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NWPC- INFORMATION

NWPC FIELD TEST NO. 1
WITH PRESSURE PRESERVATIVES
RESULTS DURING 10 YEARS' TESTING

NTR feltforsøg nr. 1
med trykimprægneringsmidler
Resultater gennem 10 års prøvning



NORDIC WOOD PRESERVATION COUNCIL
Nordisk Træbeskyttelsesråd

NWPC - THE NORDIC WOOD PRESERVATION COUNCIL

NTR - Nordisk Træbeskyttelsesråd

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Secretariat: 1982 Norway
1983 Sweden
1984 "
1985 Finland

NWPC FIELD TEST NO.1 WITH WOOD PRESERVATIVES

Results after 10 years' testing

Erik Borsholt

INTRODUCTION

Stake tests have a long tradition in Denmark, Finland, Norway and Sweden.

In 1968 a field test with stakes was started by the NWPC in co-operation with the Technological Institute, Denmark, the Technical Research Centre of Finland, the Norwegian Institute of Wood Working and Wood Technology and the Royal College of Forestry (nowadays included in the Swedish University of Agricultural Sciences).

The test includes Baltic redwood (*Pinus sylvestris*, L.) sapwood stakes pressure treated with 8 wood preservatives to 5 retention levels and is being carried out in accordance with NWPC Standard for testing of wood preservatives No.1.4.2.1/71: "Field test with stakes".

The stakes are still under exposure in 4 test-fields, of which there is one in each country (See Fig. 1).

The test has been under the supervision of

Denmark:	E. Borsholt
Finland:	O. Perttunen T. Vihavainen
Norway	G.S. Klem F.G. Evans
Sweden:	B. Henningsson Ö. Bergman

The results after 5 years' testing were published in NWPC Information No.6, 1974.

METHOD

Selection and treatment of stakes

The stakes were made of *Pinus sylvestris*, L. sapwood from trees of normal growth from Central Sweden, uniformly seasoned by air-drying to a moisture content of 20% and planed to a dimension of 20 mm x 50 mm x 500 mm. The stakes were also free from knots, cracks, stain, decay, insect holes or other visible defects.

All preservative treatments were made by the fullcell method: Vacuum 30 minutes at 0.05 bar and pressure 90 minutes at 9,5 bar. Retentions were calculated for each stake, from the difference in weight before and after treatment, for each preservative *).

Five concentration levels of each preservative were used for the treatments to obtain retentions of

50	75	100	150	200 %
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of the expected minimum retention (1968) needed to acceptably protect Baltic redwood (*Pinus sylvestris*, L.) in ground contact.

*) The retentions given have been expressed as kilograms of commercial preservative per cubic meter of wood (kg/m^3).

Table 1. Preservatives used in the test
 Imprægneringsmidler i forsøget

Trade name Handelsnavn	Type (1)	Components Komponenter						
		As	B	Cr	Cu	F	PCP	Creo- sote (2)
Basilit CFK	W			x	x	x		
Boliden K33 (3)	W	x		x	x			
BP-Hylosan	OS						x	
Celcure A	W	x		x	x			
Creosote	TO							x
KP-Cuprinol	W				x		x	
Tanalith C (4)	W	x		x	x			
Wolmanit CB	W		x	x	x			

(1) W = Water-borne, OS = Organic solvent, TO = Tar oil.

(2) Creosote in accordance with the Scandinavian Requirements of 1936 for Creosote.

(3) Boliden K33 = Celcure K33 = Kemira K33 = meKem 33 = Rentokil K33 = Allvädars K33 = Mitrol K33 = Lahontuho K33.

(4) Tanalith C - 18% water of crystallization = Tanalith CCA.

The water-borne preservatives were dissolved in water. BP-Hylosan and creosote were diluted with toluene.

Installation and inspection of stakes

The stakes were buried in the ground to half their length (25 cm) in an upright position. The soil-types of the test fields are:

Finland, Vaasa:	Forest mould containing much organic material
Norway, Sørkedalen:	Sandy soil containing some organic material
Sweden, Simlångsdalen:	Sandy soil
Denmark, Tåstrup:	Moraine clay.

