ITC-SA TIMBER CONSTRUCTION CONFERENCE –
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Timber Preservation, Regulations and Standards

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South African Wood Preservers Association
Purpose and Content

• Part 1 Timber degradation – Why treated timber
  • Types of degradation
  • Reasons for degradation
  • Prevention of degradation
  • Understanding timber durability

• Part 2 Timber preservation – What is treated timber
  • Differentiate between primary and secondary
  • Differentiate between preservation and surface protection
  • Methods used to treat timber
  • Types of preservatives
  • Choosing the correct treated timber suited to end application
  • Regulatory framework
Part 1 - Timber degradation

• Two biological degradation agents of main concern is fungal decay or (rot) and insect attack (wood borers and termites)
• Both require suitable conditions and food source to exist and for attack or degradation to occur

  • Favourable conditions – climate and habitat
    • temperature,
    • moisture,
    • In some cases elevation, i.e. height above sea level
  • Suitable and sufficient source of food/nutrients
    • Sapwood/ heartwood
    • Level of food/nutrients contained in wood
    • natural durability of wood – lower the better
Fungal decay or wood rot

- Moisture in excess of 20-25% in the wood, at frequent/prolonged periods, in presence of low light (dark) and with sufficient oxygen levels.

- Rot can be prevented by ensuring low moisture levels kept below required minimum. Can be achieved through:
  - Correct design and construction
    - Limit moisture traps (lap joints), ensure good run-off
    - Closed environments – ensure no leaks / proper moisture barriers
    - Sufficient air flow
  - Frequent and ongoing maintenance (include application of water repellent penetrating wood sealer – film forming varnish not recommended).

- Proper design, construction, and ongoing maintenance unfortunately don’t always go hand in hand – in most cases one or more fall short of expectation

- SOLUTION - Use Preservative Treated Timber, treated to the correct Hazard Class with a suitable preservative for the end application - Insurance against onset of possible fungal decay.
Wood destroying insects

- Two groups: Wood borers (wood worm) and Termites
- Wood borers: Life cycle – adult beetle lays its eggs in porous area of wood, e.g. cracks and end grain > larvae hatch and feed on wood > pupal stage > adult beetle hatches and makes flight holes, meet up and pair, female beetle lay eggs – Seasonal activity, during spring and summer
- Wood borers of main economic concern for timber structures:

  - *Hylotrupes bajulus*
    - European house borer/Italian beetle
  - *lyctus brunneus*
    - Powder post beetle
Wood borers.....

- **Hylotrupes bajulus - European house borer/Italian beetle**
  - Attacks all softwood species (coniferous species, pine, spruce, fir’s)
  - Favours mostly abundant sapwood but will also attack heartwood to certain extent
  - Found in South African coastal belt - proclaimed areas SANS 10005

- **Lyctus brunneus - Powder post beetle**
  - Attacks the sapwood portion of hardwood species – abundant sugars and starch
  - Highest at risk are hardwood poles and high sapwood containing sawn/processed timbers
  - Threat of *lyctus* in all areas and regions of South Africa, coastal and inland
Termites

- Two wood destroying types, i.e. Subterranean termites and dry-wood termites

Subterranean termites

*cryptoterms brevis*
West Indian dry wood termite
Termites..........  

• Subterranean termites – Lives in colonies under ground  
  • Sources wood from through network of tunnels and covered access points  
  • Many different species, active mostly in the inland areas of South Africa with small pockets found in coastal areas  
  • Will cause major destruction to untreated timber if left unnoticed and untreated  
  • Most common choice of prevention is soil treatment or physical barriers in or above foundations – Soil treatment has limited effective life and requires re-application  
  • Most common corrective action is pest control  

• Dry-wood termites (cryptotermes brevis)  
  • Infests and lives inside the timber under attack  
  • Causes major destruction in timber that’s infested  
  • Found along coastal regions of Southern Africa, but most destruction in warmer coastal areas from Pongola to Port Edward, with smaller pockets in other region.  

• Solution – Termites don’t attack or feed on preservative treated timber treated to the correct H class
Durability and why timber is treated

- Wood consists of **Cellulose, hemicellulose, lignin, starches sugars**, and **extracts such as oils, acids, tannins, resins**, etc.

- Some of **these** are essential food sources for wood destroying agents such as fungi and insects.

- **Extracts** can give wood varying resistance to attack, i.e. natural durability, depending on concentration and content.

- Natural durability of wood species range from non- > low- > moderately- > durable, > highly durable, e.g. dense tropical hardwoods.

- Commercially grown plantation species, e.g. SA Pine and Eucalyptus (grandis/saligna/gum) have little or very limited natural durability.

