At a minimum, the Commissioner was obligated to publish his proposed determination in the State Register and afford interested persons an opportunity to submit comments, after which the rule was to be submitted to the Attorney General for review. This procedure was not followed. Instead the Commissioner simply issued a press release setting forth his conclusions. The failure to follow proper procedures with respect to the threshold funding of a significant health problem taints the Commissioner's subsequent attempted promulgation of standards governing building materials containing formaldehyde and renders them defective under MAPA.

B. <u>The Commissioner's failure to disclose the factual basis for the Rule or to create an adequate factual record in support of the Rule offends constitutional due process</u>.

Aside from violating the rulemaking procedures of MAPA, the Commissioner's failure to disclose the factual basis for his determination that building materials emitting formaldehyde

constitutes a significant health problem offends the notice requirement embodied in constitutional notions of procedural due process. In this regard, the Minnesota Supreme Court stated in Monk & Excelsior, Inc. v. Minnesota State Board of Health, ___ Minn. ___, 225 N.W.2d 821, 825 (1975):

> "A person dealing with the department is entitled to proper notice of what regulations are being promulgated and are applicable to him. The purpose of the Administrative procedure Act is to ensure that we have a government of law and not of men. Under that Act, administrative officials are not permitted to act on mere whim, nor their own impluse, however well-intentioned they might be, but must follow due process in their official acts and in the promulgation of rules defining their operations." (Emphasis supplied).

The requirement of notice serves the important purpose of ensuring that interested parties will have an opportunity to comment on a proposed regulation affecting them. To be meaningful, comments must be made in light of a full disclosure by the agency of the facts upon which its determination rests. In United States v. Nova Scotia Food Products, 568 F.2d 240 (2d Cir. 1977), the court invalidated regulations issued by the Food and Drug Administration as a protection against botulism. Among a multiplicity of reasons cited by the court for its decision was the agency's reliance on facts that were not in the rulemaking record made available for comment to the affected company appellant. The reasoning of the court in this regard applies with equal force to the instant facts:

> "When the basis for a proposed rule is a scientific decision, the scientific material which is believed to support the rule should be exposed to the view of interested parties for their comment. One cannot ask for comment on a scientific paper without allowing the participants to read the paper. Scientific research is sometimes rejected for diverse inadequacies of methodology; and statistical results are sometimes rebutted because of a lack of adequate gathering technique or of supportable extrapolation. Such is the stuff of scientific debate. To suppress meaningful comment by failure to disclose the basic data relied upon is akin to rejecting comment altogether. For unless there is common ground, the comments are unlikely to be of a quality that might impress a careful agency. The inadequacy of comment in turn leads in the direction of arbitrary decision making."

Accord Portland Cement Association v. Ruckelshaus, 486 F.2d 375 (D.C. Cir. 1973) ("It is not consonant with the purpose of a rulemaking proceeding to promulgate rules on the basis of inadequate data or on data that, to a critical degree, is known only to the agency).

The court in Nova Scotia went on to note that an agency's failure to take into account relevant factors in making its decision would render that decision arbitrary or capricious and thus subject to challenge under the APA. Id. at 251 citing Hanly v. Mitchell, 460 F.2d 640, 648 (2d Cir.), cert. denied, 409 U.S. 990 (1972). And, the court concluded:

> "If the failure to notify interested persons of the scientific research upon which the agency was relying actually prevented the presentation of relevant comment, the agency may be held not to have considered all 'the relevant facts.'" 568 F.2d at 251.

The failure of an agency to create a record containing substantial evidence supporting the agency's rulemaking decision leaves the decision vulnerable to attack on substantive, as well as procedural, grounds. In this regard, the court in the Nova Scotia case, in overturning the agency's regulation, noted the inadequacy of facts in the rulemaking record to support the rule and the failure of the agency to sustain its burden of proof which required it to create a factual record substantiating the reliability of its methodology. Cf. P.A.M. New Corp. v. Hardin, 440 F.2d 255, 258 (D.C. Cir. 1971) ("Administrative agencies must give reasoned consideration to all the material facts and issues presented to them in the rulemaking proceeding and must articulate with reasonable clarity their reasons for decision"). In the case of Minnesota's formaldehyde statute, the Commissioner of Health's failure to include as part of the rulemaking record any factual support for its finding of a significant health problem presented by formaldehyde at levels typically prevalent in homes renders the administrative record constitutionally defective.

C. In promulgating the proposed Rule, the Commissioner failed to consider all relevant facts.

In United States v. Nova Scotia Food Products Corp., supra, the court indicated that the failure to consider all relevant factors, including both the technical feasibility and the economic impact of achieving a proposed standard, may render the agency's decision

arbitrary and capricious. In that case, the court faulted the agency for failing to make an articulate effort "to connect the scientific requirements to available technology that would make commercial survival possible." 568 F.2d at 251. The same criticism applies to the temporary Rule proposed by the Commissioner of Health. As presently drafted, the Rule requires overnight compliance with a standard of 0.5 ppm formaldehyde in newly constructed homes. For reasons discussed at pp. 36-38 of the Institute's July 30, 1980, Submission to the Commissioner of Health (the "Submission"), unless the proposed standard is phased in over a reasonable period of time, the result will be catastrophic disruption of the construction industry.

A further failure to consider technological feasibility is reflected in the test method mandated by the Commissioner of Health.[1/] Because the NIOSH ambient air test method requires skill and training to conduct, the Institute has stressed that those companies which do not have in-house industrial hygiene expertise should obtain the services of a certified industrial hygienist to direct their formaldehyde sampling program. Further, the Institute has recommended that companies which do not have in-house analytical

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1/ As revised following the comment period, the Rule proposed by the Commissioner of Health would permit the use of alternate test methods approved by the Commissioner. The allowance of such alternate analytical procedures may, in the long run, ease the testing burden. In the short run, however, until the Commissioner's approval can be obtained, manufacturers are necessarily forced to use the NIOSH ambient air method with its inherent problems of implementation.

chemistry expertise should have their samples analyzed by a laboratory certified by the American Board of Industrial Hygiene. (See discussion at pp. 26-27 of Institute Submission).

At present, it is the Institute's understanding that there are only two private laboratories in Minnesota equipped to do the necessary testing. Current information indicates that present testing capacity for the NIOSH test in Minnesota would not exceed 3,000 units per year. Considering that, in 1979 alone, more than 35,000 conventional and mobile homes were manufactured or sold in this State, it is clear that overnight implementation of an ambient air standard would have disastrous consequences for an entire industry. The total failure to consider the economic impact of the test method and standard proposed renders the Commissioner's decision arbitrary and capricious.

II. Constitutional Defects

A. The proposed Rule violates the equal protection and due process guarantees of the Minnesota and United States Constitutions.

In terms of the equal protection and substantive due process guarantees embodied in the Fourteenth Amendment to the United States Constitution, the test of whether a state has properly exercised its police power in the area of environmental health regulation is whether the state's action bears some rational

relationship to a legitimate governmental interest. New Orleans v. Duke, 427 U.S. 297 (1976). The same standard applies to the due process guarantee contained in Article I, Section 7 of the Minnesota Constitution.

Assuming arguendo, a rational basis for regulating formaldehyde at levels typically found in residential dwellings, there is no rational basis for singling out building materials and residential units for regulation, while ignoring the many products containing formaldehyde which are sold for use in such units. Within homes, at least the following sources of formaldehyde emissions have been identified:

(1) hardwood plywood paneling;
(2) particleboard flooring;
(3) particleboard cabinets;
(4) carpeting;
(5) draperies;
(6) furniture;
(7) gas cooking;
(8) gas heating;
(9) tobacco smoking;
(10) construction adhesives;
(11) air fresheners;
(12) personal deodorants; and
(13) insulation.

While it is possible to identify these sources of formaldehyde, the contribution from each has not been established. There is, accordingly, no rational basis for assuming that building materials are any more to blame for any adverse health effects which may result from exposure to formaldehyde than are other products typically found in homes.