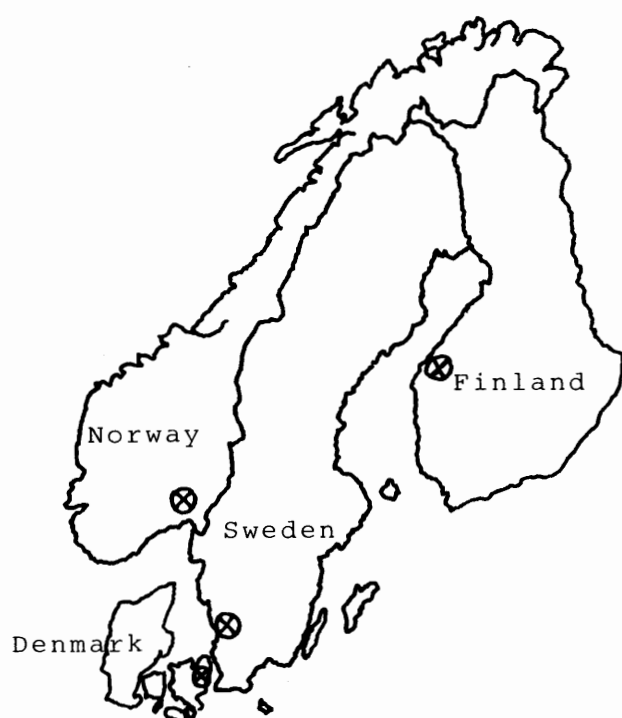


Fig. 1. Locations of the 4 Nordic test-fields

De 4 nordiske feltforsøgs beliggenhed

The stakes in Denmark were originally set in a test-field at Hillerød and in 1974 moved to Tåstrup. The other stakes have not been removed from where they were originally placed in 1968.

In the Nordic test-fields only decay by micro-organisms, mainly at the ground line, can be expected. The sites are far away north of the termite border in Europe.

The number of stakes at each preservative retention level were:

Finland, Vaasa:	10
Norway, Sørkedalen:	10
Sweden, Simlångsdalen:	20
Denmark, Tåstrup:	10

The stakes were taken up and inspected visually and/or by the Bending Apparatus (NWPC Standard No.1.4.2.1./71, Appendix No.1), and returned to their original place unless their condition indicated removal.

The following grading system was used to evaluate the decay:

<u>Condition</u>	<u>Index of decay</u>
Sound - no attack	0
Slight attack	25
Moderate attack	50
Severe attack	75
Failure in bending apparatus	100

By adding up the index of decay for the stakes of each group and dividing the sum by the number of stakes the average index of decay for each preservative and retention level was obtained. When all stakes in a group had failed (average index of decay = 100) the average service life was calculated.

RESULTS

The index of decay for all the stakes examined during the 10 years is shown in Figures 2 - 9.

The service life of the untreated stakes ranges from 1 year in Vaasa, Finland (North) to 5 years in Tåstrup, Denmark (South). Variations in the index of decay have also been observed for the treated stakes. The reasons for these variations have not been closely examined. However, the main reasons are expected to be soil and climate. The soil of the Vaasa field is very rich in organic matter and the climate is continental. Sørkedalen, Norway has a continental climate too but a poor soil, whereas Simlångsdalen, Sweden and Tåstrup, Denmark have a coastal climate with cool and moist summers.

The CCA preservatives Boliden K33, Celcure A and Tanalith C, show the highest protection per kg of commercial preservative at all the test-fields.

Basilit CFK and Wolmanit CB followed by KP-Cuprinol show a better relative protection in Simlångsdalen than at the other fields.

The organic solvent type preservative BP-Hylosan and creosote have given the best performance in Vaasa. But creosote has failed in all four test-fields at a retention level above that expected. The results are not in agreement with practical experience, e.g. with transmission poles. - The main reasons for the poor results for creosote and to a certain extent also for BP-Hylosan could be an unacceptable redistribution of preservative after treatment caused by the evaporation of the diluent (cf. R. Cockcroft: "Movement of creosote in wood caused by drying of volatile solvents", Wood 22: 331-337, August 1957) and the dimension of the stakes which does not permit a vertical movement of creosote to the ground line as observed in transmission poles.

In Table 2 the results from the water-borne wood preservatives are presented in ranked order as an average for the four test-fields. Creosote and BP-Hylosan have been left out for the reasons mentioned above.

