

FLNRO Standards for Bridge Timbers and Wood Treatment

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FLNRORD Engineering Branch - Victoria
Webinar January 8, 2020
11:00 am – 12:00 pm



Ministry of Forests, Lands, Natural Resource Operations
and Rural Development

FLNRO Development of Standards for LUMBER and treated Wood Materials

Currently observing challenges with conformance to ministry standards:

- Lumber standard not always being enforced
 - Lumber quality verification
 - Grade stamping versus Certificate of Inspection
- Treatment standards not always being enforced, and confusion on treatment standards and options
 - No or improper documentation supplied
 - 3rd party wood treatment inspection and results not provided
 - Coastal vs Interior Douglas-Fir for CCA treatment



Presentation Outline

Review of:

1. Bridge Timbers and Lumber Material Standard

- allowable untreated and treated wood species, as specified for different bridge components
- specification of the Use Category (UC4.1 or UC4.2) for treated wood.
- grade stamping for timber quality verification versus Certificate of Inspection in lieu of grade stamped lumber



Presentation Outline

Review of:

2. Pressure Treated Wood Standard for Timber Deck Bridge Components

- 4 types of allowable preservatives: chromated copper arsenate Type C (CCA); ammoniacal copper zinc arsenate (ACZA); creosote (CR); and pentachlorophenol in type A oil (PCP-A)
- Wood species, allowable preservatives, treatment specifications
- Coastal vs Interior Douglas-Fir

3. Q & A / discussion



FLNRO Development of Standards for LUMBER and treated Wood Materials

Challenges at the time (2009ish):

- Limited reference to standards for lumber and for treated wood
- Referenced conformance to CAN/CSA-080 “Wood Preservation” as a general ‘catch-all’
- No checks for quality assurance for lumber or for treated wood; no 3rd party verification of treatment results
- Wanted requirements that could be supplied from BC

Possibly received wood materials of questionable quality, and where preservative treatment was specified the treated wood supplied may have consisted of only ‘dip treatment’



FLNRO Development of Standards for LUMBER and treated Wood Materials

Objectives to remedy challenges:

- consistent quality timber materials; meet Canadian Lumber Standards
- industrial quality treated wood that will provide long term performance for the intended use
- conform to CSA-080 Series “Wood Preservation”, and Best Management Practices
- require quality assurance for lumber and for treated wood

To establish standards that provide for performance and service life expectancy, and to establish a level playing field for suppliers



FLNRO DEVELOPMENT OF STANDARDS FOR LUMBER AND TREATED WOOD MATERIALS

- FSR bridge design and construction standards include standards for lumber and treated wood materials:
 - Bridge Timbers & Lumber Material Standard
 - Pressure Treated Wood Standard for Timber Deck Bridge Components
 - Process Specification for CCA Treatment of Coastal Douglas-fir Wood

<https://www2.gov.bc.ca/gov/content/industry/natural-resource-use/resource-roads/engineering-standards-guidelines/bridge-design-construction/material-standards>



FLNRO BRIDGE TIMBERS & LUMBER MATERIAL STANDARD

Key requirements for lumber:

- Rough lumber material
- Conforming to various wood species depending on bridge component
- Lumber graded in accordance with NLGA grading rules
 - Lumber grade is related to structural characteristics
 - No. 1 grade for cross-ties and stringers
 - No. 2 grade for all other timber components
- All rough lumber to be:
 - Full sawn
 - Trimmed for removal of sniped, splintered, or uneven lengths
 - Trimmed full to length (tolerances specified), and double-end trimmed
- Lumber quality (applied grading rule, grade, wood species) verified by:
 - grade stamp or
 - Certificate of Inspection, prepared by Accredited Grading Agency



FLNRO BRIDGE TIMBERS & LUMBER MATERIAL STANDARD

Table 1 Lumber species and grade requirements for standard timber deck bridges (<u>except</u> components for 6.1 m span "All Timber Portable Bridge" as noted in attached Table 2)			
Bridge Component	Allowable Untreated Lumber Species	Allowable Lumber Species and Use Category ³ if Treated (Refer to Pressure Treated Wood Standard for Timber Deck Bridge Components)	Required Lumber Grade NLGA
Timber guardrail, riser blocks and brackets <i>(e.g., untreated 250 mm x 250 mm size)</i>	<ul style="list-style-type: none"> D Fir-L⁴ (preferred) Hem-Fir North⁵ or SPF West⁶ (if justified by life cycle cost analysis for site-specific crossing) 	Use Category UC4.1 <ul style="list-style-type: none"> Coastal D-Fir Hem-Fir North 	No. 2 or better <i>(e.g., NLGA Para. 131c – "No.2" – Structural Posts and Timbers for 250 mm x 250 mm size)</i>
Timber deck running planks (wear planks) <i>(e.g., untreated 75 mm x 250 mm size for wear planks to sub-deck; e.g., untreated 100 mm x 300 mm size for wear planks to cross-ties)</i>	<ul style="list-style-type: none"> D Fir-L (preferred) Hem-Fir North or SPF West (if justified by life cycle cost analysis for site specific crossing) 	Not treated (because mechanical wear is the life limiting factor rather than rot)	No. 2 or better <i>(e.g., NLGA Para. 124c – "No.2" - Structural Joists & Planks for 75 mm x 250 mm size)</i>
Timber sub-deck planks <i>(e.g., 100 mm x 300 mm for sub-deck planks to cross-ties)</i>	<ul style="list-style-type: none"> D Fir-L 	Use Category UC4.2 <ul style="list-style-type: none"> Coastal D-Fir Hem-Fir North 	No. 2 or better <i>(e.g., NLGA Para. 124c – "No.2" - Structural Joists & Planks for 100 mm x 300 mm size)</i>
Timber cross-ties <i>(e.g., 200 mm x 200 mm, 200 mm x 250 mm, 200 mm x 300 mm, 250 mm x 300 mm size, etc.)</i>	<ul style="list-style-type: none"> D Fir-L 	Use Category UC4.2 <ul style="list-style-type: none"> Coastal D-Fir 	No. 1 or better <i>(e.g., NLGA Para. 131b – "No.1" – Structural Posts and Timbers for 200 mm x 200 mm size, 200 mm x 250 mm size or 250 mm x 300 mm size)</i> <i>(e.g., NLGA Para. 130b – "No.1" – Structural Beams and Stringers for 200 mm x 300 mm size)</i>
Ballast wall timbers <i>(e.g., treated 150 mm x 300 mm size)</i>	None. Must treat ballast wall timbers →	Use Category UC4.2 <ul style="list-style-type: none"> Coastal D-Fir 	No. 2 or better <i>(e.g., NLGA Para. 130c – "No.2" – Structural Beams and Stringers for 150 mm x 300 mm size)</i>
Timber sills <i>(e.g., treated 200 mm x 400 mm; 305 mm x 305 mm, etc.)</i>	None. Must treat timber sills →	Use Category UC4.2 <ul style="list-style-type: none"> Coastal D-Fir 	No. 2 or better <i>(e.g., NLGA Para. 130c – "No.2" – Structural Beams and Stringers for 200 mm x 400 mm size)</i>