In Clover Leaf Creamery Co. v. Minnesota, 289 N.W.2d 79 (Minn. 1979), the Minnesota Supreme Court overturned, on Fourteenth Amendment grounds, legislation banning the use of nonrefillable plastic containers but imposing no similar ban on nonrefillable paper containers. The Court examined the record and concluded that the Act bore no rational relationship to achievement of the State's legitimate interest in preserving the environment since "the evidence is conclusive that proper containers are not environmentally superior to plastic nonrefillables. 289 N.W.2d at 86. In the instant case, there is no evidence that building materials or residential units containing such materials present any greater health threat than other products containing formaldehyde which are commonly found in such units. Nor has the State demonstrated any "practical exigencies" justifying the scheme of classification reflected in the Statute. See, Fabio v. City of St. Paul, 267 Minn. 273, 126 N.W.2d 259 (1964). Therefore, both the Statute and the Rule must be found to offend the constitutional guarantees of equal protection.

B. To the extent they apply retroactively, both the Rule and the Statute violate due process and constitute a taking without just compensation.

Where its application results in a taking of, or interference with, vested property rights, retrospective legislation may be held invalid on due process grounds. Wichelman v. Messner,

250 Minn. 88, 83 N.W.2d 800 (1957); cf, Adams' Nursing Home of Williamstown, Inc. v. Mathews, 548 F.2d 1077, 1080 (1st Cir. 1977) ("Laws that unsettle settled rights can be harsh, and they deserve a special scrutiny. This principle has received explicit constitutional recognition in the taking and contract clauses.")

Whether an unconstitutional taking has occurred depends on whether the operation and effect of the statute in question, if applied retroactively, would produce such harshness or oppression as to offend notions of fairness and substantial justice. In this regard, one court has said:

> "Laws which attempt retroactively to create a liability in relation to a transaction as to which no liability previously had attached generally are so arbitrary, harsh and oppressive that it is perhaps accurate to say of them that they are presumptively invalid." Application of Bailey, 178 Misc. 1045, 37 N.Y.S.2d 275 (1942).

In the case of Minnesota's formaldehyde statute, both the private remedies portion of the Statute, Minn. Stat. § 325.991(4), and the proposed Rule, on their face, apply retroactively to create tort liability with respect to building materials and residential units manufactured and sold prior to the effective date of the statute. The Minnesota Supreme Court has suggested that it is doubtful whether the legislature, consistent with due process, can ever make an act a tort by means of retroactive legislation. Kettle River Quarries Co. v. City of East Grand Forks, 96 Minn.

290, 104 N.W. 1077, 1078 (1905). Aside from this opinion, however, there can be little question but that retroactive application of the Statute in this particular case would produce such a harsh result as to offend notions of fairness and substantial justice.

A central question in any retroactivity challenge is whether the challenger's conduct or the conduct of others in the class would have differed if the law had applied from the start. See, e.g., Chase Securities Corp. v. Donaldson, 325 U.S. 304, 316 (1944); Fairfax Nursing Ctr., Inc. v. Califano, 590 F.2d 1297, 1302 (4th Cir. 1979). In the instant case, it seems obvious that these manufacturers and builders who, in the past, have used materials containing urea formaldehyde would have acted differently had they known that, in using and selling such materials, they were subjecting themselves to tort liability. Indeed, the magnitude of the potential damage awards to which the Act exposes manufacturers and builders, in and of itself, establishes the harshness of any retroactive application of the Rule or Statute. Because of the harshness and oppression created by the Statute and the Rule as presently drafted, both should be set aside as offending the guarantees of due process embodied in the Fifth Amendment to the United States Constitution and Article I, § 13 of the Minnesota Constitution.

C. As presently drafted, both the Rule and the private remedy portion of the Statute are so vague and imprecise as to offend constitutional due process.

In relevant part, the private remedy portion of the Statute provides as follows:

> "Subd. 4. The manufacturer of a product or builder of a housing unit that contains materials made with urea formaldehyde shall pay the reasonable cost of repair or relocation if the consumer can document that the housing unit contains a significant ambient air level of formaldehyde and in addition has documented medical records of illness related to formaldehyde and a statement from a physician that the consumer must vacate the premises."

On its face, the Statute permits recovery of the cost of repair or relocation upon the production of three items:

(1) documentation of "significant ambient air levels" in the consumer's home;

(2) documented evidence of medical illness related to formaldehyde; and

(3) a statement of a physician that the consumer must vacate the premises.

Neither the Statute nor the proposed Rule contains explicit guidelines as to what constitutes a "significant ambient air level." Nor do they specify what kind of documentation of medical illness related to formaldehyde must be provided by the consumer, the level of proof necessary to entitle the consumer to recovery, or the causal nexus that is required between the medical illness and the level of formaldehyde in the consumer's home. Finally, on its face,

the Statute does not require that the physician's statement set forth any justification for the conclusion that the consumer must vacate the premises nor does it require that the physician consulted by the consumer be qualified to offer a professional opinion regarding the relationship between various symptoms and formaldehyde exposure.

It has long been recognized that the guarantee of due process embodied in the Fifth and Fourteenth Amendments to the United States Constitution requires that a statute be sufficiently clear and precise to enable men of common intelligence to know in advance what the Statute commands or forbids. See, e.g., Bouie v. City of Columbia, 378 U.S. 347 (1964); Goguen v. Smith, 471 F.2d 88 (2d Cir. 1972), aff'd, 415 U.S. 566 (1974); Heilman v. Levi, 391 F. Supp. 1106 (D. Wisc. 1975); Wichelman v. Messner, 250 Minn. 88, 83 N.W.2d 800 (1957). A law fails to meet the requirements of due process, not only if it is so vague and standardless that it leaves the public uncertain as to the conduct prohibited, but also if it leaves judges and jurors free to decide, without any fixed legal standards, what is prohibited and what is not in each particular case. Ricks v. District of Columbia, 414 F.2d 1097 (D.C. Cir. 1968).

In the context of the Statute here at issue, the absence of any guidelines as to the documentary or testimentary proof required to warrant consumer recovery of costs or damages

leaves manufacturers and builders totally in the dark as to their exposure to liability. Because the remedy portion of the Statute thus fails to give fair warning as to the circumstances which will trigger liability, it violates the notice aspect of due process and must be set aside as void for vagueness.

The same criticism of vagueness and ambiguity applies to the test procedures set forth in the Rule. In addition to temperature and humidity, air flow is a variable that may significantly influence the results of an ambient air test. The Rule as revised requires that testing be performed using "a normal ventilation rate" without specifying what "normal ventilation" is.[2/] In addition, the Rule fails to specify many of the parameters that must be defined if the NIOSH ambient air method, originally designed for use in an industrial setting, is to be adapted to a residential setting: At what elevation should measurements be made? At what location within the living space or room? How soon after the unit is manufactured should the measurement be made? Should a correction be made for the outside ambient air level of formaldehyde? Unless definitive answers are provided to these questions, two different tests of a single unit might produce widely divergent results.

[2/] Moreover, to the extent the Rule permits testing, and provides for liability, under conditions involving less than one air change per hour, it can be said to contradict, and be preempted by, express federal policy. See discussion in Section III, infra.

Because the Rule thus fails to allow manufacturers and retailers to predict with any degree of assurance their potential exposure to liability under the Statute, it offends the notice requirement of due process and must be set aside as contrary to both the Minnesota and the United States Constitutions.

III. Federal Preemption

Finally, serious consideration must be given to the possibility that any action by the Commissioner of Health is precluded by the Supremacy Clause, Art. VI, cl. 2 of the United States Constitution because Congress has preempted the field. As indicated in the Institute's Submission to the Commissioner of Health, no fewer than six federal agencies are currently addressing the subject of formaldehyde and indoor air quality. In particular, the Department of Housing and Urban Development (HUD) has assumed a predominant role in the regulation of all aspects of mobile home construction and safety, including indoor air quality. Acting pursuant to Section 7(d) of the Department of Housing and Urban Development Act, 42 U.S.C. § 3535(d), and Title VI of the Housing and Community Development Act of 1974, 42 U.S.C. § 5401, et seq., HUD has promulgated comprehensive mobile home standards (the "Standards"). See 24 C.F.R. § 3280.01, et seq. (1979). Section 3280.303 of the Standards sets forth general requirements for building materials used in the body and frame construction of mobile homes. Specific standards for wood and wood-based products,

including plywood and particleboard, are set forth in § 3280.304. Because the material specifications contained in the Standards are designated as minimum requirements, 24 C.F.R. § 3280.303(a), there is no explicit preclusion of stricter state standards. The pervasiveness of the HUD regulatory scheme, however, may be seen as implying a federal intent to preempt the regulatory field surrounding mobile home construction. See Northern States Power Co. v. Minnesota, 447 F.2d 1143, 1146-47 (8th Cir. 1971), aff'd 405 U.S. 1035 (1972). Beyond this, given the potential for chaos in a nationally-oriented industry, such as the mobile home industry, resulting from the need to meet 50 potentially different state standards, a strong policy argument can be made for state deference to the federal government.