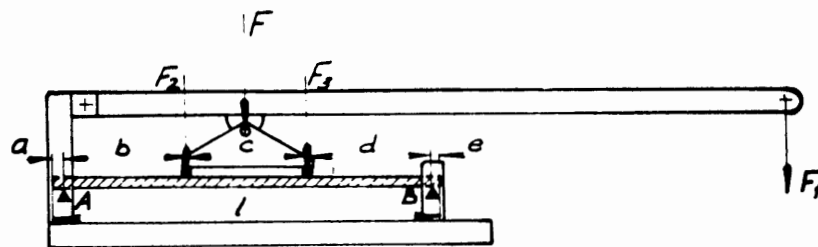


Fig. 1 b Bending Apparatus
NWPC Standard No. 1.4.2.1./71
Appendix 1, Fig. 2

Bøjebredsapparat
NTR Standard nr. 1.4.2.1./71
Appendix 1, fig. 2

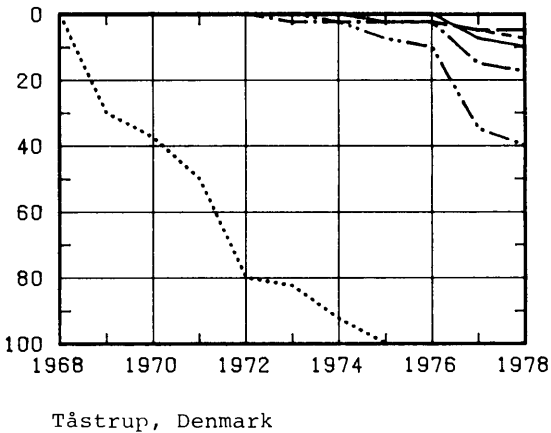
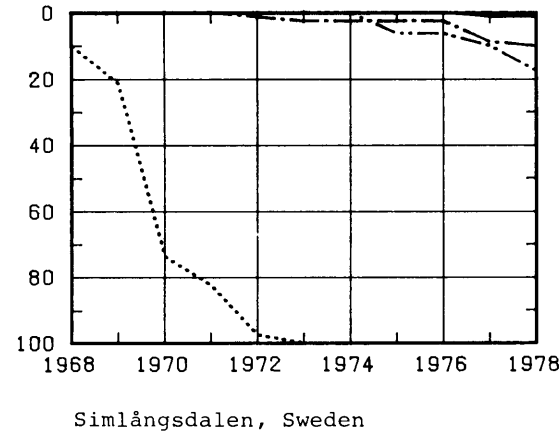
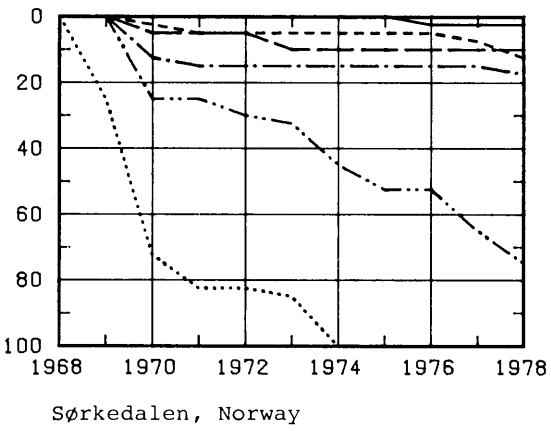
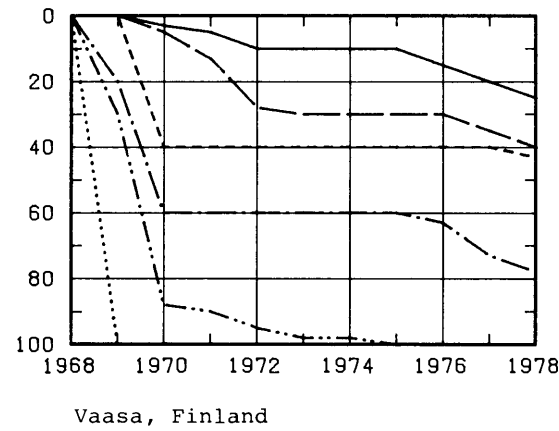
WOOD PRESERVATIVE: Basilit CFK
Imprægneringsmiddel:

WOOD: Pinus sylvestris L., sapwood
Træart: Skovfyr, splintved

CONCENTRATION: ————— 4.0%
Koncentration: - - - - - 3.0%
 - - - - - 2.0%
 - . - . - 1.5%
 - . . - . 1.0%
 0 %

TEST FIELD
Forsøgsplads

INDEX OF DECAY
Rådfaktor



Concentration	Retention	Index of decay and average service life ($\bar{x}$)											
Koncentration	Optagelse	Rådfaktor og gennemsnitlig funktionstid ($\bar{x}$)											
% w/w	kg/m ³	Vaasa Finland			Sørkedalen Norway			Simlångsdalen Sweden			Tåstrup Denmark		
		Year	- år	$\bar{x}$	Year	- år	$\bar{x}$	Year	- år	$\bar{x}$	Year	- år	$\bar{x}$
		5	10		5	10		5	10		5	10	
4.0	27.1	23	25		0	3		0	1		0	5	
3.0	20.2	40	40		10	10		0	0		0	3	
2.0	13.5	40	43		5	13		0	1		0	8	
1.5	10.1	58	78		15	18		0	8		3	15	
1.0	6.7	98	100	3.2	33	75		3	16		0	35	
0	0	100	100	1.0	85	100	4.7	100	100	3.4	78	100	5.1

Fig. 2. Basilit CFK - The development of index of decay during a 10-year period
Rådfaktor gennem 10 år

WOOD PRESERVATIVE: Boliden K33

Imprægneringsmiddel:

WOOD: Pinus sylvestris L., sapwood

Træart: Skovfyr, splintved

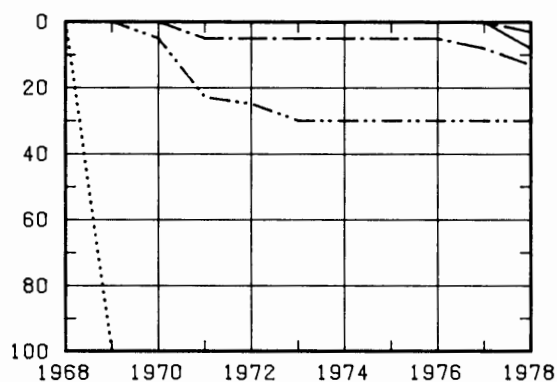
CONCENTRATION: ————— 4.0%
 Koncentration: - - - - - 3.0%
 - - - - - 2.0%
 - . - . - . 1.5%
 - . . - . . 1.0%
 0 %