FLNRO BRIDGE TIMBERS & LUMBER MATERIAL STANDARD

- Different wood species have different strength characteristics
- Therefore different species specified depending on deck component type and whether wood treatment is specified
- No species or grade substitutions

Table 9.13
Specified strengths and moduli of elasticity
for beam and stringer grades, MPa
 (See [Clauses 9.4.2, 9.5.5, 9.6.3, 9.7.1, 9.8.2.1, 9.8.2.4, 9.10, 9.11.2, 9.23.4.4.6, 16.12.2.1, 16.12.2.2, 16.12.3.1, and 16.12.3.2.](#))

Species combination	Grade	Bending at extreme fibre, f_{bu}	Longitudinal shear, f_{vu}	Compression parallel to grain, f_{pu}	Compression perpendicular to grain, f_{qu}	Tension parallel to grain, f_{tu}	Modulus of elasticity	
							E_{50}	E_{05}
Douglas fir-Larch	SS	19.5	1.5	12.0	4.7	10.0	12 000	8 000
	No.1	15.8	1.5	10.0	4.7	7.0	12 000	8 000
	No.2	9.0	1.5	6.6	4.7	3.3	9 500	6 000
Hem-Fir	SS	14.5	1.2	9.8	3.1	7.4	10 000	7 000
	No.1	11.7	1.2	8.2	3.1	5.2	10 000	7 000
	No.2	6.7	1.2	5.4	3.1	2.4	8 000	5 500
Spruce-Pine-Fir	SS	13.6	1.2	8.6	3.6	7.0	8 500	6 000
	No.1	11.0	1.2	7.2	3.6	4.9	8 500	6 000
	No.2	6.3	1.2	4.7	3.6	2.3	6 500	4 500



Table 9.13 from CSA S6-14



D FIR-L GROWING REGION

Species Combination: Douglas Fir-Larch

Abbreviation: D.Fir-L or DF-L

Species Included in Combination	Growth Region
 <p>Douglas Fir Western Larch</p>	 <p>■ Douglas-Fir ■ Western Larch</p>

D Fir-L includes Coastal Douglas-fir, Interior Douglas-fir, and Western Larch.



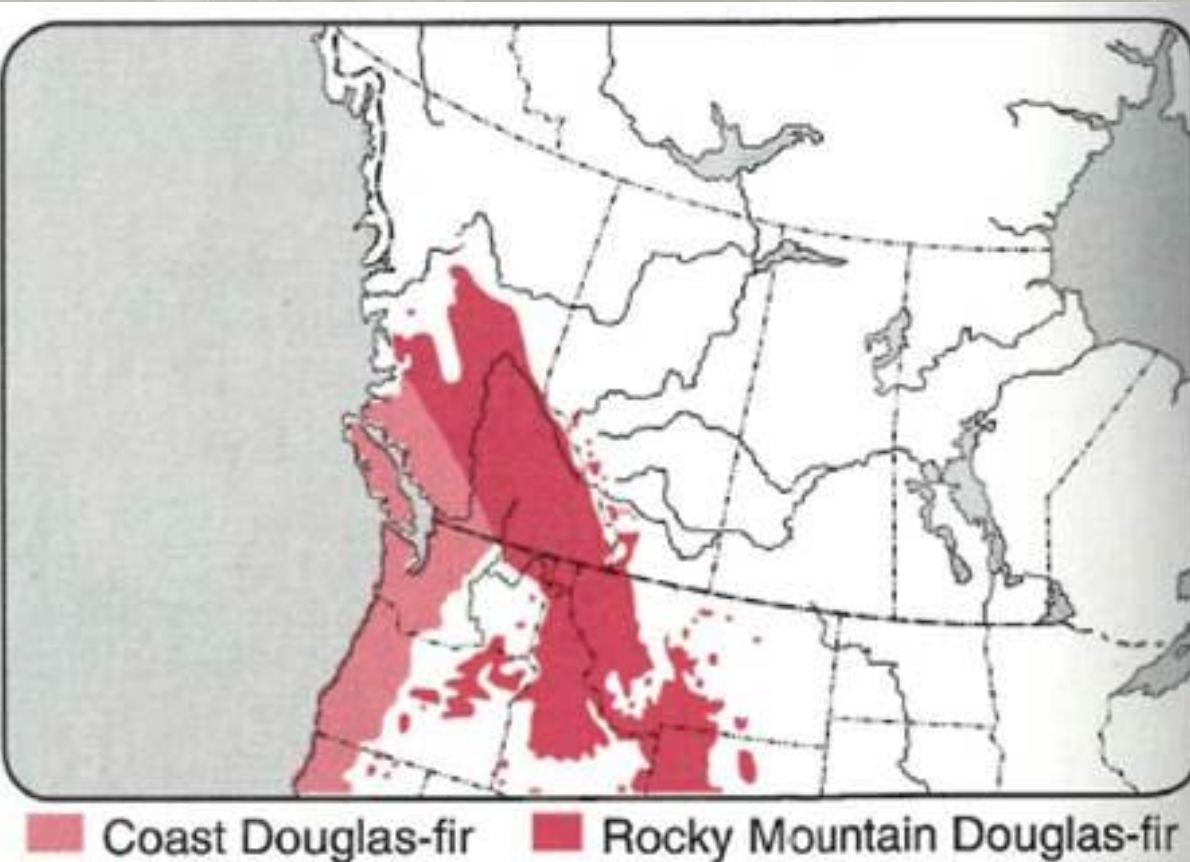
Ministry of Forests, Lands, Natural Resource Operations
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COASTAL D-FIR GROWING REGION