Moreover, to the extent there is a problem caused by the emission of formaldehyde in mobile homes, the problem must be viewed, at least in part, as the direct result of a federal requirement that mobile homes be airtight to maximize the conservation of energy. Section 3280.501 et seq. of the Standards set forth requirements for thermal insulation, air filtration and heat loss. Specific heat loss/heat gain transmission coefficients are set out in § 3280.508. The tight construction of mobile homes mandated by the HUD Standards necessarily results in a very low air exchange rate which, in turn, results in the trapping of indoor air contaminants -- including free

formaldehyde -- in new mobile homes. HUD has recognized the problem and on July 25, 1979, initiated an investigation of air quality in mobile homes. Recently, a second HUD contract has been awarded for research concerning the measurement of formaldehyde levels in mobile homes (see Exhibits N and O to the Institute's Submission). Given the direct relationship between heightened occupant awareness of indoor air pollutants and the airtight construction of mobile homes mandated by the federal government, it may make sense for the states to defer to the federal government in resolving the inevitable conflict between airtightness and air quality.

At the very least, the states should not act so as to place themselves at cross-points with federal indoor air quality policy. In this regard, the Department of Energy (DOE) and the Environment Protection Agency (EPA) have recently agreed, in conjunction with the residential energy conservation program administered by DOE, that to preserve a healthy indoor air quality, residential housing must be constructed so as to permit at least one air change per hour. (See Exhibit P to the Institute's Submission.) In light of this federal policy, any standard for regulating formaldehyde emission levels in homes in this state should contain a similar requirement of at least one air change per hour. To the extent the proposed Rule fails to incorporate an air change requirement, it can be seen as contravening express federal policy and, under the Supremacy Clause, must be deemed preempted.

IV. Conclusion

For all of the reasons stated, the Rule proposed by the Commissioner of Health, as well as the underlying Statute, are procedurally and substantively flawed. In light of these deficiencies, and consistent with the guidelines promulgated by the Attorney General as Minn. Reg. Atty. Gen. 305(b), 1 MCAR § 1.305(b), the Formaldehyde Institute urges that the proposed Rule be disapproved.

Very truly yours,

FAEGRE & BENSON

By _____
Gordon G. Busdicker

_____
Jerry W. Snider

_____
Elizabeth L. Taylor

On behalf of the Formaldehyde Institute.

CC: Jerry Anderson, Esq.

he proportion of defective items from schedule *i*.

The concepts and the approach outlined above can e considered as a first step toward formulating a rocedure for evaluating the quality of dried wood roducts in an objective fashion. In the present state f the art of pencil slat drying, quality evaluation is arried out in a subjective fashion. Under these onditions it is possible that independent quality ssessments obtained by equally prestigious drying xperts may be conflicting with one another. For nstance, one evaluator may say "this batch of wood, ried according to schedule *i*, is better than that one, ried according to schedule *j*." On the other hand, nother evaluator may independently reach exactly he opposite conclusion. Therefore, until an objective nd generally acceptable method to evaluate quality in rying is established, the problem of efficient drying annot be formulated without a degree of ambiguity.

A statistical approach for appraising final product quality by comparing eight different drying schedules was demonstrated in this study. The results suggest the feasibility of using statistical inference in defining an overall quality parameter to be used in quantitative efficiency comparisons of alternative drying schedules. A measure of pairwise relative efficiency of differing kiln schedules takes into account both drying cost and final product quality.

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Degradation Phenomena in Urea-Formaldehyde Resin-Bonded Particleboard

P. Robitschek

R. L. Christensen

Abstract

Hydrolytic phenomena in degradation of particleboard resulting from effects of moisture, temperature, and catalysts were studied. Particular emphasis was given to in-plant degradation problems resulting during manufacture, storage, and exposure of particleboards. The data can be used to minimize degradation problems.

UREA-FORMALDEHYDE RESINS degrade by hydrolysis (1,3,4,6,7,8,9). Under severe conditions, the products of hydrolysis are urea and formaldehyde, and both components can be recovered quantitatively (5). The hydrolytic reaction requires the presence of water and is accelerated by heat and acids.

In a urea resin solution or suspension, the hydrolysis is a reversible reaction. Thus the addition of urea to a urea-formaldehyde resin results in incorporation of the urea by molecular rearrangement, with chain scission being the probable mechanism.

Formaldehyde liberation from particleboard is caused by hydrolysis of the resin. It was found, as would be expected with hydrolysis, that increasing moisture and temperature accelerates formaldehyde liberation (2).

It can be reasonably assumed that, aside from liberation of formaldehyde, hydrolysis will also lead to reduced mechanical properties of particleboards. The following experiments were performed to study this effect. Samples of commercial particleboards were stored at various temperatures, various moisture contents (MCs), and for various lengths of time to determine the effect of hydrolysis on internal bond (IB). The specimens were held at MCs of 2, 7, and 12 percent; at temperatures of 160°F, 190°F, 221°F, and 267°F; and for times of 8 hours, 1, 2, 5, and 10 days. The results are shown in Figures 1 to 3. It is possible that part of the loss of strength may have been the result of movement of wood particles resulting in bond

The authors are, respectively, President and Senior Wood Chemist, Chembond Corp., Springfield, Oreg. This paper was received for publication in January 1976.

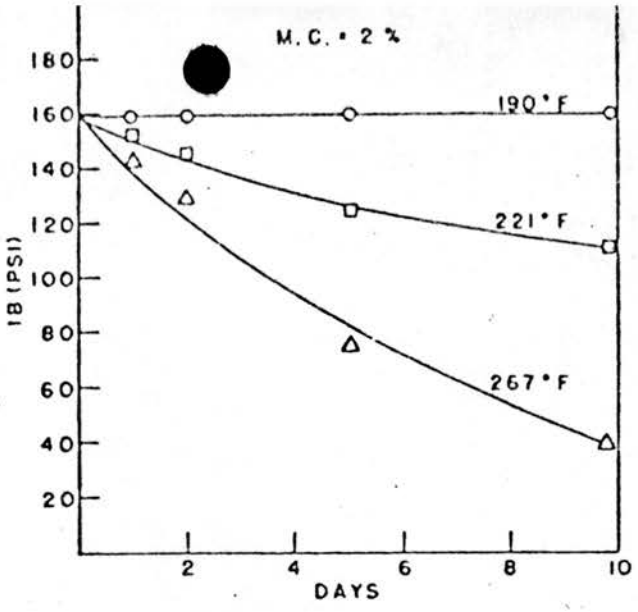

Figure 1 — Effect of temperature on IB degradation, 2 percent MC.

