

# Layout and Best Management Practices for Quality and Cost



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# Layout and Management of Inventory

## At the sawmill

- Logs
- Green lumber

## Secondary processing

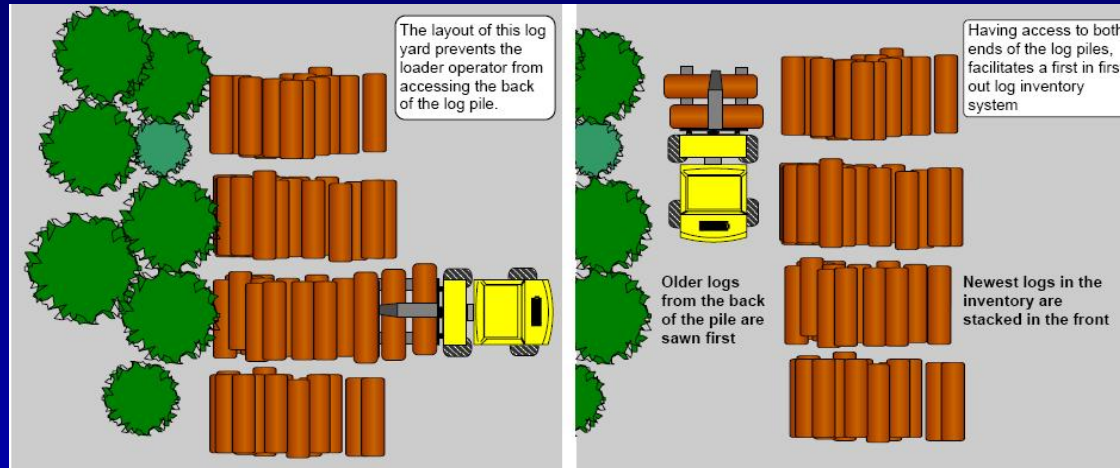
- Dry lumber
- Parts and finished goods

# Log Storage

## Problems

- Staining
- Moisture content loss
- Checks and end splits
- Insect infestation

# Log Yard Design



# Protecting Logs

## •Inventory?

- Time in the woods
- Storage at the mill
  - Stain
  - End splits
  - Moisture content uniformity



# Protecting Logs

## End coating

- Reduces end splits
- Reduces fungal stain



# Insect Infestation

Wood in all stages of drying are subject to attack  
Wood boring beetles

- two major categories
  - those that infest only live trees or recently harvested wood
  - those that infest dry, seasoned wood



# Protecting logs



# Protecting Logs

It all comes down to this:

- Logs should be sawn as quickly as possible – perishable commodity
- Using stock as rapidly as possible
  - First in first out
- Protect long term inventories with end coating, shade cloth, water

# Green Lumber

- Should green lumber be considered inventory?
- Prone to what type of degrade?
  - Checks
    - Cover, dry slowly
    - End coat
  - Stain prone
    - Get on sticks quickly
    - Start drying rapidly
    - Dip for fungal stain



# Protection form Fungal Stain

- Apply within 1 day if Temp 80 F
- Apply within 2 days if temp 70 F
- Dip is good for about 1 month



# Dry Lumber or Parts

## Problems

- Moisture uptake
  - Dimensional change
  - Gluing problems
  - Machining problems
- Insect infestation

# Insect Infestation

- **Prevention:**
  - Do not allow lumber to sit
  - Picks up moisture
  - Keep yard and areas clean

No old lumber!



# Maintaining Moisture Content After Drying

## Considerations

- Ends of lumber diffuse moisture 10-15 times faster
- MC change starts immediately!

## Too long time period results in:

- Moisture content change
- Insect infestations

# Dry Storage Problems

The major factors that define the extent of the problem are:

- the type of dry storage
- the duration or time in storage
- weather conditions
- whether the lumber is stickered or dead-stacked in storage

# Dry Lumber Storage

## Ideal

- Four sided, concrete floor, temperature controlled environment

## Unheated shed

- Roof and concrete floor
- Up to one month
- MC can change up to 1-2% per month

## Minimum

- Roofed shed
- Use quickly

# Monitoring EMC

- Sling psychrometer
- Sample boards



Oven dry weight of the kiln sample =  $\frac{\text{Original weight of kiln sample} \times 100}{100 + \text{MC of sample in \%}}$

# Measuring Relative Humidity

EMC for sitka spruce (*Picea sitchensis*). Average values from adsorption and desorption data. Taken from USDA Wood Handbook, Agr. Hdbk. No. 72.

