

BORON DIFFUSION TREATMENT FOR INTERIOR BUILDING TIMBERS

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1. Introduction

As a building material, timber has a number of valuable properties as well as several shortcomings. One of the shortcomings is the non-durability of timber. Some timbers are said to be naturally durable; yet even with these it is necessary to recognise the conditions under which the term will apply because the time during which timbers remain sound depends on environment more than on the species. Durability refers to the resistance of timber to decay by termites or fungi. Other types of deterioration are staining, weathering, mechanical wear, charring etc.

A number of timber species are not accepted for construction and other purposes, due to the lack of durability. Application of modern preservation methods can overcome this disadvantage and hence non-durable species can be rendered durable by appropriate treatment. Selecting the proper treatment method is just as important as selecting an effective preservative for a particular service condition.

It is very important to note that timber treated by diffusion process with Boron compounds can only be used for *indoor work* and cannot be used in ground contact or in places where timber is likely to get wet.

2. Advantages of the Process

- (a) It is simple to operate and cheap.
- (b) It does not involve a high level of technical knowledge.
- (c) It is not hazardous to operators.
- (d) It is applicable to most of the species and all sizes.
- (e) It can be used at saw mills of any size.
- (f) The treated timber can be cut and machined without exposing untreated wood.
- (g) The treated timber is not harmful or poisonous to human beings and animals.
- (h) The treated timber can be painted, polished and glued.

3. Diffusion Process

In this process, green timber is immersed in the preservative solution, and then kept block stacked, the duration depending on the thickness of the timber. The strength of the preservative solution is adjusted according to the thickness of the timber being treated. After immersion, the timber is allowed to drain for a short time to permit excess solution to run back to the treatment vessel. The timber is then block stacked and stored under cover so as to permit diffusion of the preservative through the cross-section of the timber. The

duration for total diffusion depends upon the thickness of the timber. At the end of the diffusion period timber is sampled and tested for penetration of the preservative.

It is very important that all timber is green when treated.

4. Preservative Chemical

For this treatment a mixture of Borax and Boric acid in certain proportions is utilised. These proportions are adjusted to give an approximate neutral solution. A fungicide such as Sodium Pentachlorophenate is incorporated in the solution to inhibit mould growth on the timber.

Boron compounds are toxic to all the major wood destroying insects and fungi.

The recommended proportion for the chemicals are—

Either (a)	Borax	1.14 parts
	Boric Acid	1.00 part
Or (b)	Neobor	1.18 parts
	Boric Acid	1.00 part

(Borax—Sodium Borate with 10 molecules of water of hydration).

(Neobor—Sodium Borate with 5 molecules of water of hydration).

Solution strengths are expressed as Boric Acid Equivalent (B.A.E.). In calculating solution strengths from Assay or by hydrometer, it is assumed that all Boron is present as Boric Acid and the results are expressed as weight of Boric Acid per 100 gallons of solution.

Ten (10) lbs. of sodium pentachlorophenate per 100 gallons of solution are sufficient to prevent mould growth. Should stain or mould appear in large scale operations the amount of sodium pentachlorophenate can be progressively increased to 20 lbs. per gallon of solution.

5. Equipment Required

Dip tank with cover, weighing scale, thermometer, hydrometer and jar, rubber or plastic gloves.

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Dip tank should be sufficiently large so as to permit immersion of the largest pieces of timber to be treated.

Heating facilities must be provided to raise the preservative solution to the required temperature. This can be either by open fire or by steam through a coil.

6. Basic Solution Strengths

Recommended basic solution strengths and the operating temperatures for each thickness of timber are given below:—

Thickness of Timber	Solution concentration weight/volume Boric Acid equivalent %	Minimum operating temperature °F
1 "	25	115
1½ "	30	125
2 "	35	130
3 "	45	135

7. Procedure

Timber for treatment must be sawn from logs which have been felled not more than seven (7) days. After sawing, the timber should be kept in block stock and treated within 48 hours of being cut. It is important that any sawdust adhering to the wood is removed by brush or scraper. The timber is then lifted board by board and immersed completely in the solution (of correct strength and temperature). Time for immersion is the minimum time necessary to completely immerse each

piece. The time should be maintained the same for each piece. After immersion, the piece of timber should be removed from the solution and held over the solution to permit excess solution to run off.

The concentration of the treating liquid should be determined by analysis or from its specific gravity. The specific gravity of the solution may be determined with a standardised hydrometer corrected for temperature.

Just after treatment, treated timber should be block stacked. The bottom of the stack should be 2 in. off the ground and all boards stacked uniformly so that there is as small as possible a portion of the surface of any piece of timber not covered by other boards. Immediately after stacking is completed the stacks should be covered to prevent air circulation, during the diffusion period. Recommended diffusion periods are as follows:—

Thickness of Timber	Minimum diffusion period
1 "	4 weeks
1½ "	6 weeks
2 "	8 weeks
3 "	16 weeks at least

Before removal from diffusion storage the samples of timber should be spot-tested.

Note: It is very important that checking for correct solution uptake is necessary when starting treatment of a new species.