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FOREST PRODUCTS LABORATORY
MADISON, WISCONSIN

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**TREATING SPRUCE AND BALSAM FIR CHRISTMAS TREES
TO REDUCE FIRE HAZARD**

After investigating a number of methods considered to have possibilities for making Christmas trees less flammable, the U. S. Forest Products Laboratory has concluded that keeping the tree standing in water is about the most practical, satisfactory, and convenient method of those tried for reducing the fire hazard and preventing the needles from discoloring or falling. Additional protection against fire can be provided by the use of fire-retardant coatings in conjunction with the water treatment if the retention of the natural color of the foliage is unimportant.

RECOMMENDED TREATMENT

The procedure recommended for the water treatment is as follows:

1. Obtain a tree that has been cut as recently as possible.
2. Cut off the end of the trunk diagonally at least 1 inch above the original cut end. Stand the tree at once in a container of water and keep the water level above the cut surface during the entire time that the tree is in the house. If the tree is not to be set up for several days, it should be kept standing in water meanwhile in a cool place.

If started in time, this treatment not only will prevent the needles from drying out and becoming flammable, but it will also keep them fresh and green. It will, in addition, retard the fall of needles of such species as spruce, which loses needles very easily, in

contrast to balsam fir, which retains its needles even after the branches have become dry and the needles brittle. Freshly cut spruce or balsam fir trees standing in water cannot be set on fire by candle or match fires, but, of course, will not withstand a large source of heat.

(Product

Ingredients

DECORATIVE COATINGS

Several types of fire-retardant coatings that either prevent or greatly retard flame spread when applied to wood will provide similar protection when applied to Christmas trees.

Sodium alginate
Monoammonium phosphate
China clay
Water

For those willing to undertake the extra trouble and expense in the use of decorative coatings, the following simple formulations are suggested:

Formula III can be prepared in the following manner: Heat approximately 180° F. a uniform gel is formed. Monoammonium phosphate, heating chemical has dissolved. Stir until it is

Formula I

(Produces a shiny transparent colorless coating)

<u>Ingredient</u>	<u>Parts by volume</u>
Sodium silicate (water glass)	9
Water, containing a wetting agent, such as Dreft, Vel, or Breeze, (about 1 teaspoon per quart)	1

In application be kept in mind order to reduce retardant to be the amount desired. It will only reduce the thickness are even more either by dipping thin Formula I applications are

Formula II

(Produces a cream-colored coating. May be tinted with suitable dyes.)

Silver effluents paint on trees

<u>Ingredient</u>	<u>Parts by weight</u>
Sodium silicate (water glass)	31
China clay	41
Water, containing wetting agent (about 1 teaspoon per quart)	28

If a coating water treatment is used in addition to the treatment against fire. Furthermore, the treatment improves the appearance of the formulas I and II and does not shrink and

Formula III

(Produces a frosty white coating. May be tinted with suitable dyes.)

<u>Ingredient</u>	<u>Parts by weight</u>
Sodium alginate	1.0
Monoammonium phosphate	25.0
China clay	4.0
Water	70.0

Formula III can be prepared most readily in the following manner: Heat the required amount of water to approximately 180° F., add the sodium alginate, and stir until a uniform gel is obtained. Then add the monoammonium phosphate, heating gently and stirring occasionally until the chemical has dissolved. Finally, add the china clay and stir until it is uniformly distributed throughout the gel.

In applying any of the foregoing coatings, it must be kept in mind that a heavy coating is necessary in order to reduce the fire hazard. The amount of fire-retardant to be applied depends on the amount of protection desired. One coat of these formulations will greatly reduce the tendency for flames to spread; two coats are even more effective. The coatings may be applied either by dipping or by spraying. It may be necessary to thin Formula I for spray application, in which event more applications are necessary.

Silver effects can be had by spraying an aluminum paint on trees coated with either formula II or III.

If a coating is applied, it is recommended that the water treatment also be used to insure the added protection against fire that the moisture in the tree provides. Furthermore, experiments have shown that the water treatment improves the adherence of brittle coatings, such as formulas I and II, because the moisture-filled needles do not shrink and thus allow brittle coatings to flake off.

FIRE-RETARDANT CHEMICAL SOLUTIONS

Experiments at the Forest Products Laboratory have shown that the introduction of several fire-retarding chemicals into spruce resulted in one or more of the following: needle discoloration, needle fall, increased combustibility. The increase in flammability was due to the fact that chemical solutions were taken up by the tree neither so rapidly nor in such large amounts as water and trees actually lost weight while being treated with chemical solutions. Thus, while the trees were taking up some fire-retardant chemical, they were losing another excellent fire retardant, water.

As a specific example, ammonium sulfate caused serious discoloration of both spruce and balsam fir needles. Spruce needles started to fall 2 days after treatment and by 5 days were falling freely. (Reports that have come to the Forest Products Laboratory from those who have used the ammonium sulfate treatment have revealed similar experiences). Both spruce and balsam fir treated with ammonium sulfate were more flammable than water-treated specimens. The spruce was more flammable than the balsam.

Although the experiments with materials of known fire retarding possibilities failed to disclose a chemical superior to water, they do not prove that such treatment is impossible. Until some other treatment is proven to be substantially superior, water or the combination of water and coating, if used under the conditions here recommended, will serve well.

EXTRA FIRE PRECAUTIONS

In addition to these treatments, all possible precautions against fire should be in effect around the Christmas tree, including the elimination of defective electrical connections, and avoidance of the accumulation of combustible decorations on or beneath the tree; the tree should be placed so that its accidental burning would not ignite curtains or other combustible furnishings nor trap the occupants of a room or building.