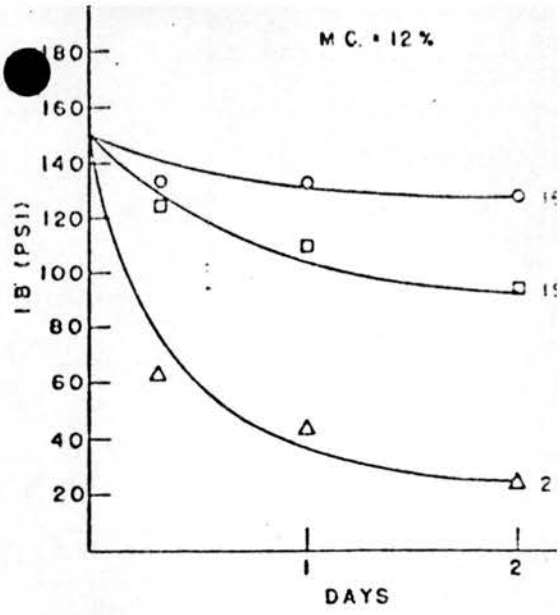

Figure 3 — Effect of temperature on IB degradation, 12 perc

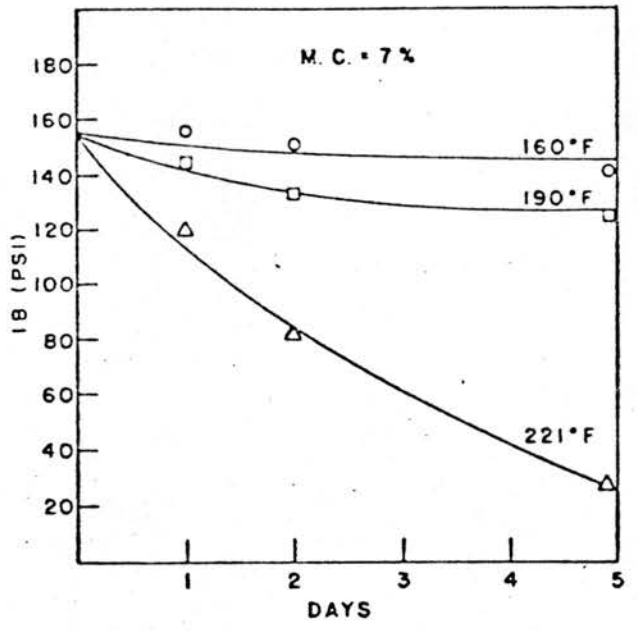

Figure 2. — Effect of temperature on IB degradation, 7 percent MC.

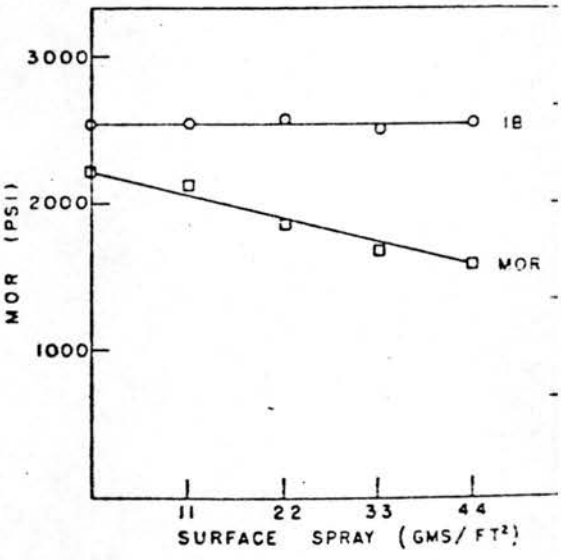

Figure 4. — Effect of surface spray on board pro

breakage (3,4). However, this is probably a minor effect.

Hydrolytic degradation of particleboard can take place during its manufacturing, during its storage, and during its use.

Degradation During Pressing

During pressing of particleboard, two simultaneous reactions take place. Part of the free formaldehyde in the resin enters into further polymerization or crosslinking reaction and part is expelled during pressing. The part expelled is reported to be about 1/5 to 1/10 of the total free fo in the resin. The following equation is re literature (10):

$$U_F = 0.044A + 0.538B + 0.794C - 11.6 \pm 0.$$

where

U_F = expelled formaldehyde in mg/g of dr
A = temperature of pressing in °C
B = MC based on dry material
C = % free formaldehyde in the resin

Hydrolysis of the resin also takes pl pressing, though to a lesser degree, excep MC is very high, or the temperature is ver the press cycle is very long. This is illustr literature with work by Peterson, Reuther,

n (8,9) where they show the increase of emitted lehyde with increasing mat MC, with in- g temperature and with increasing press time. lustrative of this effect are the following two nents. In the first, moisture was added to the the form of surface spray. The level of spray was substantially higher than is used in board plants. Figure 4 shows that with ing mat spray, modulus of rupture (MOR)

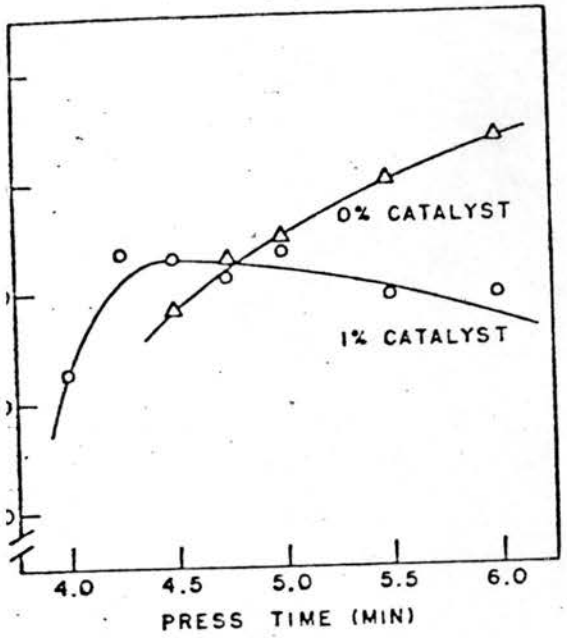

Figure 5. — Effect of acidic catalyst on IB degradation.

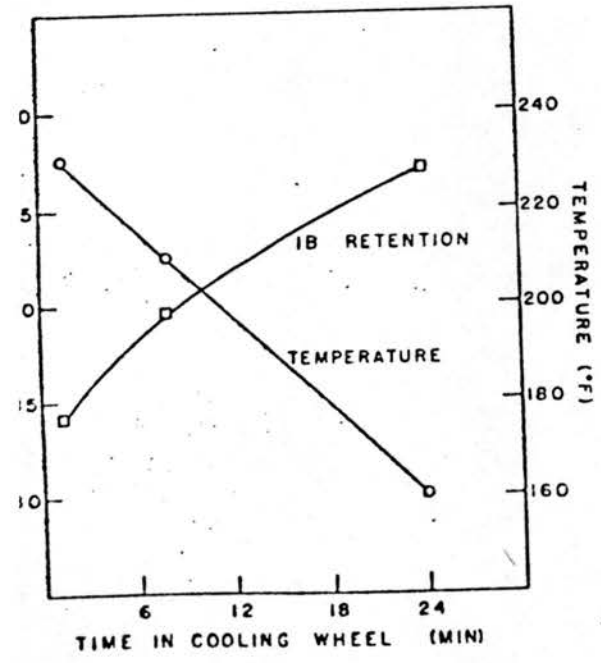

Figure 6. — Effect of cooling time on IB and temperature.

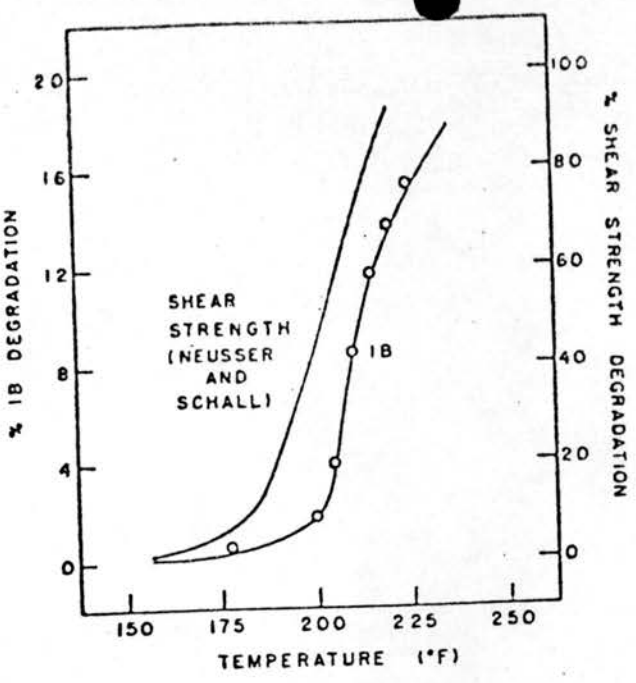

Figure 7. — Effect of temperature on degradation.

decreased due to hydrolysis. Since the moisture was concentrated on the surface, IB held constant. It was verified, by extending press times, that the MOR drop was not the result of undercure at the high moisture levels, and must be attributed to hydrolysis.

In the other experiment, particleboards were made using resin with and without acidic catalyst (ammonium sulfate). Figure 5 relates the effect of press time on IB with no catalyst and with 1 percent catalyst (based on total weight of liquid resin). The lower IBs at long press cycles are consistent with the known effect of acidic catalysts on hydrolysis.