TEST FIELD

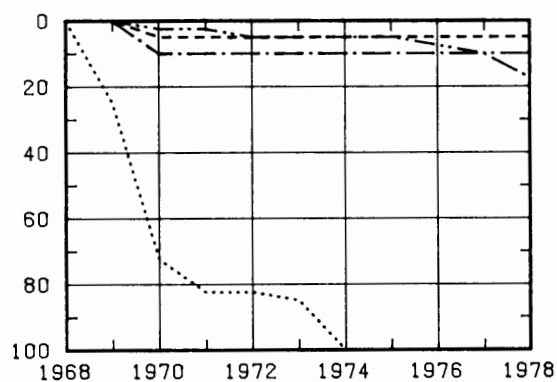
Forsøgsplads

INDEX OF DECAY

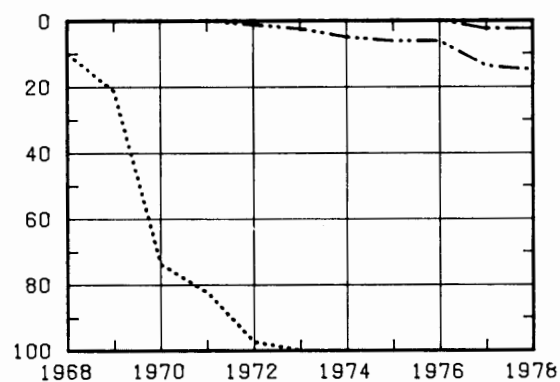
Rådfaktor



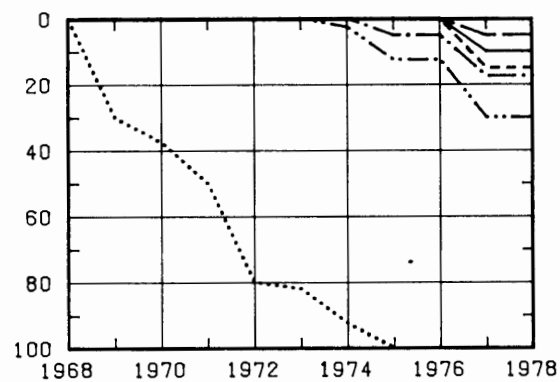
Vaasa, Finland



Sørkedalen, Norway



Simlångsdalen, Sweden



Tåstrup, Denmark

Concentration	Retention	Index of decay and average service life ($\bar{x}$)											
Koncentration	Optagelse	Rådfaktor og gennemsnitlig funktionstid ($\bar{x}$)											
% w/w	kg/m ³	Vaasa Finland				Sørkedalen Norway				Simlångsdalen Sweden			
		Year	- år			Year	- år			Year	- år		
		5	10	$\bar{x}$		5	10	$\bar{x}$		5	10	$\bar{x}$	
4.0	26.7	0	8			0	0			0	0		5
3.0	19.9	0	3			0	0			0	0		3
2.0	13.3	0	0			5	5			0	0		13
1.5	10.0	5	13			10	18			0	3		18
1.0	6.7	30	30			5	10			3	15		30
0	0	100	100	1.0		85	100	4.7		100	100	3.4	5.1

Fig. 3. Boliden K33 - The development of index of decay during a 10-year period
 Rådfaktor gennem 10 år

WOOD PRESERVATIVE: BP-Hylosan
Imprægneringsmiddel:

WOOD: Pinus sylvestris L., Sapwood
Træart: Skovfyr, splintved

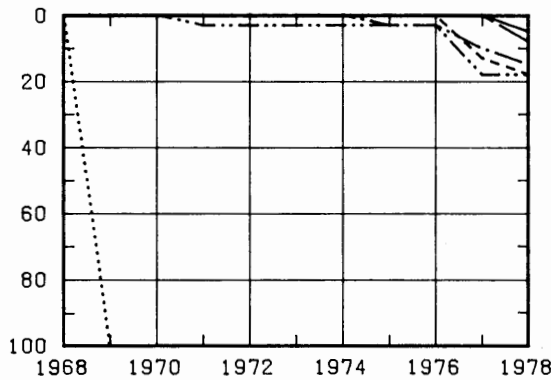
CONCENTRATION: 66.7%
Koncentration: 50.0%
33.3%
25.0%
16.7%
0 %

