Wood Preservation and Protection

What is Preservation?

"Preservation can be defined as anything which is done to extend the useful life of timber and timber products"

Why do we Preserve Timber?

- To reduce or retard the effects of:
  1. Weathering (Erosion and discolouration)
  2. Exposure to sunlight
  3. Moisture Movement
  4. Fire

- To reduce or eliminate the risk of:
  1. Fungal Attack
  2. Insect Attack

Weathering

- The weathering effect of wind, rain and sunlight will gradually degrade the surface of unprotected timber by breaking down the surface
- Water Penetration of non-durable wood is the greatest problem (dimensional change and fungal attack)
- Sunlight causes change of colour and contributes to degradation

How do Preservatives work?

- Preservatives can protect the timber in two ways:
  1. Give physical protection by stopping weather, fungi and insects getting at the wood (Paint)

  2. Give chemical protection, making the wood poisonous to insects and fungi

Types of Preservatives

PAINT AND VARNISHES

Paint and Varnishes

- Exterior quality paints and varnishes can protect timber from
  - The entry of water
  - Abrasive Particles (grit and dirt)
  - Solar Radiation (discolouration)

Paint and Varnishes

Correctly painted surfaces should give relatively good protection for up to five years, provided that:

- The timber is thoroughly dry before paint is applied
- The surfaces have been prepared correctly, the recommended number of coats are given
- The end grain has received particular attention with regard to coverage
- Inspections are carried out regularly

Types of Preservatives

WATER-REPELLENT EXTERIOR STAINS

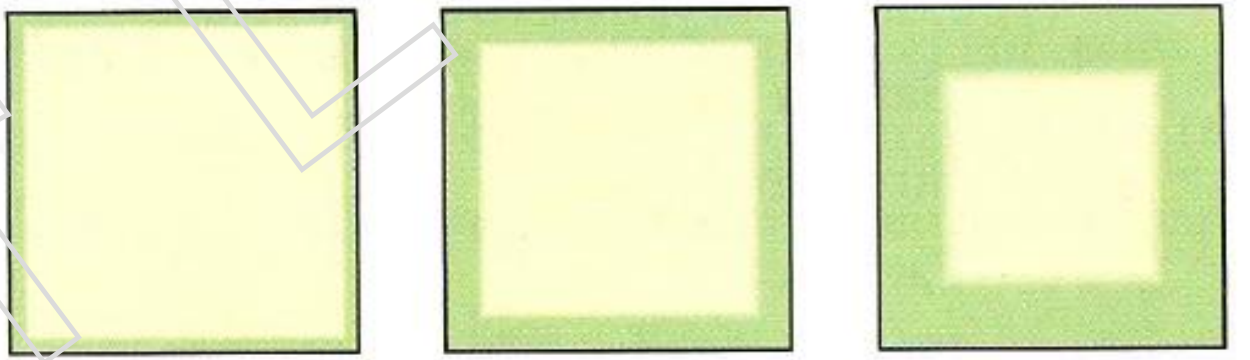
Water-Repellent Exterior Stains

- Exterior stains provide a clear or coloured, matt or semi-gloss, water-repellent surface which allows the wood grain to show through
- Stains protect against weathering and can also protect for up to four years against fungal staining
- Stains allow wood to breath, thereby allowing trapped moisture to escape

Jigsaw Activity

- Tar Oil Preservatives
- Water-Bourne Preservatives
- Organic- Solvent Preservatives

