PROTECTION AND RESTORATION OF LOG BUILDINGS

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Summary

The Sansin Corporation is involved in the wood protection, Boracol wood preservation, and natural wood coatings industry. Specifically the treatment and preservation of log buildings in North America.

Field tests of differently coated log structures with water and oil based stains and paints, acrylic, latex, film forming and penetrating wood finishes are in progress.

1. Introduction

Log buildings are one of the first housing structures in North America. It's place in history was so important that at one point in time the Republican party in the U.S.A. used it as their party symbol, (before it chose the elephant symbol) for practice of the values of courage, integrity, and strength (Figure 1). These log homes were built by the occupants as their shelter and home. Most often the logs were lime washed or not treated at all (Figure 2). These structures are still around 150 years or more after being erected, eroded but ...often in decent shape.

WE SHOULD ASK OURSELVES WHY?

When, in contrast, many modern log homes treated with "today's" coatings technology are often failing badly within a five (5) to fifteen (15) year period (Figure 3,4).

2. Weathering and Erosion of Log Buildings

Weathering of wood is a combination of physical, mechanical, and chemical effects. Weathering will remove only between 1/32 inch to ½ inch of untreated wood per century from the exposed surfaces, depending on the climate, exposure and species (Bruce Hoadley, The Encyclopedia Of Wood).

Variables other than coatings responsible for decay found in log structures include:

- Environment as it is positioned in direct surrounding environment. Trees, shrubs, etc. (Figure 5).
- Lawn sprinklers.
- Design and construction shortcomings.

- Exterior water taps forming condensation.
- Insufficient overhangs.
- Balconies.
- Handling equipment during construction.
- Lack of cleaning and maintenance (Figure 6).

We will continue with the subject of degradation of Log structures caused by non-suitable coatings.

3. Log Building Finishing

Wood coatings can be categorized into: Penetrating vs. Film Forming Finishes. Penetrating and Film Forming finishes in service for five (5) to twelve (12) years were analyzed for preservative, water repellent, dimensional stabilization, decay, and UV resistant contents.

3.1 Film Forming Finishes

During our inspections we experienced that several Log Structures treated with Film Forming finishes showed severe decay after five (5) to eight (8) years in service (Figure 7).

Film Forming finishes can be categorized into:
- Clear varnishes.
- Coloured varnishes.
- Oil based solid colour stains.
- Water based latex stains.
- Acrylic stains.
- Paints.

Penetrating Non Film Forming wood finishes are generally subdivided into:
- Oil and water borne transparent and semi-transparent stains.
- Clear preservatives.
- Water repellants.

Film Forming coatings generally protect well against surface erosion and theoretically should be superior in protection against moisture absorption. However, our experience illustrates that particularly large timbers and logs used for exterior structures finished with Film Forming coatings tend to collect moisture as much or more than a penetrating Non Film Forming finish or water repellant. As the moisture in the timber or log evaporates, the wood contracts, closing many micro checks. This, as well as, the film of the finish prevent or slow down the moisture from evaporating out of the wood. As a

result, the moisture content of the wood, in many cases, permanently increased, creating favorable conditions for wood destroying fungi (Figure 4, Figure 8).

It is our opinion based on field experience that Film Forming finishes in general are not suitable finishes for Log Buildings (Figure 9, Figure 10)

3.2 Penetrating Non Film Forming Finishes

The Sansin Enviro-Stain penetrating system is far from new (Figure 11). History showed that the fundamental idea of using nature's own protective ingredients to preserve wood is as ancient as wood itself (Figure 12). Over 1,000 years ago, the people of Norway practiced an annual ritual to preserve and protect their more valued buildings, such as "Stave Churches". In the spring, tradition called for trees to be tapped for their sap, similar to the way we tap for Maple syrup today. The sap would be gathered, warmed and liberally applied with a broom to the roof and exterior siding.

Modified natural oil based Sansin Enviro-Stains are water reducible. Water helps to carry the preserving solids into the wood and as the water evaporates it does not emit the high levels of toxic fumes found in coatings that contain flammable or harsh solvents. The Sansin formulas are low odor and non-flammable, and do not leave an oily or waxed surface film that attracts dirt. The natural oils and resins penetrate deep into the wood. Once these solids have dried and bonded to the wood cells they become a permanent part of the substrate. Sansin Enviro Stains do not contain petroleum based oils, mineral oils, non-drying mildew-prone oils, or wax. The Stain formula's, when applied to wood, penetrate and over 3 separate applications saturate the wood pores to prevent a water droplet from penetrating the wood. However internal moisture or water that penetrated the wood can easily evaporate from the wood.

4. Restoration Field Case

In 1998 the Sansin Corporation was invited by a log home owner to inspect his 12 year old log home which was treated with a Film Forming coating. A very high moisture content was measured and extreme wood rot and decay was found behind the solid film finish. (Hollow sound while tapping on the finish). The natural coloured finish turned very dark over the years (almost black). The finish was carefully stripped off the logs and the logs treated with Boracol 20-2, as well as, Impel rods. After an ample drying period (Approx. 7 days) to allow the Boracol to penetrate, 3 coats of Sansin stain were applied liberally to ensure full saturation of the wood substrate (Figure 13). After this treatment the building, 12 years after erection, settled another 1 ½ inches, proving that "breathable" Sansin finish system allowed the moisture to escape from the logs creating a healthy environment.