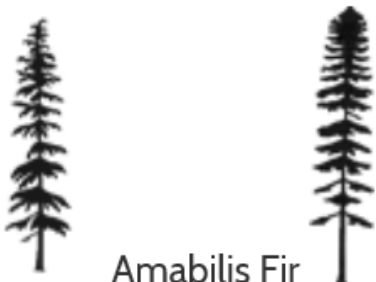

Source: Trees in Canada (page 110), by John Laird Farrar (1995)

As depicted in the 'pink' coloured polygons, Coastal D-Fir grows:

- on Vancouver Island,
- along Coastal BC, in a fringe bordered roughly by Bella Coola to the north, and inland by Chilliwack and Abbotsford, as far north east as Yale, and south of Whistler. Beyond these boundaries, there are transitional zones between Coastal D-Fir and Interior D-Fir. For example, closer to Merritt, there are both transitional fir zones and Interior D-Fir, and
- along the coast of Washington and Oregon.












HEM-FIR NORTH GROWING REGION

Species Combination: Hem-Fir Abbreviation: Hem-Fir or H-F	
Species Included in Combination	Growth Region
 <p>Pacific Coast Hemlock Amabilis Fir</p>	 <p>Pacific Coast Hemlock Amabilis Fir</p>

Hem-Fir North is a Canadian subset of Hem-fir that includes Western Hemlock and Pacific silver (amabilis) fir.



SPF GROWING REGION

Species Combination: Spruce-Pine-Fir		
Abbreviation: S-P-F		
Species Included in Combination		Growth Region
<p>✓</p> <p>White Spruce</p> 	<p>✓</p> <p>Engelman Spruce</p> 	
 <p>Red Spruce</p>	 <p>Black Spruce</p>	
 <p>Jack Pine</p>	<p>✓</p> <p>Lodgepole Pine</p> 	
<p>✓</p> <p>Alpine Fir</p> 	 <p>Balsam Fir</p>	

⁶ Spruce-Pine-Fir West (SPF West) is a Western Canadian subset of Spruce-Pine-Fir that includes *Engelmann Spruce*, *Western White Spruce*, *Lodgepole Pine*, and *Alpine Fir*.



Lumber Grade Stamps



9.11.1.3 Identification of wood

All wood shall be identified by a grade stamp or certification of an association or independent grading agency approved by the Canadian Lumber Standards Accreditation Board as specified in CSA O141. When it is possible that preservative treatment could obscure the grade stamp, a certificate of inspection or other evidence of grade approved by the engineer shall be supplied by the treating company.

Reference: CSA S6-14 & 19





CANADIAN LUMBER STANDARDS ACCREDITATION BOARD
 QUALITY MANAGEMENT IN CANADA'S LUMBER INDUSTRY

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Council of Forest Industries

The Council of Forest Industries (COFI) is the voice of the BC interior forest industry. COFI companies operate 100 production facilities in more than 60 forest-dependent communities in the interior of British Columbia. COFI member company operations account for approximately 80 percent of all BC softwood lumber shipments and 35 percent of Canadian softwood lumber shipments. COFI is a CLSAB-accredited Lumber Grading Agency.



Council of Forest Industries

250 - 1855 Kirschner Road
 Kelowna, BC
 Canada, V1Y 4N7

Tel: 250-860-9663
 Fax: 250-860-0009
 Web: www.cofi.org

Accredited to supervise:

- Visually Graded Lumber
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- Machine-Graded Lumber



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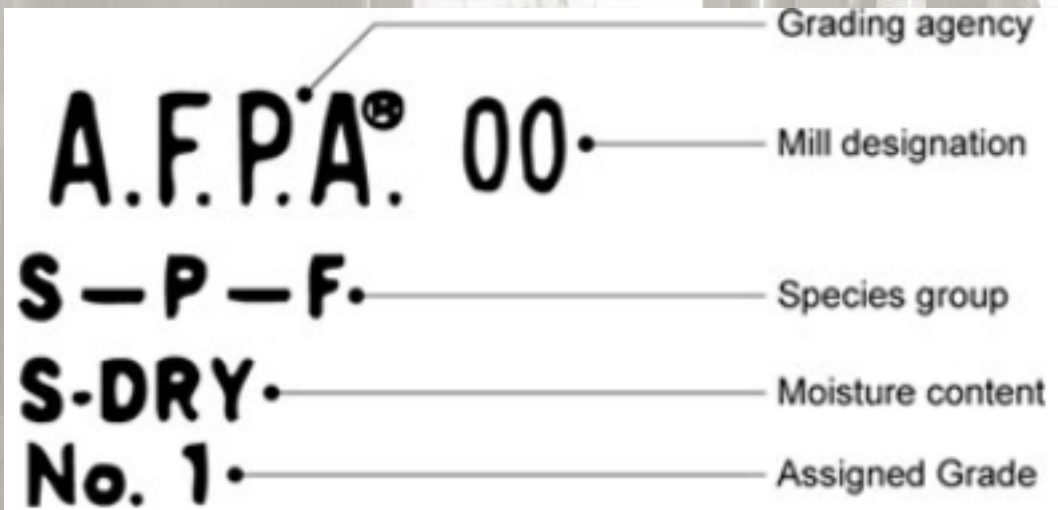


MERCER INTERNATIONAL GROUP





Lumber Grade Stamps



Lumber Quality Verification¶

Grade Stamped Lumber¶

13. For verification of lumber quality, each piece of rough lumber must be marked with a certified grade stamp issued by the accredited Grading Agency, showing as a minimum the:¶

- a. → registered symbol of the certified agency (i.e., accredited Grading Agency)¶
- b. → mill and/or grader identity usually by number¶
- c. → grading rule used where applicable¶
- d. → grade¶
- e. → condition of seasoning¶
- f. → species or species group.¶



American Lumber Standard Committee, Incorporated®



Pacific Lumber Inspection Bureau (PLIB)
909 South 336th Street
Suite 203
Federal Way, WA 98003

253.835.3344
fax: 253.835.3371
e-mail: info@plib.org

1. Approval as an inspection agency including mill supervisory service under:
 - a. WCLIB rules
 - b. WWPA rules
 - c. RIS rules
 - d. NLGA rules
2. Approved to supervise glued and machine graded lumber.
3. Approved to provide heat treatment audit services under all rules.



