

## TRANSIT PROTECTION OF LUMBER

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### Introduction

The increasing volumes of kiln-dried S-P-F lumber being shipped to the export markets have resulted in a corresponding increase in complaints and monetary claims for moisture pick-up, stain and mould.

A task force was organized and instructed to study the matter, reach conclusions and make recommendations for improvement.

The Task Force has been very active and has initiated:

- \* Paper/poly material arrival condition studies in the UK and Europe. In addition, there were two studies carried out at Vancouver Terminals.
- \* Five separate studies were carried out on water repellents. Four of the studies involved trial parcels of lumber sent to overseas markets and assessed by COFI Timber Specialists upon arrival.
- \* Poly under the top tier plus special water repellent with anti-transit stain mixture which was sprayed on top and side of packages.
- \* Moisture content analysis and moisture meter comparisons.
- \* Testing of new improved wrapper products.
- \* In addition a number of other ideas were looked into and trials conducted but will not be mentioned as they were not successful.

### Discussion and Study Details

#### Wrapper, Poly Bag and Poly Under Top Tier (PUTT)

Based on visual inspection in Europe, UK and Vancouver terminals, the conclusions were that no existing product offers 100% protection.

It has become obvious that little (in many cases, no) quality control is exercised at any stage, i.e. at wrapper, during storage, loading, and unloading nor by truckers or the railroad.

Some products have built in problems such as:

- stitched seams
- paper disintegrates with moisture contact
- insufficient anti-tear substance built in
- ultra-violet (UV) light breaks down waterproof barrier
- no pigment to restrict infrared rays
- one wrapper products is suspect of shrinking after application.

Major physical damage is caused by:

- Friction of dunnage against wrapper during travel either breaks down poly waterproof substance or causes

holes in protective material. Friction during travel nearly always causes tearing.

- Forklift damage.
- Strapping (on rail cars) digs into corners piercing through the protective material.
- Chains or cables used by some truckers cause damage to the protective material by digging into corners of the packages.
- Wrappers improperly fastened tear off or come loose during travel.
- Spacers with gouges (around knot, etc.) cause damage to wrappers (travel friction).
- Spacers (dunnage) always cause damage when placed over strapping.
- Railroad coring (telescoping of bottom rows) causes staple pull through which allows wind access resulting in much of wrapper being torn away.
- Tearing of corners on long loads due to bending stresses when lifted by fork truck.
- Cross sticks protruding on side of packages (also causes damage to adjacent packages).

In addition, there are specific problems associated with certain products.

#### Poly Under Top Tier

Main problems are:

- Poly too thin and travel friction causes small holes in the poly sheet.
- When applied on tilt hoists, top row often causes poly to move towards the center of package leaving no protection for outer two or three rows.
- Creeping from ends towards inner part of load occurs.
- No protection from wind-driven rain on sides or ends of loads.
- Lengthwise tearing (shearing) between individual pieces.
- Does not protect against transit stains.

Advantages of PUTT are:

- No further damage occurs to poly (other than those listed above).
- Under the right circumstances it allows moisture to escape from ends and sides of packages.
- Less of a disposal problem to buyers than the other wrapper products.

#### Woven Poly with Poly Film Overlay

These are supplied in bag and wrapper form. Specific problems are:

- Clear poly causes condensation within the packages.
- Overlay layer over weaved product breaks down with stretching (or dunnage friction) causing small holes at the corners of the weave.
- Staples easily "pull through".
- In the case of poly bags the stitched seams leak.

## Action Taken to Date

The poly weave manufacturer and the product distributor have taken the following action.

- Advised their customers of the problems of using clear poly and encouraged them to use a pigmented product (usually white or opaque).
- Stitching a wider top to the bag so that when applied the seam is down the side as opposed to the top or corners of the package.
- Developed an improved product which has a tighter weave and a two-coat polyethylene overlay. One side with black poly to restrict the infrared rays and the other in white to reflect the heat rays. Tests showed this product to be much improved.

## Water Repellent Treatments

Four separate studies were completed on trial parcels which were treated with water repellents. All involved KD S-P-F and were treated with a spray system. The products tested contained wax emulsions for water repellency, chlorinated phenols to prevent staining should wet pieces be contained in the packages plus color pigment as a quality control feature.

## Test Procedure

Packages of KD S-P-F CLS were moisture content monitored at the mills in Prince George. The packages were then trucked to the coast and treated with the water repellent. They, along with control packages, were moisture metered again to assure no moisture pick-up occurred. Some packages had PUTT, others were without. The packages were then stored in the open and exposed to the elements. The rainfall was recorded.

Two trial parcels were shipped to Japan and two to the UK where they were again metered for M.C. The stock had been exposed to over 8" of rainfall in B.C. In addition, packages from the two tests in Japan were left in the open throughout the monsoon rains in Japan. The total rainfall these packages were exposed to exceeded 22".

## Results

- The final moisture content did not vary much from the original M.C.
- There was virtually no size change (which substantiates little moisture pick-up).
- With the exception of the top layer and edges of outside pieces (weathering) the stock was bright.
- There was virtually no stain and mould even on wet Alpine Fir pieces.

## Comments

- Moisture contents were recorded in all cases with a Delmhorst needle meter. Readings in all cases were taken in the same cross sectional area of the pieces.
- There is an advantage to wax emulsions that is rather important. The emulsion does not permit (or minimizes) the re-entry of loose water into the lumber but it does allow for moisture within the lumber to escape. The theory for this phenomenon is that the wax emulsion is like a cluster of ball bearings tightly packed together but having minute openings between them. The water "beads" on the wax and these beads are much too large to enter the minute openings. The trapped water contained within the lumber escapes in vapor form through evaporation. The end result given drying conditions and time is a more uniformly dried product.
- Poly under top tier prevents loose water getting back in which under favorable drying conditions allows further evaporation. Result is less variation in moisture content between pieces and lower fixed moisture content.

A fifth parcel was treated with a wax emulsion mixture which did not contain any anti-stain chemical. The results were acceptable even though several pieces contained signs of sap stain. Further work is being done to confirm the results and to further identify the degree of mold and stain which may occur.

## Conclusions

Using the data accumulated from the aforementioned studies and field trials the Task Force was able to rank the various protective methods in order of effectiveness. Results of rating from best to worst are:

### Performance

### Product(s)

- |       |   |
|-------|---|
| No. 1 | Wax Emulsion containing anti-stain chemical<br>+ Protection (paper/poly) under top tier (PUTT)<br>+ Anti-Transit Stain sprayed on outside of the package. |
| No. 2 | Wax Emulsion containing anti-stain chemical<br>+ Anti-Transit stain outer package protection  |
| No. 3 | Wax Emulsion containing anti-stain chemical<br>+ Poly/paper under top tier  |
| No. 4 | Wax Emulsion (without anti-stain chemical)<br>+ Anti-Transit Stain outer package protection<br>+ Poly/paper under top tier                                |
| No. 5 | Poly/paper under top tier<br>+ Tarped during trucking<br>+ Stored under cover while awaiting vessel loading   |

Performance

Product(s)

No. 6            Good quality wrapping material, i.e. laminated reinforced paper products or the newly developed improved woven polyolefin fabrics plus extensive good quality control practices.

No. 7            Poly or paper under top tier (PUTT)

NOTE: a) Lower quality paper and poly products are not recommended.

b) Transit Stains refers to the reactive stains which occur during rail transport. It is caused by a reaction when small metal particles from the brake shoes come into contact with a moist wood surface.