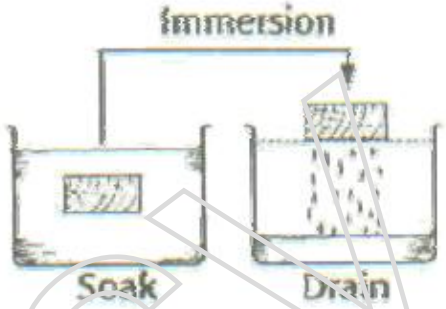
METHODS OF APPLICATION



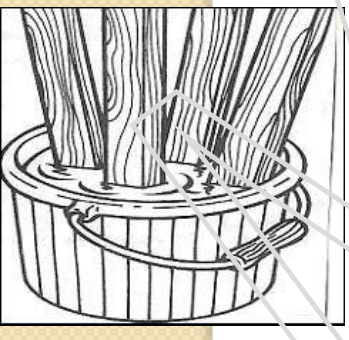
Brushing and Spraying

- Preservatives can be applied using a brush or a spray gun
- This method is the easiest to use and not too costly
- The preservative, however, does not penetrate deep into the wood and the treatment needs to be repeated regularly to keep the wood protected

Immersion

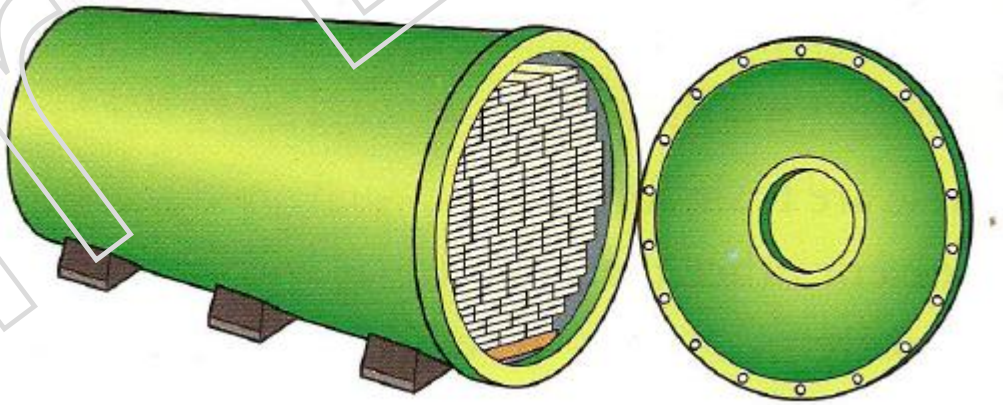


- The wood is placed into a container of preservative
- The wood soaks up the preservative quite quickly
- The immersion process penetrates better than brushing
- Often the ends of fence posts are treated in this way for a couple of day before they are placed in the ground



Pressure Treatment

- The most effective method of applying preservative is by forcing the preservative into the wood under pressure.
- This pressure can come from inside (vacuum) or outside (pressure)



Tar Oil Preservatives

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Tar oil preservative

Creosote is perhaps the most important of these preservatives and has been used since the 1830s. It is used for the pressure treatment of telegraph poles. Creosote is made from a mixture of 160 different chemicals. It is distilled from coal tar. Tar oil preservatives can be applied by brushing, spraying, dipping or pressure treatment. They are only suitable for outdoor use.

Telegraph poles have to be treated with tar oil preservative to ensure long life

- **Advantages:**
  - Cheap and plentiful
  - Highly toxic to insects and fungi
  - Penetrate the timber well
  - Permanent, as they cannot be easily washed out of the wood (leaching).
- **Disadvantages:**
  - Strong smell
  - Toxic to plants
  - Cannot be painted over unless well weathered
  - Not suitable for indoor use.

Tar-oil preservatives

- Derived from coal tar, and are ideal for preserving exterior work which is not to be painted.
- They do not usually have any corrosive effect on metals, but they will stain most porous materials they contact.
- The most common form is creosote, which is light to dark brown in colour, and can be applied by various processes including brushing and spraying. It has a strong odour for some time after its application.

The most common is creosote, derived from coal or wood tar. It contains tar acids such as phenols to kill fungi, and also 'heavy' oils that protect against moisture and sun damage. The solutions are black and staining and the penetration of the wood is limited. A low-toxicity alternative, pigmented emulsified creosote (PEC) or Cleansote, has been developed.