Canadian Mill Services Association (CMSA)
#200, 601-6th Street
New Westminster, BC V3L 3C1

604.523.1288
fax: 604.523.1289
e-mail: sing@canserve.org

1. Approved as an inspection agency including mill supervisory service under:
 - a. NLGA rules
 - b. NGR portion of WWPA rules for Douglas fir, larch, and SPF(S)
2. Approved to supervise glued and machine graded lumber.
3. Approved to provide heat treatment audit services under all rules.



CMSA 100 HT



Canadian Softwood Inspection Agency, Inc. (CSI)
MacDonald Inspection Services (MI)
403-20238 Fraser Highway
P.O. Box 61599
Langley, BC V3A 4E6

604.568.6911
888.331.8200
fax: 604.568.6933
e-mail: info@canadiansoftwood.com



Ministry of Forests, Lands, Natural Resource Operations
and Rural Development

Certificate of Inspection

No. **30635**

PLB **PACIFIC LUMBER INSPECTION BUREAU**
 909 South 336th Street, Suite 203, Federal Way, WA 98003 • Phone: (253) 835-3344 • Fax: (253) 835-3371 • Web: www.plb.org

U.S.A.
CERTIFICATE OF INSPECTION

ORDER No. PO#3045-935 WO#2637 PAGE

NAME AND ADDRESS OF SUPPLYING MILL Woodco Industries Ltd. 4753 Jackpine Drive Barriere, BC V1E 1E0	NAME AND ADDRESS OF CONSIGNEE Stinger Welding P.O. Box 2808 Prince George, BC V2N 4T6	
GRADING RULES NLGA Standard Grading Rules for Canadian Lumber	TOTAL PIECES 1380 pcs.	TOTAL BOARD FEET 69,637
MARK ON EACH PIECE Graded with purple lumber crayon on face or end of each piece (S= Select, 1=No.1, 2=No.2).		DATE TALL October 15, 16

I/We the undersigned, approved supervisor(s) and/or agent(s) of PLIB and at the time acting in that capacity, do hereby certify that I/we have inspected on the date(s) and at the place stated, the material herein described and that the material was in good order and condition at the time of inspection.

This Certificate is not valid unless bearing the seal of the Pacific Lumber Inspection Bureau, free from alterations or additions of any nature, and countersigned by an authorized representative.

The undersigned, as authorized representative of PLIB, hereby certifies the above named are approved supervisors or agent(s) of PLIB.

Countersigned: *Maureen Rose* Pacific Lumber Inspection Bureau Dated: October 28, 2019

SPECIFICATION
FULL SAWN - DET - ROUGH - GREEN

"NO. 2" & Better- STRUCTURAL JOISTS and PLANKS per para No. 124.a-c:
 HEM FIR (N): 3x10 450/10 450 pcs.

Canadian Mill Services Association

Suite 200, 601-6th Street, New Westminster, B.C. V3L 3C1
 Tel: (604) 523-1288 Fax: (604) 523-1289 Web: www.canserve.org

CERTIFICATE OF INSPECTION

Certificate Number:	COI 20xx-xx	Date:	Xxxxxx
Mill Order Number:		Date Inspected:	xxxxxx
Mill / Wholesaler:		Lot/Mark:	
Destination:		Grade Rules:	
Species:		Surfacing:	
Seasoning:		Mill Number:	

MATERIAL INSPECTED

Lot#	Species	Grade	Size	Length	Pieces	Package	Net m ³



Recent Non-conformance Situation

1. A ministry order for non-treated timber deck modules and loose timbers did not expressly specify that a Certificate of Inspection was acceptable for lumber quality verification purposes in lieu of grade stamped lumber.
2. Grade stamping was not carried out by the supplier. Instead, after the supplier shipped the wood products, it provided unsatisfactory lumber quality verification letters to the ministry titled “Quality Control Grade Declaration” signed by the mill.
3. The ministry rejected the supplier’s letters, and requested the supplier to retain a CSLAB Accredited Agency at the supplier’s cost to inspect the supplied wood products for quality verification.
4. The CSLAB Accredited Agency determined some pieces were off grade in a few timber deck module panels, and the supplier was requested to rectify deficiencies at its cost.



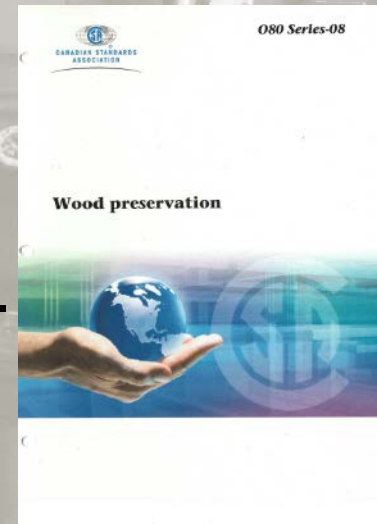
Pressure Treated Wood Standard for Timber Deck Bridge Components



Ministry of Forests, Lands, Natural Resource Operations
and Rural Development

Why do we have Treated Wood Standards?

1. To produce a consistent, industrial quality, treated wood that will provide long term performance for the intended use & exposure condition.
2. To meet CSA 080 Standards for Wood Preservation, including its '**results based**' criteria for retention and penetration.
3. To meet Best Management Practices to protect the environment.
4. To require quality assurance with 3rd party inspection of process, and testing of preservative retention & penetration to gauge against CSA 080 results based criteria.



Why do we have Treated Wood Standards?

5. To establish standards for suppliers that will create a level playing field.
6. *Properly preservative-treated wood can have 5 to 10 times the service life of untreated wood. This extension of life saves the equivalent of 12.5% of Canada's annual log harvest.*

Source:
Canadian Wood Council
<http://cwc.ca/design-with-wood/durability/pressure-treated-wood/>
7. Wood products treated in accordance with CCA 080 Series of Standards are expected to significantly outlast untreated wood.