TEST FIELD

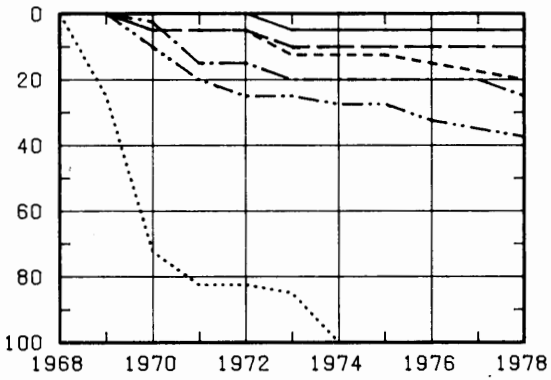
Forsøgsplads

INDEX OF DECAY

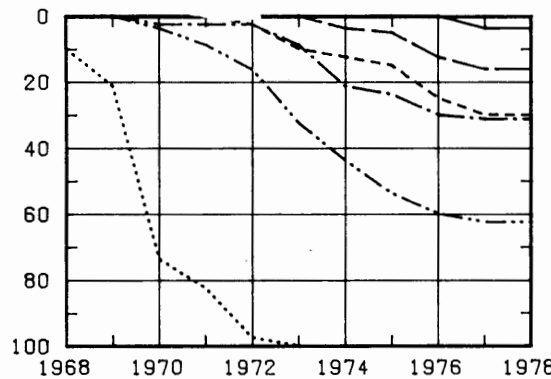
Rådfaktor



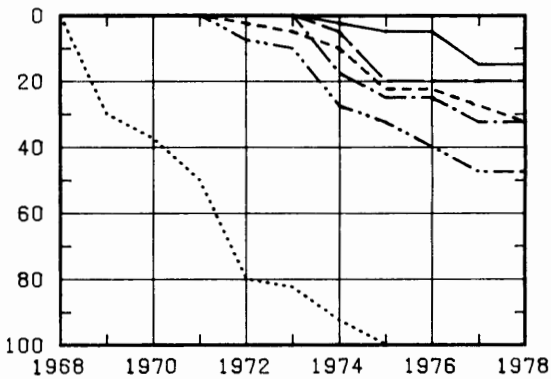
Vaasa, Finland



Sørkedalen, Norway



Simlångsdalen, Sweden



Tåstrup, Denmark

Concentration	Retention	Index of decay and average service life ($\bar{x}$)											
Koncentration	Optagelse	Rådfaktor og gennemsnitlig funktionstid ($\bar{x}$)											
% w/w	kg/m ³	Vaasa Finland			Sørkedalen Norway			Simlångsdalen Sweden			Tåstrup Denmark		
		Year - år			Year - år			Year - år			Year - år		
		5	10	$\bar{x}$	5	10	$\bar{x}$	5	10	$\bar{x}$	5	10	$\bar{x}$
66.7	305	0	5		5	5		0	4		0	13	
50.0	217	0	8		10	10		0	16		0	20	
33.3	126	0	18		13	20		10	30		3	30	
25.0	103	0	15		20	25		9	31		0	33	
16.7	70	3	18		25	38		33	63		8	45	
0	0	100	100	1.0	85	100	4.7	100	100	3.4	78	100	5.1

Fig. 4. BP-Hylosan - The development of index of decay during a 10-year period
Rådfaktor gennem 10 år

WOOD PRESERVATIVE: Celcure A

Imprægneringsmiddel:

WOOD: Pinus Sylvestris L., sapwood

Træart: Skovfyr, splintved

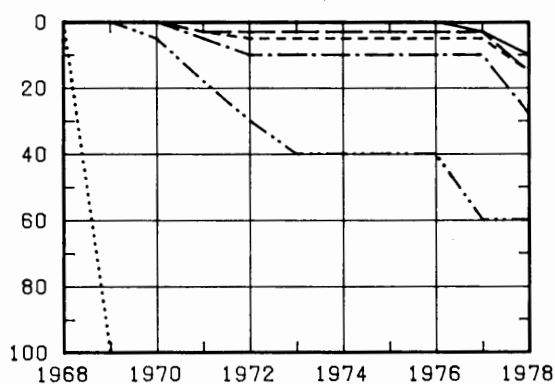
CONCENTRATION: ————— 4.8%
 ————— 3.6%
 - - - - - 2.4%
 - . - . - . 1.8%
 - . . - . . 1.2%
 0 %