Degradation During Storage

The degradative process continues after removal of the boards from the press. The extent of degradation is dependent on the temperature and moisture in the boards (see Figs. 1 to 3). Experiments were conducted in a particleboard plant to determine the effect of storage (hot stacking) on the degradation of IB. Thermocouple wires were imbedded in the particleboard mat before pressing so that temperatures could be measured at various times after the board was out of the press. Of particular interest was the effect that the time in the board cooler (cooling wheel) had on the temperature of the boards going into the hot stack. Figure 6 shows the effect that the time in the cooling wheel has on board temperature and also on the percent IB retention (% IB of the board prior to hot stacking). The effect of temperature on degradation is shown in Figure 7. Also plotted for comparison is a curve of Neusser & Schall (6), which is data on urea-formaldehyde-bonded veneer joints. These data show that above about 200°F, even slight variation in temperature caused substantial changes in degradation.

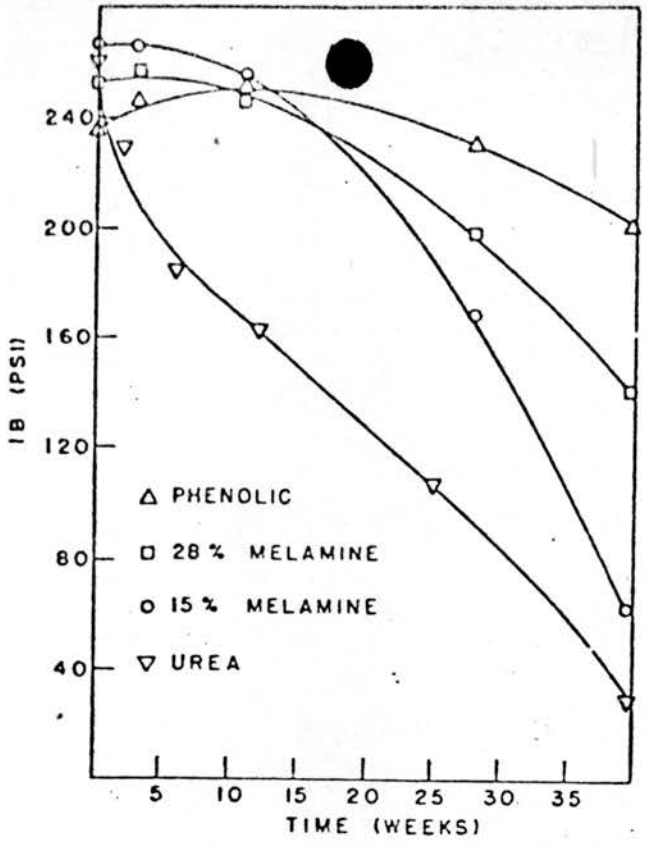

Figure 8. — Effect of resin composition on IB degradation.

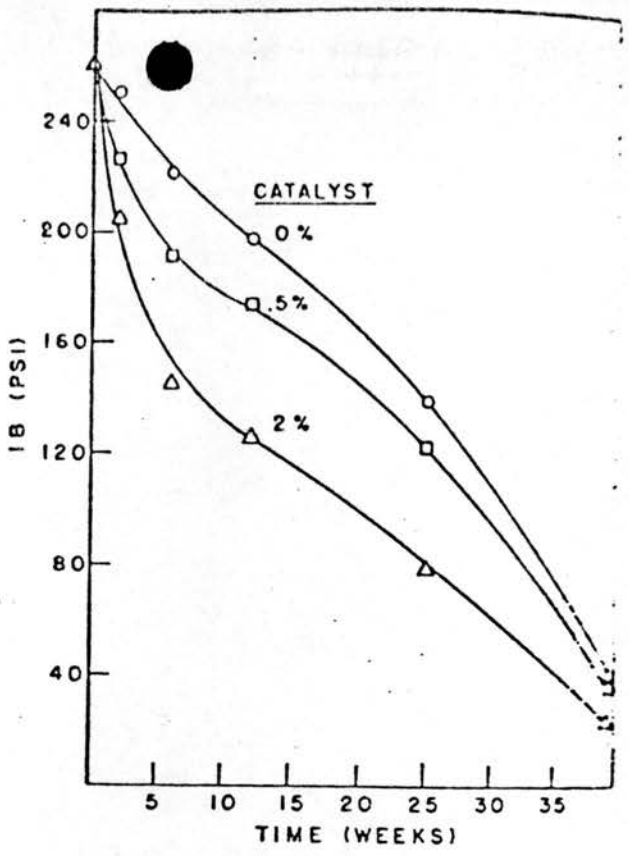

Figure 9. — Effect of catalyst (ammonium sulfate) on IB degradation

Degradation in Use

Under normal conditions of use, degradation of boards is extremely slow. To simulate drastically adverse conditions, particleboards were aged at 150°F and 70 percent relative humidity (RH) for up to 40 weeks. Figure 8 shows the drop in IB under the above conditions. For comparison, data obtained from boards made with phenol-formaldehyde resin and melamine-urea-formaldehyde resin are also plotted. These resins are known to be resistant to hydrolysis so their slowed rate of degradation was anticipated.

The effect of acidic catalyst on degradation during use was also studied at 150°F and 70 percent RH. Figure 9 shows that increasing ammonium sulfate increased the rate of degradation, even though after 40 weeks the IBs ended up approximately the same.

Summary

Hydrolytic polymer breakdown is the cause of formaldehyde split-off and decrease in mechanical properties of urea-formaldehyde resin bonded particleboards. The common factors accelerating the breakdown have been shown to be high MC, high temperatures, time, and acid catalysts, in approximately that order of importance. Control of these factors (and such is possible by evaluating pressing, stacking, and resin catalyzation operations) should lead to improvements in MOR and IB properties of the boards.

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Accelerated Aging Of Glue-Wood Bonds

G. E. TROUGHTON

ABSTRACT. The half lives calculated for acid-hydrolysis reactions at a given temperature for formaldehyde glue-wood samples provided a convenient index for estimating bond durability, ranking glues in good agreement with their service lives. The acid-hydrolysis reactions of four formaldehyde glues — urea formaldehyde, melamine-urea formaldehyde, melamine formaldehyde and phenol formaldehyde — and glue-wood samples were measured over the temperature range 50° to 100°C. The kinetic results indicated that covalent bonding takes place between the formaldehyde glues and wood.

IT IS HIGHLY DESIRABLE for both users and manufacturers of adhesive-bond wood products to have available accelerated tests to predict the service lives of these products. If the degradation of a glue-wood bond is treated as various chemical reactions, then the measurement of these reactions can provide a quantitative basis for the durability of the glue-wood bond (1,2). The rate constants can be used as indices of durability for the glue-wood bonds in question. In this investigation, mild acid conditions were used to accelerate the hydrolysis of glue-wood bonds. A good correlation between the acid-hydrolysis rate constants and bond service lives was found for four formaldehyde glues — urea formaldehyde, melamine-urea formaldehyde, melamine formaldehyde and phenol formaldehyde.

By studying both the glues and glue-wood samples, along with a wood control for each, any chemical interaction between the glue and wood can be determined, since the reaction rate constant is dependent upon the type of chemical bond being broken during the acid hydrolysis.

Experimental

Each of the glues was mixed according to the manufacturer's formulation. All glues then were mixed with extractive-free Douglas-fir [*Pseudotsuga menziesii* (Mirb.) Franco] wood powder. Melamine formaldehyde was also mixed with lignin, cellulose, and cellulose triacetate powder. The above mixtures were cured for 40 minutes at 120°C. The cured samples were then ground to powder to pass a 40-mesh screen in a Wiley mill.

A colorimetric method of determining total formaldehyde concentration (3) was adopted in this investigation with the following modification (4): 0.05 gm. of stannous chloride was mixed with 25 ml. of 4 wt. percent chromotropic acid, centrifuged and filtered with Whatman No. 1 filter paper. The prepared chromotropic acid was then ready for use and was stored no longer than 48 hours.