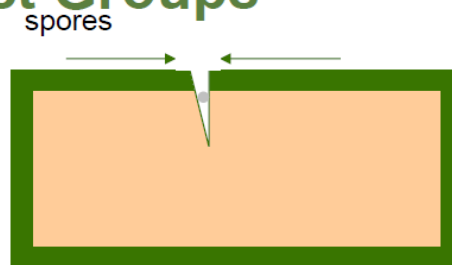


- Chemicals are used to treat wood (the chemicals react with the wood)
- Chemicals make wood unattractive to wood-rotting fungi and insect pests like borers & termites
- Typically:
 - Specify galvanized steel where bare steel would rust;
 - **Similarly**, specify treated wood where it will be used in a setting conducive to decay and insect attack

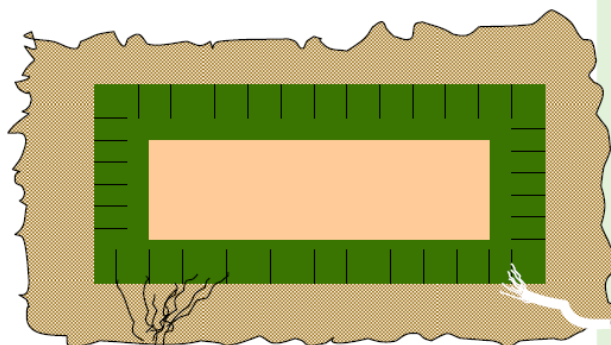


Ignore Residential Product Groups

- Shallow penetration OK for above ground, low decay hazard, if cuts are field-treated.



Actively growing fungus



- Structural and ground contact needs incising

Graphic Source: FPInnovations



Photo Source: FPInnovations

Incising improves the penetration into impermeable wood by making a series of small, shallow slits cut into the wood by an incising machine





**Ministry of Forests, Lands, Natural Resource Operations
and Rural Development**

Overview of CSA 080 Series Standards for Wood Preservation

1. Series of 5 standards (specifications; processing, sampling and results requirements; preservative formulations; solvents; and chemical additives)
2. Gives technical specification requirements based on a “Use Category System” (UCS)
3. UCS is designed to match level of treatment to decay/termite risk by matching the:
 - wood species
 - preservative type
 - preservative penetration, mm
 - preservative retention (loading) e.g., kg/m³



Best Management Practices: For the use of treated wood in aquatic and wetland environments:

<http://preservedwood.org/portals/0/documents/BMP.pdf>

- Provides:
 - BMP quality assurance procedures
 - specific recommendations for each preservative type
 - processes to minimize mobility of preservative (e.g., CCA fixation)
 - processes to maximize cleanliness of wood surface
 - guidelines for installation and maintenance



Guidelines for Use of Treated Wood In and Around Aquatic Environments and Disposal of Treated Wood:

 Ministry of Transportation and Infrastructure | Ministry of Forests, Lands and Natural Resource Operations

Guidelines for Use of Treated Wood In and Around Aquatic Environments and Disposal of Treated Wood

1.0 SCOPE

This document is to provide information on mitigating or minimizing potential impacts of treated wood used in new structures in and around aquatic environments. This document does not provide guidance on the engineering requirements of structures using treated wood.

1.1 BACKGROUND

Wood is a renewable resource and can be a cost effective option for structures. The Province of British Columbia has committed to stimulate the forest industry with the Wood First Act, which requires wood to be considered as a primary component in all public buildings. The BC Ministry of Transportation and Infrastructure (MOTI) and Ministry of Forests, Lands and Natural Resource Operations (FLNR) are following in the spirit of the Wood First Act by encouraging the use of treated wood on bridges where appropriate. For applications exposed to soil, rain, or water, wood should be treated with preservatives to protect it from decay, which will conserve and prolong the service life of the wood.

1.2 REGULATORY FRAMEWORK

Pest Management Regulatory Agency

In Canada, the Pest Management Regulatory Agency (PMRA) under Health Canada and in the United States, and the Environmental Protection Agency (EPA), have regulatory authority over the use of wood preservatives and treated wood. Jointly, these agencies regularly conduct a thorough review of the environmental impacts of treated wood. Each of the wood preservatives discussed in these guidelines are currently registered by PMRA. Labels which describe the accepted uses of products are available on the PMRA web site at www.hc-sc.gc.ca/tps-spc/pest/index-eng.php.

Environment Canada

A 1985 Memorandum of Understanding (MOU) between Fisheries and Oceans Canada (DFO) and Environment Canada (EC) states that EC is responsible for the administration and enforcement of the pollution prevention provisions of the federal Fisheries Act. Subsection 34(1) of the Fisheries Act defines a "deleterious substance" as any substance that degrades the quality of water so that it is deleterious to fish or fish habitat. Subsection 36(3) prohibits the deposit of a deleterious substance of any type in water frequented by fish. In some cases, the pesticides found in treated wood are considered to be a deleterious substance, should the preservatives leach into an area deemed to be fish habitat.

Fisheries and Oceans Canada

DFO is responsible for enforcement of all sections of the Fisheries Act, however, Environment Canada currently administers and enforces the pollution prevention provisions of the Fisheries Act per the aforementioned 1985 MOU. DFO administers the footprint impacts of works that occur in and about fish habitat, through subsection 35(1) which prohibits unauthorized works that cause the harmful alteration, disruption, or destruction of fish habitat. DFO administers and enforces subsection 36(3) in regards to the release of sediment and other deleterious substances that are not considered chemical pollutants.

While a wood preservative may be registered as an approved product by PMRA, it is the responsibility of the proponent to ensure that use of the treated wood will not cause the release of a deleterious substance as defined under subsection 36(3) of the Fisheries Act (laws-lois.justice.gc.ca/eng/acts/F-14/).

EC does not provide authorizations or permits relating to either the use of treated wood products, or for the deposition of acceptable levels of wood preservatives released in sensitive environments. Also, EC does not endorse or certify commercial products, including wood preservatives.