TEST FIELD

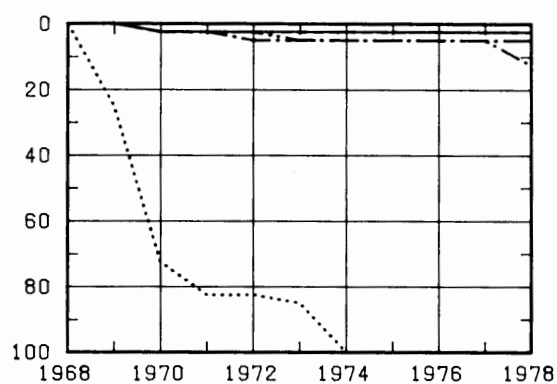
Forsøgsplads

INDEX OF DECAY

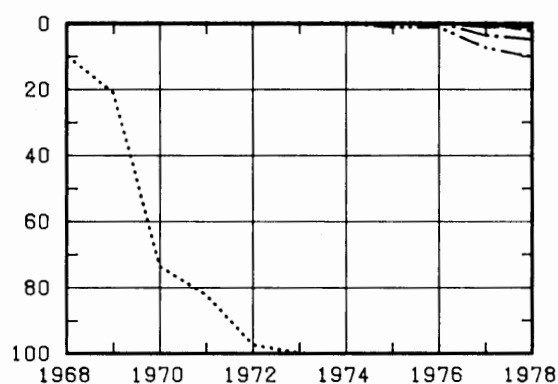
Rådfaktor



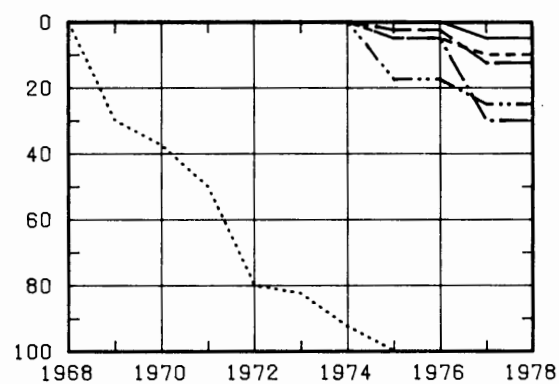
Vaasa, Finland



Sørkedalen, Norway



Simlångsdalen, Sweden



Tåstrup, Denmark

Concentration	Retention	Index of decay and average service life ($\bar{x}$)											
Koncentration	Optagelse	Rådfaktor og gennemsnitlig funktionstid ($\bar{x}$)											
% w/w	kg/m ³	Vaasa Finland			Sørkedalen Norway			Simlångsdalen Sweden			Tåstrup Denmark		
		Year - år			Year - år			Year - år			Year - år		
		5	10	$\bar{x}$	5	10	$\bar{x}$	5	10	$\bar{x}$	5	10	$\bar{x}$
4.8	31.9	0	10		3	3		0	0		0	5	
3.6	23.4	3	15		0	0		0	1		0	13	
2.4	15.6	5	15		3	3		0	3		0	10	
1.8	11.7	10	28		5	5		0	5		0	28	
1.2	7.7	40	60		5	13		0	10		0	25	
0	0	100	100	1.0	85	100	4.7	100	100	3.4	78	100	5.1

Fig. 5. Celcure A - The development of index of decay during a 10-year period
 Rådfaktor gennem 10 år

WOOD PRESERVATIVE: Creosote
Imprægneringsmiddel: Kreosotolie

WOOD: Pinus sylvestris L., sapwood
Træart: Skovfyr, splintved

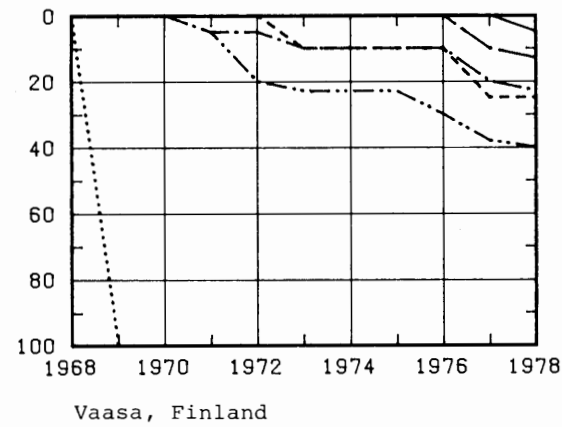
CONCENTRATION: ————— 66.7%
Koncentration: - - - - - 50.0%
 - - - - - 33.3%
 - . - . - . 25.0%
 - . . - . . 16.7%
 0 %

TEST FIELD

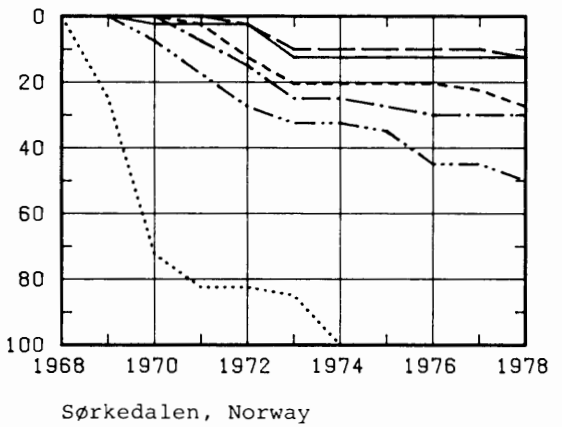
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INDEX OF DECAY