Temp. Dry-bulb (°F)	Wet-bulb depression (°F)				(Dry-bulb - Wet-bulb)															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
30	89	78	67	57	46	36	27	17	6	-	-	-	-	-	-	-	-	-	-	-
35	90	81	72	63	54	45	37	28	19	11	3	-	-	-	-	-	-	-	-	-
40	92	83	75	67	60	52	45	37	29	22	15	8	-	-	-	-	-	-	-	-
45	93	85	78	72	64	58	51	44	37	31	25	19	12	6	-	-	-	-	-	-
50	93	86	80	74	68	62	56	50	44	38	32	27	21	16	10	-	-	-	-	-
55	94	88	82	76	70	65	60	54	49	44	39	34	28	24	19	-	-	-	-	-
60	94	89	83	77	73	68	63	58	53	48	43	39	34	30	26	-	-	-	-	-
65	95	90	84	78	75	70	66	61	56	52	48	44	39	36	32	-	-	-	-	-
70	95	90	86	81	77	72	68	64	59	55	51	48	44	40	36	-	-	-	-	-
75	95	91	87	82	78	74	70	66	62	58	54	51	47	44	41	-	-	-	-	-
80	96	91	87	83	79	75	72	68	64	61	57	54	50	47	44	-	-	-	-	-
85	96	92	88	84	80	76	73	70	66	63	59	56	53	50	47	44	41	38	36	-
90	96	92	89	85	81	78	74	71	68	65	61	58	55	52	49	47	44	41	39	-



# General Rule of Thumb

Temperature has a much smaller effect on moisture content than relative humidity.

RH	MC%
30	6
50	9
65	12
80	16

# Control RH by adding heat

## Control RH by adding heat

- For 5% EMC add 33 deg\*
- For 7% EMC add 22 deg\*
- For 9% EMC add 15 deg\*
- \*above the morning low



# Storing Dried Lumber

- Obvious: kiln-dried lumber should not be stacked outside exposed to direct rain (and condensation or fog)
- It is not uncommon to see kiln-dried lumber stacked outside uncovered, because “there is no room to put it anywhere else.”
- Dangers of exposing kiln-dried lumber to rain
  - new checking
  - hairline cracks
  - stain
  - warp

# Short-term Storage

Days to a couple of weeks

- three-sided shed
- roof protects from wind-driven rain
- lumber should be dead-stacked



# Intermediate length storage

Weeks to a couple of months

- Closed building
- Unfortunately, most storage areas of this type are not really “closed” areas or buildings
  - doors are left open, building has loading docks with the doors open



# Problems with Storage

- Open storage areas are susceptible to short-term weather patterns.
- Prolonged periods of rain, fog or high humidity can affect the lumber more than normal

“How quickly we forget.....”

# Long-term Storage

## Couple of months - .....

- EMC conditions must be controlled
- Area must be closed to the outside
- Humidification and dehumidification of the storage area are usually too expensive
- The most effective way to control the EMC is with heat
- If the building is too big, a separate area should be walled-off for the actual lumber storage
- You do not need to heat an entire building if you are only using one-third of it for lumber storage

# Tracking Systems

## Overview of what's used

- Log Tracking
- Lumber Tracking



# Log Tracking & Inventory

- Tracking methods

- “Drive-by”
- Tally sheet
- Tally sheet to spreadsheet
- Bar code/scanner



# Log Tracking Systems

- Bar coding and inventory tracking systems using hand held laser scanners
- Information:
  - Species
  - Grade
  - Gross Scale
  - Net scale
  - Price per grade and MBF
  - Logger and track information
- Allows knowledge of exact footages and log counts in real time



# Log Tracking Systems

## Logger and track information

- trucker
- logger
- vendor
- tract
- on-landing

# Lumber Inventory Systems

## • Knowledge of lumber inventory

- Species
- Thickness
- Grade
- Order ID
- Track every customer shipment and produce reports by date range and product type



# Lumber Inventory Management

- Track lumber from the moment it leaves the saw until it arrives onsite with the customer
- Tracks throughput timeframes from process to process
- Reduce inventory verification times
  
- Potential Use
  - green chain tally
  - kiln dried chain tally
  - block tally functions
  - full pack tally functions
  - physical inventory movements
  - kiln loading/unloading
  - regular inventory verification



# RFID

## Radio-frequency identification (RFID)

- automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders

### RFID tags contain at least two parts

- One is an integrated circuit for storing and processing information, modulating and demodulating a (RF) signal and can also be used for other specialized functions.
- The second is an antenna for receiving and transmitting the signal.



# RFID, GPS and Logging?

“Four logging and sawmill operators in the Quebec area are now using the company's Virtual AT (Virtual Authorization for Transportation) system. Identec Solutions is providing RFID interrogators (readers) and tags for the Virtual AT solution, which facilitates the loading and weighing of logging trucks by reducing the need for drivers to step out of their trucks or fill out paperwork. Instead, an RFID tag installed on the truck cab's dashboard automatically transmits data the logging company can use to track the truck and its load—and to calculate how many hours the driver worked.” - RFID Journal

- It is estimated that human error will be reduced from about 68% to 99%

# The Future?