September 2013 | Guidelines for Use of Treated Wood In and Around Aquatic Environments and Disposal of Treated Wood – page 1

https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-resource-use/resource-roads/bridge-design-construction/guidelines-treated_wood.pdf



CSA 080 Use Categories

UC4.1 (hazard class)

&

Product for highway construction, above ground, exterior use for bridge construction

Table 1
Use categories and associated service conditions

(See Clauses 5.1.1 and 5.2.)

Use category	Service conditions	Use environment	Common agent(s) of deterioration	Typical application(s)
UC1	Interior construction — above ground — dry	Protected against weather and other sources of moisture	Insects	Interior construction and furnishings
UC2	Interior construction — above ground — damp	Protected against weather, but can be exposed to moisture	Decay fungi and insects	Interior construction
UC3.1	Exterior construction — above ground — coated and rapid water run off	Protected against weather by coating or cladding and not subject to prolonged wetting	Decay fungi, disfiguring fungi, and insects	Coated millwork, siding, and trim
UC3.2	Exterior construction — above ground — uncoated or poor water run off	Exposed to all weather cycles, including prolonged wetting	Decay fungi, disfiguring fungi, soft-rot fungi, and insects	Decking, deck joists, railings, fence pickets, and uncoated millwork
UC4.1	Ground contact or freshwater — non-critical components	Exposed to all weather cycles; normal exposure conditions, including salt water splash*	Decay fungi, disfiguring fungi, soft-rot fungi, and insects	Fence, deck, and guardrail posts, crossties, and utility poles (low-decay areas)
UC4.2	Ground contact or freshwater — critical structural components or difficult replacement	Exposed to all weather cycles; high potential for decay	Decay fungi, disfiguring fungi, soft-rot fungi, and insects (with increased potential for biodeterioration)	Land, freshwater, and foundation piles, permanent wood foundations, building poles, horticultural posts, crossties, and utility poles (high-decay areas)
UC5A	Coastal waters — brackish water or salt water and adjacent mud zone	Continuous salt water exposure	Salt water organisms	Piles, bulkheads, and bracing



CCA: Copper is the primary fungicide, arsenic is a secondary fungicide and an insecticide, and chromium is a fixative which also provides UV resistance.

Table 1 Wood Preservative Treatment Types				
Allowable Preservative Treatment Types (Note: FLNR will specify required treatment type in a purchase order or contract document)	Allowable Wood Species for Treatment	Required Treatment Standard	Bridge Components, Wood Species, and Use Category Combinations	
Oilborne Preservatives	\$\$\$ Creosote (CR)	<ul style="list-style-type: none"> Coastal D-Fir Hem-Fir North³ 	See Table 1 or 2 (as applicable) of <i>Bridge Timbers and Lumber Material Standard</i>	
	\$\$\$ Pentachlorophenol in type A oil (PCP-A)			
Waterborne Preservatives	Chromated copper arsenate, Type C (CCA)	<ul style="list-style-type: none"> Coastal D-Fir 		Apply FLNR's process specification for CCA treatment called, <u>Interim Process Specification for CCA Treatment of Coastal Douglas-fir Wood</u>
		<ul style="list-style-type: none"> Hem-Fir North 		Meet or exceed CAN/CSA 080 Series "Wood Preservation" in effect and applicable at the time of treatment
	Ammoniacal copper zinc arsenate (ACZA) Only in US!	<ul style="list-style-type: none"> Coastal D-Fir Hem-Fir North 		Meet or exceed CAN/CSA 080 Series "Wood Preservation" in effect and applicable at the time of treatment



Background history behind development of process based CCA treatment specification

Evaluated wood treatment options:

Oil Borne:

- Creosote (**CR**)
- Pentachlorophenol in Type A Oil (**PCP-A**)

Water Based:

- Ammoniacal Copper Zinc Arsenate (**ACZA**)
- Chromated Copper Arsenate, Type C (**CCA**)

Desired criteria:

- An economical waterborne preservative
- Treatment type readily available in BC
- Treatment to be effective with D-Fir
- 3rd party inspection



Background history behind development of process based CCA treatment specification

- **Focussed on CCA:**
 - Economical
 - Less environmental “baggage”
 - Fewer implications for handling
 - Readily available within BC
 - Best option considering alternatives
 - Better than what we had at the time
 - Worth an attempt

Recognized that not likely to attain CSA-080 Series results for penetration (and sometimes for retention) - thus

Ministry decision to move forward with development of a process based specification for CCA treatment of Coastal Douglas-fir



CCA is not recommended for treatment of Interior Douglas-fir

"CCA is considered an excellent treatment for most softwood species. Achieving the required penetrations in Douglas-fir may be extremely difficult. CCA is not recommended ... for treatment of interior Douglas-fir."

Reference: Page 14 of Best Management Practices: For the use of treated wood in aquatic and wetland environments:

<http://preservedwood.org/portals/0/documents/BMP.pdf>



Ministry of Forests, Lands, Natural Resource Operations
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CCA is not recommended for treatment of Interior Douglas-fir

Table 6 of CSA 080

Table 6
Wood species and associated use categories — Sawn products
(See Clauses 8.1, 8.2, and 9.1.1.)

Species	UC1 and UC2	UC3	UC4.1	UC4.2	UC5A	Permanent wood foundations	Shakes and stingles	Sawn crossarms	Highway bridges
Softwoods									
Pines									
Eastern white pine	X	X	X	X		X			
Jack	X	X	X	X	X	X		X	
Lodgepole	X	X	X	X	X	X	X	X	
Ponderosa	X	X	X	X	X	X			
Red	X	X	X	X	X	X			
Southern	X	X	X	X	X	X	X	X	X
Western white pine	X	X	X	X		X			
Hemlocks, true firs, and spruces									
Hem-Fir	X	X	X	X	X	X		X	X
Hem-Fir orth N	X	X	X	X	X	X		X	X
Eastern hemlock	X	X	X						
Western hemlock	X	X	X	X	X	X		X	X
True fir f	X	X	X	X		X			
Spruce-Pine-Fir	X	X							
Spruce-Pine-Fir West	X	X	X						
Engelmann spruce	X	X	X						
Western white spruce	X	X	X						
Douglas fir									
Coastal	X	X	X	X	X	X		X	X
Interior								X	
Cedars									
Western red	X	X					X		
Yellow cypress	X	X						X	
Hardwoods									
Beech	X	X	X						