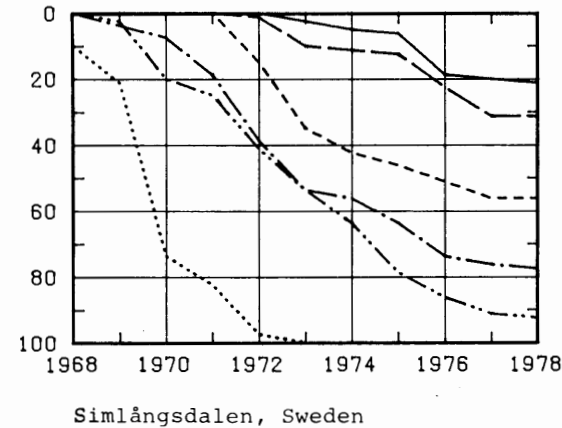
Rådfaktor



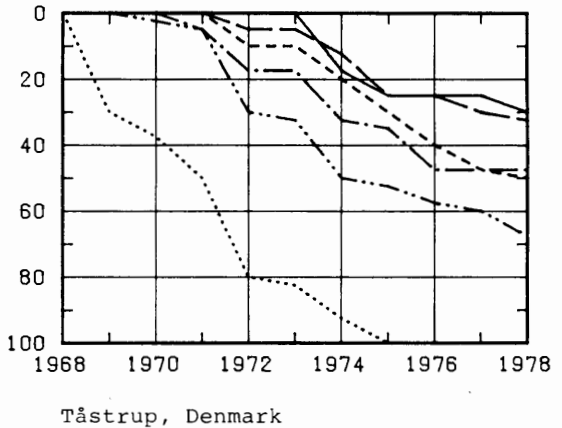
Vaasa, Finland



Sørkedalen, Norway



Simlångsdalen, Sweden



Tåstrup, Denmark

Concentration Koncentration % w/w	Retention Optagelse kg/m ³	Index of decay and average service life ($\bar{x}$) Rådfaktor og gennemsnitlig funktionstid ($\bar{x}$)											
		Vaasa Finland			Sørkedalen Norway			Simlångsdalen Sweden			Tåstrup Denmark		
		Year - år			Year - år			Year - år			Year - år		
		5	10	$\bar{x}$	5	10	$\bar{x}$	5	10	$\bar{x}$	5	10	$\bar{x}$
66.7	231	0	5		13	13		3	21		0	28	
50.0	196	0	13		10	13		10	31		3	28	
33.3	144	10	25		20	28		35	56		3	50	
25.0	108	10	23		33	50		54	78		8	45	
16.7	74	23	40		25	30		54	93		28	68	
0	0	100	100	1.0	85	100	4.7	100	100	3.4	78	100	5.1

Fig. 6. Creosote - The development of index of decay during a 10-year period
Kreosotolie - Rådfaktor gennem 10 år

WOOD PRESERVATIVE: KP-Cuprinol

Imprægneringsmiddel:

WOOD: Pinus sylvestris L., sapwood

Træart: Skovfyr, splintved

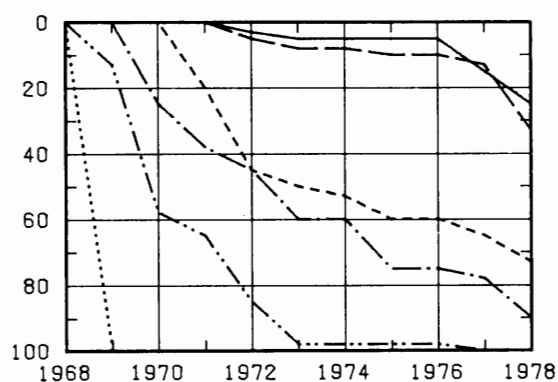
CONCENTRATION: _____ 5.5%
 ----- 4.1%
 Koncentration: - - - - - 2.7%
 2.1%
 - 1.4%
 0 %

TEST FIELD

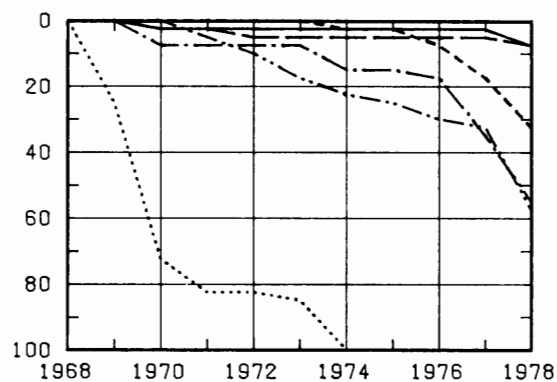
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INDEX OF DECAY

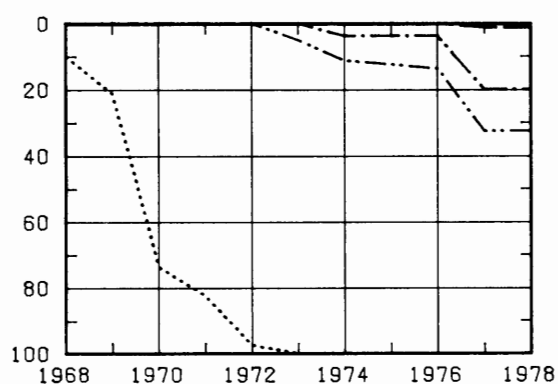
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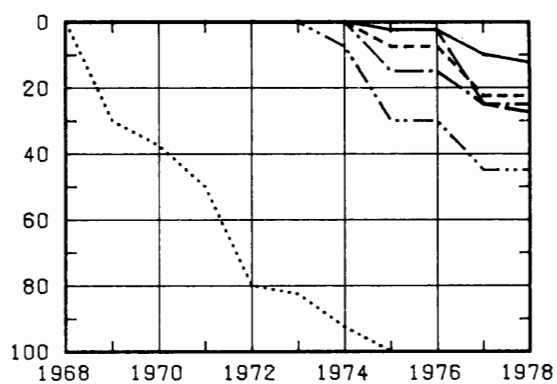
Vaasa, Finland