Creosote is the most effective and long lasting wood preservative of all. However it has downsides:

- Smelly, almost stinky
- Filthy
- Permanently stains clothes, carpets, paving etc
- Toxic
- The fumes from application kill most plants within a radius of many feet.
- Smell & plant deaths can lead to neighbour disputes
- Now banned for home use.
- May be legally applied by professionals
- Available from trade outlets, but not DIY sheds

Water-Borne Preservatives

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WATER-BORNE PRESERVATIVES

These preservatives are made from different toxic salts which are carried by water into the wood.

When the water dries out, the toxic salts remain. Chemicals such as copper chrome arsenates (CCA) and borates are used as preservative salts. These are particularly good for protecting softwoods in damp conditions. Water-borne preservatives are usually pressure impregnated, although they can be applied by other methods.

- **Advantages:**
  - Timber is clean after treatment
  - No bleeding (such as occurs with oil in hot weather)
  - Generally colourless
  - Timber can be painted after treatment
  - Do not pose a fire hazard and can be combined with fire-retarding chemicals
  - Are usually odourless and so can be used indoors.
- **Disadvantages:**
  - Many types can be washed out of the wood
  - Timber needs to be dried out by kiln or air seasoning after treatment
  - Can cause distortion and swelling due to the water
  - Do not protect against weathering effects.

Water-borne preservatives

- Use of water to convey the toxic chemicals.
- There are three types:
  - For treating unseasoned timber where the preservative is introduced into the wood by a method known as "diffusion".
  - Types requiring a pressure treatment system.
  - Special formulations to allow for in situ and remedial application by non pressure methods.
- These preservatives are non-flammable.
- Drying is always necessary after treatment.
- When dry, treated timber can be painted over.

Water is the most common solvent carrier in preservative formulations due to its availability and low cost. Water-borne systems do however have the drawback that they swell timber, leading to increased twisting, splitting and checking than alternatives.

- Water based preservatives have become popular due to lower cost per gallon. However this is only part of the story.
- Water based preservatives have a very short life, and typically need recoating every year. This means an annual travel to the diy store, money spent, and time spent recoating the woodwork.
- They are also not as effective as spirit based products, and will not effectively prevent rot in wood constantly exposed to water, such as fence post bottoms and earth retaining woodwork (eg bed edging, raised beds, compost containers).

Organic Solvent Preservatives

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SOLVENT-BASED PRESERVATIVES

These are toxic substances which are dissolved in a solvent other than in water. Usually this is an oil solvent, which is easily evaporated, for example white spirit. After treatment the solvent evaporates, leaving the preservative in the wood. This type of preservative penetrates the wood well because of the light oil solvent.

- **Advantages:**
  - Resistant to leaching and suitable for indoor and outdoor use
  - Can be painted over after the solvent has evaporated
  - Usually do not stain or creep
  - Not corrosive to metals
  - Better penetration, so are more suitable for brush and spray application.
- **Disadvantages:**
  - Can be a fire hazard
  - Can have a strong odour
  - More expensive than other types.

- Spirit based preservatives last multiple years from a single coating. This makes spirit based preservatives a much lower cost option than water based, even though the cost per gallon is higher.
- This also makes spirit preservatives the more energy efficient option. Although the per gallon energy input is higher, many less gallons are used, due to less frequent application.
- Less transport & human travel is also needed, further reducing energy consumption.
- The reduced frequency of painting also means much less human time & energy input.

Organic-solvent preservatives

- Use a medium of organic solvents to transmit the toxic chemicals into the wood.
- After application, the solvents evaporate, leaving the wood toxic to insects and/or fungi.
- Methods of application include:
  - Low pressure processes
  - Brushing
  - Spraying
  - Immersion
- Solvents used are generally volatile and flammable.
- These preservatives do not affect the dimension of timber or have a corrosive effect on metals.
- The ability to glue or paint timber is unaltered after treatment once the preservative has dried.