A formaldehyde-glue sample of 0.400 gm. or a formaldehyde glue-wood sample equivalent to 0.400 gm. of formaldehyde glue, was added to a 400 ml. solution of 0.2 N H_2SO_4 and heated at constant temperatures over the temperature range 50° to 100°C. Two ml. aliquots of the solution were removed at various intervals during the resulting degrada-

The author is on the staff of the Forest Products Laboratory, Forestry Branch, Dept. of Fisheries and Forestry, Vancouver, B. C., Canada. Acknowledgment is due Miss C. Hortie and G. Rosenberg for their technical assistance in this investigation, and to E. Hartz of Monsanto Canada Ltd. for supplying the formaldehyde glue used in the study. This paper was received for publication in June 1968.



Figure 1. — Acid-hydrolysis r
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Results and Dis

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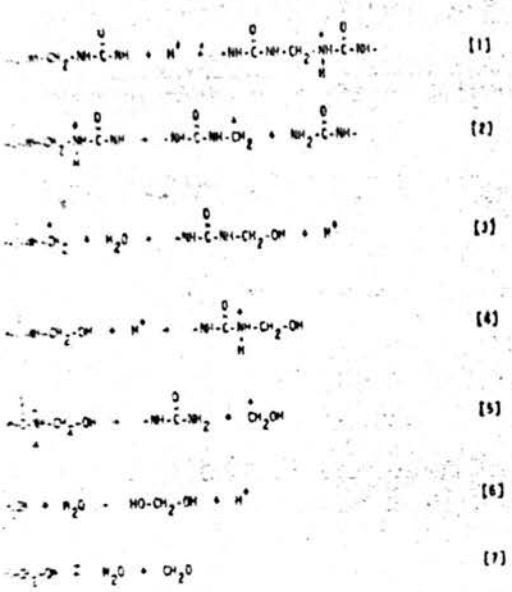


Figure 1. — Acid-hydrolysis mechanism for urea-formaldehyde glue.

...ion process for color development and fil-...ered with Whatman No. 1 filter paper. Titra-...ions using standardized NaOH were done in ...duplicate on the above samples at various ...times during the acid hydrolysis to measure ...the hydrogen ion concentration.

Results and Discussion

...In a previous paper (5), the acid-hydrolysis ...reactions of melamine-formaldehyde glue and ...melamine-formaldehyde glue-wood samples ...were described. The acid-hydrolysis reactions ...of three more formaldehyde glues — urea-...formaldehyde, melamine-urea formaldehyde ...and phenol formaldehyde—are now discussed. ...The reaction rate for the phenol-formaldehyde ...system was too slow to be measured. The re-...actions for urea formaldehyde and melamine-...urea formaldehyde followed the same mech-...anism as melamine formaldehyde and are ...illustrated in Figure 1 for urea-formaldehyde.

First-order kinetics were observed for the urea-formaldehyde, melamine-urea formalde-hyde and melamine-formaldehyde systems and a typical first-order plot for urea-formal-dehyde is shown in Figure 2. In the diagram, A_I represents the formaldehyde concentration at infinite time and A_T represents formalde-hyde concentration at any time during the reaction. The acid-hydrolysis rate constant, k, was calculated by multiplying the slope of this line by 2.303. It is seen from Table 1 that the reaction rates for the above glues vary greatly. Titrations done at 10-minute intervals during the acid-hydrolysis reactions of the above glues indicated that the hydrogen-ion concentration did not change during the course of the reactions as would be expected from the acid-hydrolysis mechanism of Figure 1, since reaction (6) of this mechanism shows that the hydrogen ions are regenerated. The acid-hydrolysis reactions were followed by measuring the formaldehyde liberated in re-action (7).

A typical Arrhenius plot of $2 + \log k$ (acid-hydrolysis rate constant) versus 10^3/Temper-ature (°K) is shown in Figure 3 for the urea-formaldehyde glue-wood system. The activa-tion energy in Kcal/mole is equal to 4.575 times the slope of this line and the value given by the intercept at 10^3/Temperature (°K) = 0 is equal to the pre-exponential factor. The activation energies and pre-exponential factors were calculated in a similar manner for the other systems and are shown in Table 1.

Control experiments performed at 100°C. in 400 ml. of 0.2N H_2SO_4 using Douglas-fir pow-

Table 1. — KINETIC PARAMETERS FOR ACID HY-DROLYSIS REACTIONS.

Adhesive System	E Kcal/mole	log A (sec.$^{-1}$)	Reaction rate 10 k at 80°C (min.$^{-1}$)
Melamine-formaldehyde glue	27	12.1	2.7
Melamine-formaldehyde glue-cellulose triacetate	28	12.2	2.7
Melamine-formaldehyde glue-wood	21	11.2	5.4
Melamine-formaldehyde glue-cellulose	20	11.0	5.2
Melamine-formaldehyde glue-lignin	20	11.0	5.2
Melamine-urea formaldehyde glue	21	9.1	13.3
Melamine-urea formaldehyde glue-wood	19	8.4	24.6
Urea-formaldehyde glue	16	7.7	115.0
Urea-formaldehyde glue-wood	17	7.2	80.0

where: E = activation energy
A = pre-exponential factor
k = acid-hydrolysis rate constant.

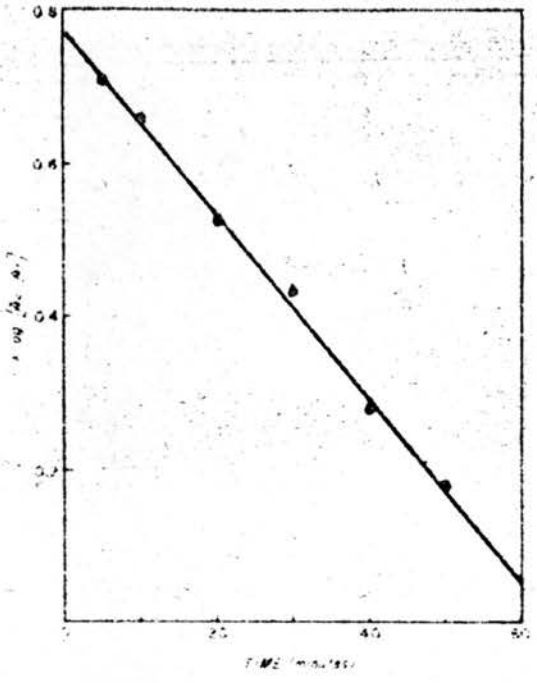


Figure 2. — A first-order plot for urea-formaldehyde glue in 0.2N H_2SO_4 at 52° C.

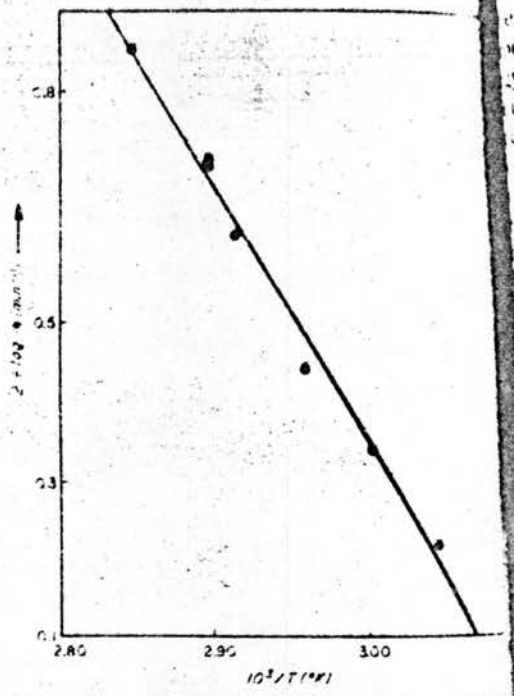
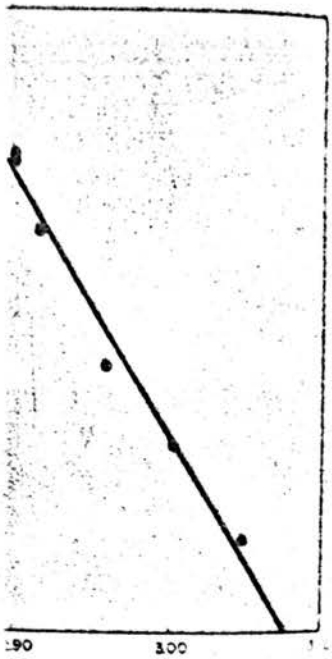