Description of FLNRO CCA Process Specification

- 3rd party Quality Assurance (QA) inspection required
 - Inspections at the treatment plant to verify conformance with process specification
 - Tests of preservative retention and penetration
- Documentation requirements:
 - Inspection reports of CCA Process
 - record of pressure treatment and treating cycle summary
 - record of retention and penetration test results
 - Statement of CCA Treatment Process Conformance
 - Letter specifying log source for Coastal D-Fir

CSI Canadian Softwood Inspection Agency, Inc.
TREATED WOOD PRODUCTS
Inspection and Progress Report

Name: Douglas Fir Timbers Purchase Order No.: Report No.: 3
Client: Specification: NLGA Project: _____
Treatment Specification: MFR Date: _____
Manuf. And Location: Stella James Inc. Manuf. P/O No.: _____
Seasoning (MCN): Min: _____ Max: _____
Destination: Prince George, BC Charge No.: 69926
Forward to Drawing: No Incised: Yes

PENETRATION RESULTS						MATERIAL INSPECTED				
<input type="checkbox"/> Incised Zone <input type="checkbox"/> Non-Incised Zone						Process	<input type="checkbox"/> LDRY	<input type="checkbox"/> ADHNG	<input type="checkbox"/> REFSAL	
100% SAMP	20% SAMP	5.0% SAMP	20% SAMP	20% SAMP	5.0% SAMP	DB	NO OF PIECES	SOB CLASS	LENGTH	CU FT
1	15	1	1							
2	4	2								
3	11	3								
4	12	4				12	8x10	16	1280	
5	4	5				28	8x10	14	3547	
6	6									
7	3	7								
8	9									
9	11	2								
10	10	2								
11	10	1								
12	16	2								
13	1	1								
14	5	4								
15	6	1								
16	4	2								
17	10	7								
18	9	8								
19	18	7								
20	4	0								
						TREATABLE CUBIC FEET IN CHARGE: 1121				

PRESERVATIVE		TREATING CYCLE SUMMARY			
<input type="checkbox"/> Creosote	<input type="checkbox"/> CCA	Stage	Temp	Time	Pressure
<input type="checkbox"/> Pentachlorophenol	<input type="checkbox"/> ACQ	Pre-treatment	150	15	100
<input type="checkbox"/> CCA	<input type="checkbox"/> SO2	Initial Vacuum	0.5		22.9
		Soak			
		Boil-off			
		HEAT AP			
		Pressure	6.0	70	112
		Pre-Soak			
		Final Soak	0.7		23.0
		Soak - Pre			
		TOTAL TIME FOR TREATING	8.7		

RENTENTION BY GAUGE

RENTENTION BY ASSAY

RUNNING TALLY

Ministry of Forests, Lands and Natural Resource Operations
Statement of CCA Treatment Process Conformance

Description of CCA Wood Treatment Order:

Producer of CCA Treated Wood (give company name and location):

Ministry Office: _____ Required Delivery Location: _____

Ministry Purchase Order No. or Contract No.: _____ Name of ministry Bridge Engineer (name provided in the purchase order or contract documents): _____

This is to advise that I am the qualified inspector for this CCA wood treatment order, and I am (check one as appropriate):

an accredited inspector by **INSERT AGENCY NAME**

OR

not an accredited inspector, but qualified by experience and having the minimum qualifications in accordance with the requirements of the Ministry of Forests, Lands and Natural Resource Operations Process Specification for CCA Treatment of Coastal Douglas-fir Wood.

I have personally inspected **STATE NUMBER** treated wood pieces containing **STATE NUMBER** Foot Board Measure (FBM) as manifested in the attached supporting documentation.

I have carried out my inspections of the treatment procedures and processes considered necessary to verify compliance with the requirements of the Ministry of Forests, Lands and Natural Resource Operations Process Specification for CCA Treatment of Coastal Douglas-fir Wood. Based on these inspections, I hereby give my assurance that, in my opinion the significant aspects of the wood treatment have been carried out in general conformance with clauses 1 and 2 of the ministry's CCA process specification.

I have undertaken the required penetration and retention testing, and I confirm the results of the testing are representative of the CCA treated wood order.

I have attached copies of the following documentation to this statement: (1) all process inspection reports; (2) all penetration and retention test results and other relevant documentation in order to confirm the supplier's adherence to the specifications; and (3) the supplier's evidence demonstrating that the treated wood is Coastal Douglas-fir.

Signature of Qualified Inspector: _____

Name of Qualified Inspector (please print): _____ DATE SIGNED: YYYY MM DD (If an "accredited inspector," identify credentials here)

EMPLOYER'S NAME AND ADDRESS (please print): _____

PHONE NO.: _____ FAX NO.: _____ E-MAIL ADDRESS: _____



Ministry of Forests, Lands and Natural Resource Operations

CSA-080 Compared to Retention Results

- Ref. CSA-080.1-15 (Table 10)
- Preservative retention requirements depend on
 - preservative type
 - UC #
 - wood species
- Coastal D-Fir, UC4.1, CCA
 - $0.4 \text{ lb/ft}^3 = 6.4 \text{ kg/m}^3$

Table 10 (Continued)

Preservative	Eastern white, ponderosa, and red pine	Jack and lodgepole pine	Southern pine	Western white pine	Hem-Fir North, eastern and western hemlock, and true firs	Spruce-Pine-Fir and Spruce-Pine-Fir West	Engelmann and western white spruce	Coastal Douglas fir	Western larch	Western red cedar	Yellow cypress
UC4.1 (Residential Product Group D only) (continued)											
MCA	3.3	3.3	3.3	3.3	3.3						
MCQ	6.4	6.4	6.4	6.4	6.4						
UC4.1 (All other uses)											
ACQ-C	6.4	6.4	6.4	6.4	6.4	6.4†††	6.4	6.4			
ACQ-D	6.4	6.4	6.4	6.4	6.4	6.4†††	6.4	6.4			
ACZA	6.4	6.4	6.4		6.4			6.4	6.4	6.4	
CA-B	3.3	3.3	3.3	3.3	3.3	3.3†††	3.3	3.3			
CCA§§	6.4	6.4	6.4		6.4			6.4	6.4	6.4	
CR	128	128	128	128	160††	120‡‡	128	128	160††	120‡‡	128
CR-S	128	128	128	128	160††	120‡‡	128	128	160††	120‡‡	128
CuN			0.8					0.8			
MCA	3.3	3.3††	3.3	3.3	3.3††						