- Must be pressure treated to increase its durability when used in exposed/risk areas.
**SAPWOOD:**
In most wood species this section is the permeable and treatable zone
- Consists of “live” wood responsible for conveying nutrients and water from the roots to the rest of the tree
- Non durable, younger newest growth

**HEARTWOOD:**
Impermeable and untreated Zone
- Consists of “deadwood” containing wood extracts and deposits which clog up the pores
- More durable, older growth

**NOT ALWAYS DISTINGUISHELABLE**
Treatable Zone - Sapwood & Heartwood ratio

**Radiata Pine vs Gum**

- **Radiata Pine**
  - Heartwood
  - Sapwood

- **Gum**
  - Heartwood
  - Sapwood
Part 2 - Preservative treatment

• What is treated timber
  • Differentiate between primary and secondary surface application
  • Process used to treat timber
  • Types of preservatives
  • Choosing the correct treated timber suited to end application
  • Regulatory framework
What is Primary Wood Preservation

• Pre-treatment - applied before the timber is used

An industrial process whereby permeable wood is impregnated (pressure) with a chemical wood preservative (containing biocides) to give it long-term durability and resistance to biological attack i.e. against fungal decay and/or wood destroying insects (wood borers and termites).

• If selected and applied correctly it will ensure at least 20 to 25 years + life expectancy
What is Primary Wood Preservation

• It’s not done to “kill” fungus and wood destroying insects, but to prevent it from happening - “its Wood preservation not Pest Control”

• It’s not a DIY brush or spray on treatment – industrial impregnation process - pre treatment of timber prior to use in structures

• It’s not supplementary or remedial preservation, i.e. not done after timber is used in structure

• It’s not a sealer or a varnish used as a finish or protective layer against weathering, i.e. UV, precipitation, temperature fluctuations etc. (although oil based type preservatives such as creosote does have weathering characteristics
How is it done – Impregnation Processes

• Pressure Processes
  o High Pressure processes – Class W & Creosote
    ▪ **Full Cell Process** - Sawn Pine and Gum poles
    ▪ Empty Cell Process – Creosote treated Pine poles
  o Low pressure processes and double vacuum process
    o LOSP type preservatives

• Hot and cold open tank process – Creosote (primitive technology but still effective)

• Diffusion processes - Boron
  o Dip diffusion - Green timber
  o Pressure diffusion – Seasoned timber
High pressure full-cell process
High pressure full-cell process
High pressure full-cell process
Industrial Wood Preservatives - Types

- 3 Main Classes/Categories:
  - Class W preservatives
    Water borne
  - Class C Preservatives
    Oil Borne
  - Class O preservatives
    Light Organic Solvent borne
Class W Preservatives

- CCA – Copper chrome arsenic: H2 to H5
- CuAz - Copper Azole (Tan-E): H2 to H5
- ACQ - Alkaline Copper Quaternary: H2 to H5
- Boron/borates: H2 (can be used in H3 conditions provided its sealed and maintained with a water repellent, penetrating, exterior wood sealer)
Class C Preservatives – Creosote (coal-tar)

H3 to H5
Class O Preservatives - LOSP

- Tributyltin naphthenate-permethrin (TBTN-P)
- Azole permethrin (ZP)
- Solvent carrier – allow to evaporate before using in closed environment, e.g. Pine flooring, interior cladding, etc.
- H2 only (can be used in H3 conditions provided its sealed and maintained with a water repellent, penetrating, exterior wood sealer)
Choosing the Correct Treated Timber

Classification System

• SANS Standards specify an international adapted Hazard Class (H Class) system that categorises treated timber into different end use applications based on:
  o **Exposure conditions**
  o **Potential, and level of biological risk**
  o **Minimum required threshold preservative retentions/uptake**
  o **Minimum required penetration requirements**
H class 2 – Dry interior above ground

- Typical end uses are for roof trusses and timber frame wall construction, interior doors and joinery

- Protection against insect attack

- Low risk category
H Class 3 – Exterior above ground

- Typical end uses are exposed decking, exterior wall cladding, outdoor furniture, exposed structural beams, fencing rails etc.

- Not in direct ground contact

- Protection against fungal attack and insect attack

- Moderate risk category
H Class 4 – Ground Contact

• Typical uses include normal in ground poles/posts used in light structures, fencing, landscaping and garden features etc.

• Protection against fungal decay and insect attack

• High risk category
H Class 5 – Fresh water and heavy wet soil

- In direct contact with fresh water/ heavy wet soils
- Sub-structure of bridges/walkways over water, retaining walls, agricultural poles/posts used in regular irrigated/fertilised soils, piling and foundation poles for permanent structures
- Protects against fungal decay and insect attack
- Very high risk category
H Class 6 – Marine waters

- In “direct” contact with marine waters, e.g. jetties, quays, marine walkways substructure, retaining walls, barriers etc.
- Protects against fungal decay and marine borers
- Very high risk category
NRCS - NATIONAL REGULATOR FOR COMPULSORY SPECIFICATIONS

- With the advent of new Consumer Protection Act, DTI mandated the NRCS to introduce and administer a compulsory specification
  - VC 9092 was published in Oct 2009
- VC 9092 requires NRCS approval for all producers and importers of treated timber to South Africa.
- All treatment plants must be SABS or SATAS certified
- All treated timber shall be treated in accordance with SANS 10005 and certified and marked in accordance applicable SANS product standard
SANS 10400-Part A: 2010 – Application of the National Building Regulations – General principles and requirements

- **Regulation A13(1)b:** All timber used in the erection of a building **shall be treated** against termite and wood borer attack and **fungal decay** in accordance with the requirements of SANS 10005 and **shall bear** the product certification mark of a body **certified** by the South African National Accreditation System.