Figure 3. — Arrhenius plot for urea-formaldehyde glue-wood in 0.2N H_2SO_4.

der alone, as well as for lignin, cellulose, and cellulose-triacetate powder, showed no liberation of formaldehyde during 2 hours of refluxing. Control experiments were also performed to show that the product, formaldehyde, did not react significantly with wood, cellulose, lignin, or cellulose triacetate during the acid hydrolysis. Wood, lignin, cellulose, and cellulose triacetate were refluxed separately at 100° C. in 400 ml. of 0.2N H_2SO_4 containing a known amount of formaldehyde. The formaldehyde concentration was measured at various intervals during the acid hydrolysis and did not change after 1 hour, thereby establishing the fact that formaldehyde did not react significantly with wood, lignin, cellulose, or cellulose triacetate under the experimental conditions used in this study. As shown in Table 1, the reaction rate for the melamine-formaldehyde glue-wood system was twice as fast as the melamine-formaldehyde glue system. From this, it is inferred that a concurrent reaction is taking place in the melamine-formaldehyde glue-wood system. The acid-hydrolysis rate constants for the melamine-formaldehyde glue-lignin and melamine-formaldehyde glue-cellulose systems shown in Table 1 are similar to that for the melamine-formaldehyde glue-wood system, suggesting that both lignin and cellulose reacted with melamine-formaldehyde glue during its cure to produce a covalent bond. The activation energy (Table 1) calculated for each of the latter three systems is about 7 Kcal/mole less than that calculated for the melamine-formaldehyde glue system and this would account for their greater reactivity towards acid hydrolysis.

The reaction rate for the urea-formaldehyde glue-wood system is slower than the urea-formaldehyde glue system (Table 1). This reversal in trend is explained in terms of the different reactivities of the bonds being hydrolyzed. The activation energy measured for the acid hydrolysis of the products formed in reactions [8] and [9] can be extrapolated by subtracting the acid hydrolysis rate constant for melamine-formaldehyde glue from the acid hydrolysis rate constant for melamine-formaldehyde glue-wood and plotting the log



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mperature (°K). Similarly, the activation
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le which is slightly higher than the activa-
n energy measured for urea-formaldehyde
e, 16 Kcal/mole, and significantly lower
n the melamine-formaldehyde glue system,
Kcal/mole.

During the cure of the melamine-formalde-
de glue-wood mixture, an oxymethylene
nd could be formed by a condensation re-
tion between the hydroxyl group in either
nin or cellulose and the methylol group in
e melamine-formaldehyde glue. These prob-
le condensation reactions are shown in
zure 4.

The products produced in reactions [8] and
could then undergo acid-hydrolysis reac-
ns similar to reactions [1] to [7] and would
count for the difference in reaction rates be-
een the melamine-formaldehyde glue and
elamine-formaldehyde glue-wood systems.

When cellulose triacetate, a polymer resem-
ing cellulose except that all its hydroxyl
oups are replaced by acetate groups, was
ixed with melamine-formaldehyde glue and
ured, the same reaction rate at 80°C. and
milar Arrhenius parameters were found as
r melamine-formaldehyde glue alone (Ta-
le 1). This indicated that this polymer did not interact with the melamine-formaldehyde glue during its cure, the expected result on the basis of reaction [8].

Various forces, such as Van der Waals, hydrogen bonding and covalent bonding have been postulated to account for adhesive-bond strengths, and these forces will vary depending upon the type of glue and substrate (6,7,8). The experimental results found in this study (Table 1) suggest that covalent bonding is taking place between the formaldehyde glues and wood. Recently, Schwenker and his colleague (9) established that covalent bonding takes place between trimethylol melamine and cellulose.

Although studies of rates of hydrolysis of cured glues (10) have been useful in providing knowledge of bond degradation because of the chemical interaction between the glue and wood, it is better to use glue-wood samples rather than glue samples alone for estimating the durability of the particular glue-wood bond. The half life of the acid-hydrolysis reaction for a glue-wood sample provides a convenient index for measuring the glue-wood durability. In Table 2, the four wood glues studied in this investigation are ranked in terms of their half lives calculated at 80°C. in descending order of durability towards acid-hydrolysis.

The above ranking is in agreement with the service lives of these glues (1). The acid-

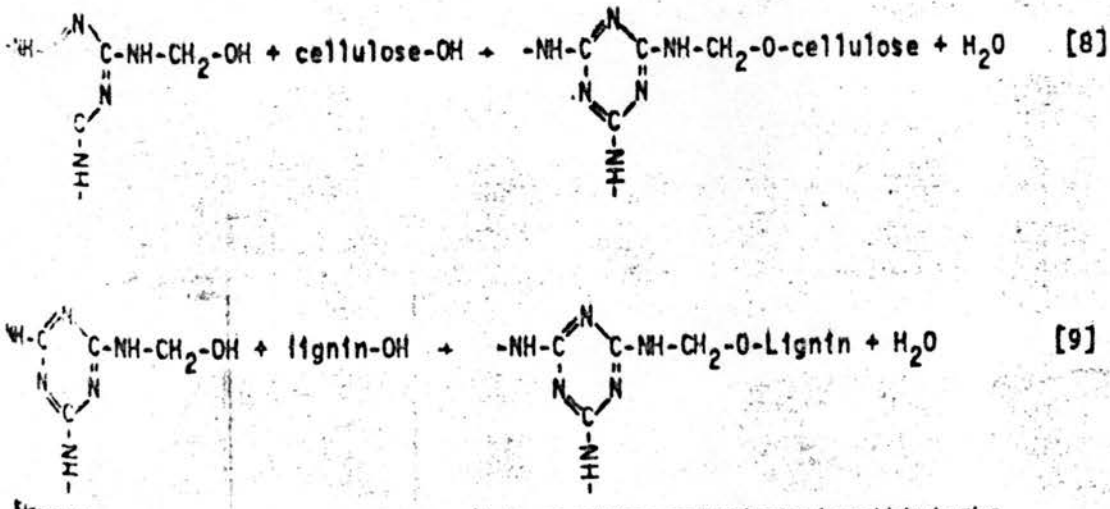

Figure 4. — Condensation reactions between lignin or cellulose and melamine-formaldehyde glue.

OPPENHEIMER, WOLFF, FOSTER, SHEPARD AND DONNELLY

ATTORNEYS AT LAW

WILLIAM H. OPPENHEIMER (1975)
BENNO F. WOLFF
WOOD R. FOSTER
GORDON SHEPARD
JAMES R. OPPENHEIMER
DAVID C. DONNELLY
RICHARD G. LAREAU
JOHN D. HEALY, JR.
LEON R. GOODRICH
ELMER B. TROUSDALE
LAWRENCE PERLMAN
LEHAN J. RYAN
STEVEN J. OLSON
LEO J. HARRIS
WILLIAM F. ARCHERD
HARRIS RAVINE
ROBERT L. BULLARD
MICHAEL BERENS
JOHN H. WOLF
THOMAS P. KANE
CRAIG W. GAGNON
DAVID F. McELROY, JR.
RONALD C. MICKELBERG
ERIC R. MILLER
JEAN RUSSOTTO*
RICHARD M. BISANZ
WAYNE G. FARIS
JOHN P. SCHMIDTKE
WILLIAM P. STUDER
CHARLES M. LEVENBERG
STEVEN C. NELSON
EDWARD J. HAYWARD*
DANIEL R. PENNIE
KIMBALL J. DEVOY
RICHARD J. MOEN
ROBERT R. REINHART, JR.
PAUL R. HANNAH
THEODORE J. MEYER
DOUGLAS L. HEMER
KEITH E. GOODWIN

1700 FIRST NATIONAL BANK BUILDING
SAINT PAUL, MINNESOTA 55101
TELEPHONE: (612) 227-7271
TELEX: 29-7015

4824 IDS CENTER
MINNEAPOLIS, MINNESOTA 55402
TELEPHONE: (612) 332-6451
TELEX: 29-0138

29 SQUARE de MEEUS
1040 BRUSSELS, BELGIUM
TELEPHONE 511-19 92
TELEX: 62236

LEE R. MITAU
BRADLEY G. CLARY
JAMES F. PEDERSEN
MARK P. WINE
MARK C. PETERSON
KRISTEEN L. HULSEBUS
RITA A. BURNS
DENNIS P. WHELPLEY
GARY M. NELSON
MARK S. OLSON
T. MITCHELL WILLEY
EDWARD M. LAINE
ANTON J. CLAESSENS*
MICHAEL J. BLECK
CHARLES H. MEYER
DONALD W. SELZER, JR.
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KENNETH M. VESLEDAHL
PIERCE A. McNALLY
CHRISTOPHER M. SCOTT
CAROL A. ELLINGSON

STAN D. DONNELLY
ERIC OSTERWEIL*
JAMES H. LEVY
OF COUNSEL

*NOT A MEMBER OF THE MINNESOTA BAR

August 5, 1980

HAND DELIVER

Mr. Jerry Anderson
Special Assistant Attorney General
G-25
State Administration Building
50 Sherburne Avenue
St. Paul, Minnesota 55155

RECEIVED
AUG 5 1980
ATTORNEY GENERAL
ADMINISTRATIVE AGENCIES

Re: Proposed Temporary Rule 7 MCAR §1.234

Dear Mr. Anderson:

This letter is intended to bring to your attention a serious potential problem relating to Proposed Temporary Rule 7 MCAR §1.234.