5. Prevention

Premature decay of wood, periodically or permanently exposed to increased moisture content (over 25%), reached serious proportions in Canada in recent years. As a result, requirements for reliable fungistatic treatments have been progressively introduced. The most acceptable pre-treatment and remedial treatment for rot and insect attack was found in the application of Boron based wood preservatives (Figure 14,15).

Boracol wood preservatives are based on inorganic Boron (disodium octaborate tetrahydrate), which has the ability to diffuse in moist wood (12% moisture content or greater), has a very low vapor pressure and the ability to progressively penetrate the wood even several years after application. Throughout this period, whenever and wherever a determined concentration of Boron is found in wood, the organisms capable of degrading wood have no chance to survive or establish infection. The only condition for proper performance is that the treated wood should not be exposed to direct contact with water (for example wood in ground contact or occasional heavy rain over construction wood). If water has access to wood, it will make it possible for Boron to "travel the opposite way" by leaching process. Therefore, a post treatment application of the wood surface is recommended by applying a proven wood stain (Figure 16), water repellant or paint system, preventing the leaching of Boron, or covering the lumber to create a barrier for keeping water away (Jepessen, Vidovic, 2000).

6. Maintenance

The secret of ensuring a healthy log structure is : MAINTENANCE. Regular cleaning by power washing prevent build up of dirt, dust, pollen, etc. Scheduled application of a maintenance coat of a penetrating stain is, after cleaning, easily applied.

7. Conclusion

Key factors for the protection of log buildings:

- A good construction design.
- "Friendly" surrounding environment.
- Cleaning and preparation for the application of a "breathable" wood finish.
- Film forming wood finishes are not suitable for log buildings.
- Maintenance is preservation.

Acknowledgements

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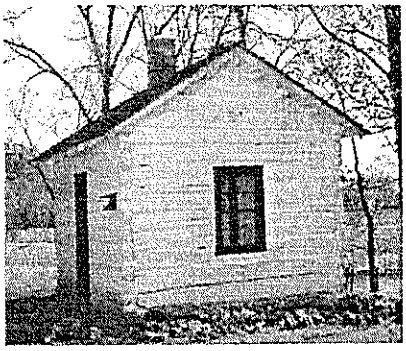
Figure 1

Muir's Log Structures Restoration Guide

- Log Home Built With Hewn Pine Logs By Norwegian Settlers, The Hanson Family, Around 1870 In Prairie Farm, Wisconsin.

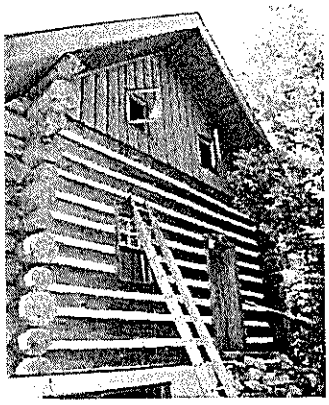
Figure 2



Norwegian Log House, Norskedalen nature Centre, Coon Valley, Wisconsin.

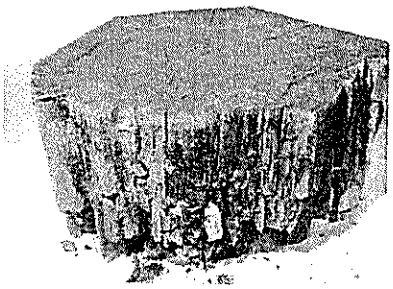
- Whitewashing Was A Common Covering On Log Buildings For Sanitary & Wood Preservative Purposes.

Figure 3



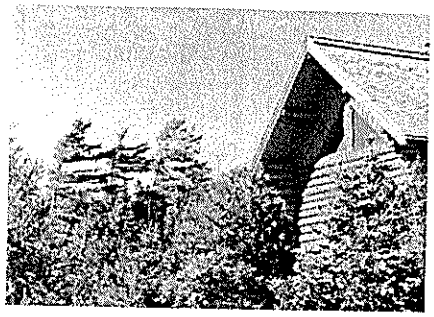
- Wood Decay In Top Row Of Logs Finished With A Film Forming Coating, In A 12 Year Old Log Home

Figure 4



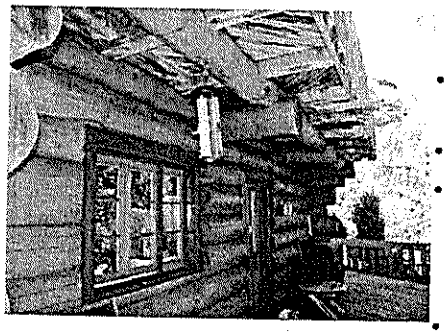
- Log End Treated With A Film Forming Finish.
- Note: High Moisture Content, Severe Decay.