- To fully understand the intent of VC 9092 and A13(a)b one must consult and understand SANS 10005
BOTH REFER TO SAME SANS STANDARD, AND TO THIRD PARTY PRODUCT CERTIFICATION

SANS 10005

SABS APPROVED

SATAS
SANS 10005
The Preservative Treatment of Timber

• Specifies not only the approved and registered timber preservatives and impregnation processes, but also the when and where and what

12.1 Qualification

To qualify as being adequate for its purpose, structural timber of the two main species used in a permanent building in the areas given in 12.2 and 12.3 shall be preservative treated in accordance with 12.4.
12.2 Gymnospermae (coniferous species)

Including laminated beams

Sawn timber (including planed and profiled timber) and poles or logs (round or partly round) of the softwood species shall be treated in accordance with 12.4 when used in the following municipal areas or towns in South Africa (see also annex E):

Amahlathi, Berg Rivier, Bitou, Breede Valley, Breede River/Winelands, Buffalo City, Cape Agulhas, Cederberg, City of Cape Town, Drakenstein, eNdondakusuka, eThekwini Metropolitan (Durban), Ezingoleni, George, Great Kei, Hibiscus, Hlabisa, Impendle, Jozini, Kamiesberg, King Sabata Dalindyebo, Knysna, Kouga, Kou-Kamma, KwaDukuza, Langeberg, Makana, Maphumulo, Matzikama, Mbombombe, Mbhashe, Mbizana, Mkhambathini, Mnquma, Mooi Mpolana, Mossel Bay, Mthonjaneni, Mtubatuba, Mzunduzi, Nama Khoi, Nelson Mandela Metropolitan (Port Elizabeth), Ndambile, Ndwedwe, Nkonkobe, Ngqushwa, Ntambanana, Nyandeni, Overstrand, Port St Johns, Qaukeni, Richmond, Richtersveldt, Saldanha Bay, Stellenbosch, Sunday’s River Valley, Swartland, Swellendam, The Big 5 False Bay, Theewaterskloof, Ubuhlebezwe, Umdoni, uMngeni, uMhlathuze, Umhlabuyalingana, uMlalazi, uMshwari, uMzimkulu, Umzumbe, Vulamehlo, Witzenberg.

Sawn timber used in the erection of an exposed loadbearing structure, i.e. the substructure of decks, shall be treated in accordance with 12.4 when used within the borders of South Africa.

Note – the requirements in above-mentioned demarcated areas applies to all soft wood species including spruce, firs (SPF) that are susceptible to Italian beetle or dry wood termite, and fungal decay, even if rated as impermeable and difficult to treat.
12.3 Angiospermae (broadleaved species)

All sawn timber, planed timber, and poles or logs (round or partly round) of the hardwood species shall be treated in accordance with 12.4 when used within the borders of South Africa.

The following products may be excluded if insufficient sapwood is available to obtain the specified retention and penetration requirements:

a) laminated timber;
b) block and strip flooring;
c) ceiling boards
d) panelling;
e) mouldings and joinery;
f) garden furniture;
g) outdoor decking boards; and
h) non-sapwood-containing, kiln-dried and planed, sawn boards processed from eucalyptus species).
12.4 Preservative treatment

The preservative treatment of timber shall comply with the provisions of SANS 457-2, SANS 457-3, SANS 753, SANS 754 or SANS 1288, as relevant.”

• The titles of the product Standards referred to in 12.4 are as follows:
  - SANS 753, Pine poles, cross-arms and spacers for power distribution, telephone systems and street lighting.
  - SANS 754, Eucalyptus poles, cross-arms and spacers for power distribution and communication systems.
  - SANS 1288, Preservative treated timber.

NOTE - SANS 1288 is applicable to all treated timber products that do not fall within the scope of the other round wood product standards given above (including all sawn and processed timber products, e.g. laminated beams)
Recent amendment to SANS 1288 Preservative treated timber – Edition 3.5:2016

- Amended to provide for the **envelope treatment** of impermeable softwoods e.g. spruce to H2\textsuperscript{h} hazard class
- Process specific parameters prescribed in SANS 1288 table 1

*Figure 6. Schematic drawings of bordered pits in tangential view. Simplified structure of: A – bordered pit in a coniferous tree with torus in the central position allowing the water transport between tracheids, B – bordered pit in dicotyledonous tree with no torus but with uniformly small pores (not shown) in the pit membrane, C – bordered torus-margo pit when the torus closes the pit aperture. Pit elements: 1 - margo strands, 2 - pit aperture, 3 – torus, 4 – border.*
VISIT THE SAWPA WEBSITE www.sawpa.co.za FOR MORE INFORMATION INCL GUIDANCE NOTES ON:

• Hazard Classes
• Understanding the markings on treated timber
• Natural Durability
• Sapwood and Heartwood
• Preservatives for pressure treatment of wood
• Wooden Pilings or Foundation poles used for permanent buildings
• Decking Substructure
• Disposal of treated wood