Proposed Temporary Rule 7 MCAR §1.234 entitled "Formaldehyde levels in residential units", as prepared by the Minnesota Department of Health, Environmental Health Division ("Department") was first published in the State Register on Monday, June 23, 1980. The comment period on the proposed temporary rule expired on Wednesday, July 31, 1980. It is not known at this time whether the Department has submitted this proposed temporary rule along with any proposed modifications to the Attorney General.

On behalf of our client, Blandin Wood Products Company of Grand Rapids, Minnesota, we submit to you our position that Proposed Temporary Rule 7 MCAR §1.234, as published on June 23, 1980, clearly exceeds the authority granted by the Minnesota legislature to the

Commissioner of Health. Specifically, Chapter 594, Section 1 of Laws 1980 grants to the Commissioner the authority to promulgate rules "pursuant to Chapter 15, including emergency rules, establishing standards governing the sale of building materials and housing units that contain products made with urea formaldehyde." (emphasis added).

Proposed Temporary Rule 7 MCAR §1.234 states: "Any newly-constructed residential unit which is sold, rented or leased after the effective date of this rule, shall not contain more than 0.50 parts of formaldehyde per million parts of ambient air." The proposed temporary rule, as drafted, does not limit its scope to only urea formaldehyde, as intended and specified by the legislature, but appears to cover other types of formaldehyde, including phenol formaldehyde as well. The Commissioner has clearly exceeded his statutory authority in proposing a rule with this scope of coverage.

I am enclosing a letter dated July 29, 1980 to Ms. Pauline Bouchard at the Department from Mr. John Licke, General Counsel for Blandin Wood Products Company ("Blandin") which sets forth the background of phenol formaldehyde usage by Blandin and the legislative history relating to Chapter 594 of Laws 1980. It should be noted that there are no studies which demonstrate that the use of phenol formaldehyde resins in manufacturing waferboard panels to be harmful.

It is our position that any temporary or permanent proposed rule promulgated pursuant to Section 1 of Chapter 594, Laws 1980 should be restricted to urea formaldehyde only.

By bringing this specific matter to your attention, we are not commenting on any other aspect of the proposed temporary rule at this time and reserve the right to do so at a later time.

Should you have any questions, do not hesitate to contact me.

Very truly yours,

OPPENHEIMER, WOLFF, FOSTER, SHEPARD AND DONNELLY

By- Mark S. Olson
Mark S. Olson

MSO:sr

cc: Ms. Pauline Bouchard
W. John Licke, Esq.

BLANDEX

BWP

Blandin Wood Products Company
P.O. Box N Grand Rapids, Minnesota 55744 (218) 326-9666

July 29, 1980

Ms. Pauline Bouchard
Division of Environmental Health
Minnesota Department of Health
717 Delaware Street SE
Minneapolis, Minnesota 55440

RE: Comment regarding Proposed Temporary Rule 7 MCAR § 1.234 "formaldehyde levels in residential units."

Dear Ms. Bouchard:

We thank you for affording us the opportunity to submit our comments regarding Proposed Temporary Rule 7 MCAR § 1.234 entitled "Formaldehyde levels in residential units", part A of which states: "Any newly-constructed residential unit which is sold, rented or leased after the effective date of this rule, shall not contain more than 0.50 parts of formaldehyde per million parts of ambient air."

In this comment we would like to set forth our position that if Proposed Temporary Rule 7 MCAR § 1.234 is adopted, the Commissioner would exceed the authority granted to the Commissioner by the Minnesota Legislature and therefore we request the Commissioner to restrict the rule making to urea formaldehyde in accordance with the language of Laws 1980, Chapter 594.

A. Background

The Blandin Wood Products Company of Grand Rapids, Minnesota, is a Minnesota corporation engaged in the manufacture of waferboard panels, a building material which is bonded with phenol formaldehyde resins. Waferboard panels are produced by combining phenol formaldehyde resin and wax with aspen wood wafers and bonding the mixture under heat and pressure to form a stable, cured bond throughout the waferboard panel.

Waferboard panels bonded with phenol formaldehyde resins do not pose a health threat to people; there are no studies which show the use of phenol formaldehyde resins in manufacturing waferboard panels to be harmful. The use of phenol formaldehyde resins virtually eliminates the fuming or "off-gassing" phenomenon associated with urea formaldehyde resins. In contrast to such decomposition, the formaldehyde release from waferboard panels bonded with phenol formaldehyde resin is inconsequential, occurs over a shorter time period, and comes from residual formaldehyde in the manufacturing process--not from the panel bond per se which is essentially cured and stabilized in the manufacturing process.

B. Legislative Intent

Formaldehyde bills introduced in the Minnesota Legislature covered formaldehyde in general. However, in response to hearing evidence and evidence discovered during their own independent investigation, both houses amended the pending bills to focus strictly on urea formaldehyde. By amending these bills the Minnesota Legislature expressed a legislative intent to exclude building materials made with phenol formaldehyde resins from the scope of the legislation. This intent is expressed in Laws 1980, Chapter 594, § 1 which states:

> "Section 1. (144.704) (FORMALDEHYDE RULES.) Within 30 days after the effective date of this section the commissioner of health shall determine if a significant health problem is presented by the use of building materials that emit formaldehyde gases. If he determines that such a problem exists he shall promulgate rules pursuant to chapter 15, including emergency rules, establishing standards governing the sale of building materials and housing units that contain products made with urea formaldehyde." (emphasis added)

Accordingly, in passing Minnesota Laws 1980, Chapter 594, the Minnesota Legislature recognized the fact that waferboard panels which are potentially capable of a very limited formaldehyde release do not constitute a health threat.

C. Conclusion

Although we share the Commissioner's concern that formaldehyde fumes may cause irritation to some individuals, we feel that in adopting Proposed Temporary Rule 7 MCAR § 1.234 the Commissioner would exceed the authority granted by the Minnesota Legislature. The Proposed Temporary Rule may be interpreted to apply to the sale of building materials and housing units that contain products made with phenol formaldehyde resins where the statute expressly limits the Commissioner to rule making with respect to building materials and housing units that contain products made with urea formaldehyde.

We hope the Commissioner will recognize the beneficial application of formaldehyde compounds, especially the virtually fume-free application of phenol formaldehyde resins in the manufacture of waferboard panels by an industry on the verge of major expansion in this state. By making the Proposed Temporary Rule too broad, the Commissioner may needlessly affect the ability of our industry to develop or to continue the manufacture of a building material which does not pose a health threat to anyone. If Proposed Temporary Rule 7 MCAR § 1.234 is adopted, the Commissioner would exceed the authority granted to the Commissioner by the Minnesota Legislature and we therefore request the Commissioner to restrict rule making to urea formaldehyde in accordance with the statute.

We respectfully submit these comments relating to the lack of authority of the Commissioner to adopt rules relating to phenol formaldehyde. We do not wish to comment on any other aspect of the rules at this time and will reserve any further comments with respect to the rules until a later time.

Thank you again for the opportunity to be heard on this point of concern to us.

Sincerely,

BLANDIN WOOD PRODUCTS COMPANY
LEGAL DEPARTMENT

W. John Licke
General Counsel

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