Figure 5



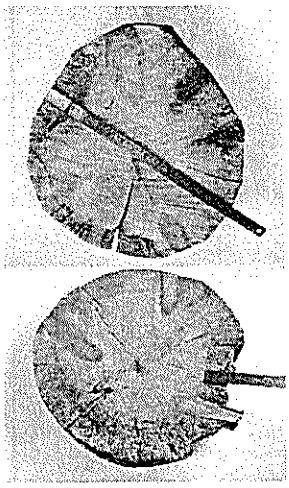
- Environment Can Be Responsible For Decay Found In Log Structures.
- Includes: Trees, Shrubs, Etc.

Figure 6



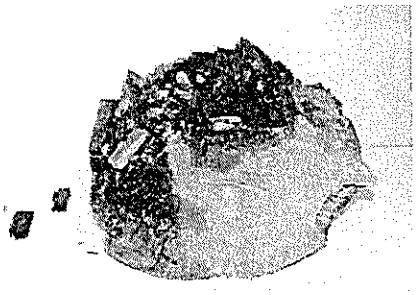
- Design & Construction Short Comings.
- Insufficient Overhangs.
- Balconies.
- Handling Equipment During Construction.
- Cleaning & Maintenance.

Figure 7



- Log Section Of A 6 Year Old Log Building.
- Note: Wood Decay Behind Film Forming Finish
- 3 Inches Of Wood Decay Behind The Hard Finish.

Figure 8

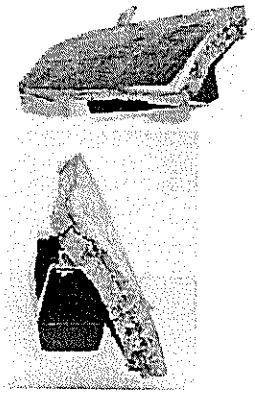


- Log Section Of A Scandinavian Style, Hand Scribed Log Home.
- 16 Years Old.
- High Moisture Content.
- Extreme Wood Decay

Figure 9

- The Impervious Paint Prevented Evaporation, So The Water Was Trapped And Decay Occurred.
- Softwood, End Grain & Corners Can Be Destroyed In Less Than 10 Years.

Figure 10

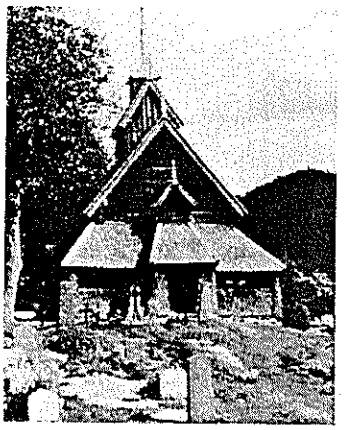


- "Surface" Of Log Section Fallen Off A 16 Year Old Log Home Coated With A Film Forming Finish.

Figure 11

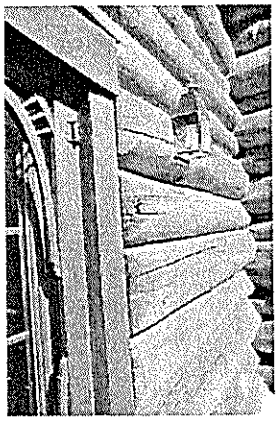
- 10 Year Old Building (Marmot Basin Chalet).
- Treated With Sansin Enviro-Stain

Figure 12



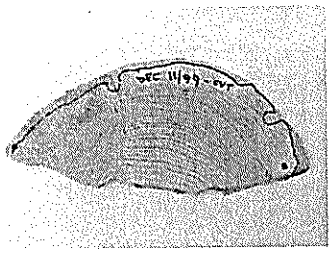
- Stave Church, Norway.
- Built In The 9th Century.

Figure 13



- 12 Year Old Log Building 3 years After Removal Of Film Forming Finish, Restoration Using Sansin Enviro-Stain & Boracol Wood Preservatives.

Figure 14



- Douglas Fir Surface Treated With Boracol 20-2
- Note: Penetration After 10 Days.

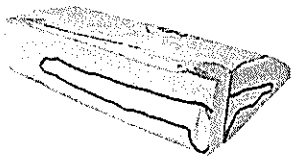
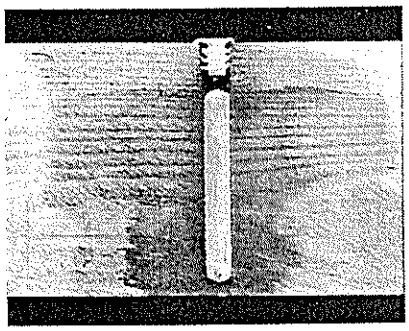


Figure 15



- Boron Diffusion From Impel Rod (Using A Red Tracer).

Figure 16

- Restored Log Home.
- 3 1/2 Years After Restoration.
- Treated With:
  - **Boracol 20-2**
  - **Impel Rods**
  - **Sansin Classic Enviro-Stain**