Test results from ministry orders indicate that process specification results in meeting or exceeding the retention requirements of CSA-080



CSA-080 Compared to Penetration Results

Ref. CSA-080.2-15 (Table 5)

- # required test borings depend on - wood species, product thickness & preservative type
- CCA treated Coastal D-Fir need:
 - minimum of 20 boring samples per charge
 - 16 of 20 borings (80%) must meet penetration requirement

Table 5
Minimum penetration requirements for sawn products*
 (See Clauses 9.1.8.1, 9.1.10.4, and 9.7.3.1 and Tables 8, 9, 11, and 13 to 15.)

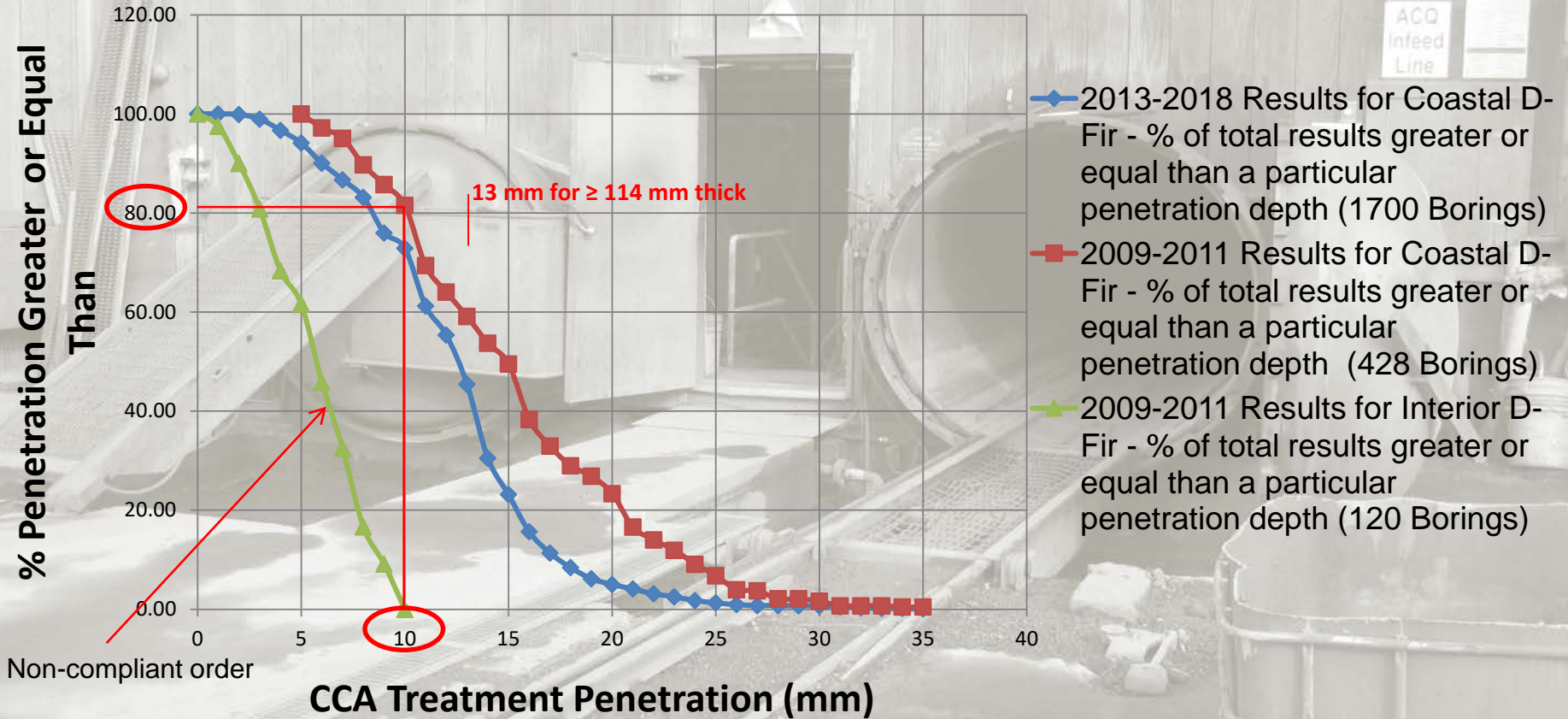
Species	Incising‡	Penetration depth†		Products All Marine (UC5A)	Number of borings required		Percentage of borings required to meet penetration requirement
		Products < 114 mm thick	Products ≥ 114 mm thick		CR, CR-S, and CR-PS	All other preservatives	
Coastal Douglas fir	Required	10 mm and 90%	13 mm and 90%	13 mm and 90%	48	20	80





Ministry of Forests, Lands, Natural Resource Operations
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Penetration Test Results Using FLNRO CCA Process Specification for Coastal D-Fir



Considerations to Address Delivery Concerns of Treated Wood Orders

1. Continue to work with contract timber and treatment suppliers to make sure they understand the standards and expectations.
 - Prior to award of purchase order/contract, discuss requirements of order with the low bidder to confirm understanding of the ministry standards for lumber and treated wood materials. This will help to avoid order problems.
 - Review requirements in detail particularly with any new supplier that has not successfully supplied previously to the ministry.
2. Encourage ordering of treated timber deck / misc. wood well in advance because:
 - there are no stock piles of industrial treated wood, and
 - wood has to be ordered, then fitted into a treatment schedule at the treating plant



Considerations to Address Delivery Concerns of Treated Wood Orders

3. Possibly pre-order Coastal D-Fir, get it treated locally by a treater that can meet the FLNRO treatment standards, store in ministry yard, ready as a source of material for assembly or use in the future
4. Possibly pre-order fully assembled, treated timber deck modules, and store in yard
5. Possibly combine bulk orders from various business areas.





Q & A



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