Sørkedalen, Norway



Simlångsdalen, Sweden



Tåstrup, Denmark

Concentration	Retention	Index of decay and average service life ($\bar{x}$)											
Koncentration	Optagelse	Rådfaktor og gennemsnitlig funktionstid ($\bar{x}$)											
% w/w	kg/m ³	Vaasa Finland			Sørkedalen Norway			Simlångsdalen Sweden			Tåstrup Denmark		
		Year - år			Year - år			Year - år			Year - år		
		5	10	$\bar{x}$	5	10	$\bar{x}$	5	10	$\bar{x}$	5	10	$\bar{x}$
5.5	35.4	5	25		3	8		0	0		0	10	
4.1	26.7	8	33		5	8		0	1		0	20	
2.7	17.9	50	73		0	33		0	0		0	20	
2.1	13.5	60	90		8	55		0	20		0	23	
1.4	9.0	98	100	4.5	18	58		5	33		0	45	
0	0	100	100	1.0	85	100	4.7	100	100	3.4	78	100	5.1

Fig. 7. KP-Cuprinol - The development of index of decay during a 10-year period
 Rådfaktor gennem 10 år

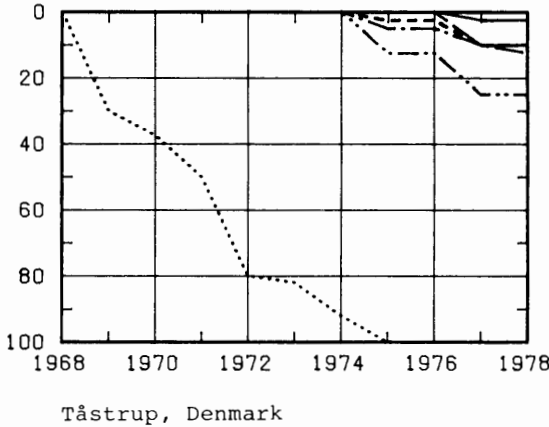
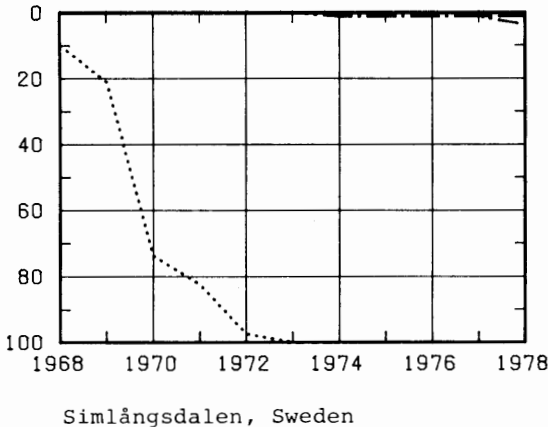
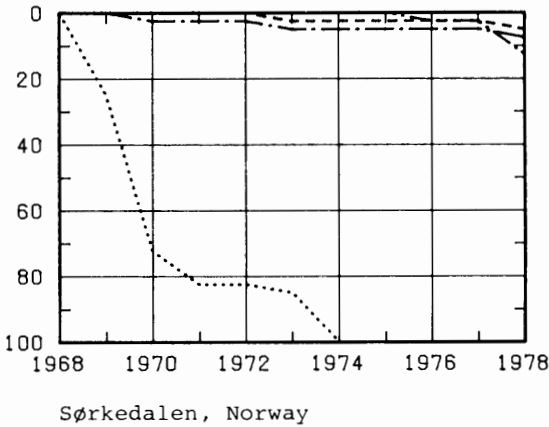
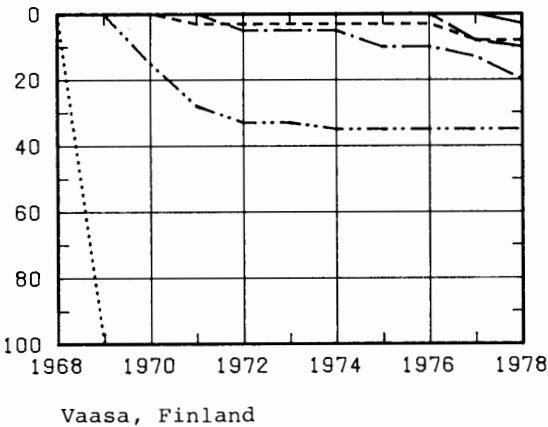
WOOD PRESERVATIVE: Tanalith C
Imprægneringsmiddel:

WOOD: Pinus sylvestris L., sapwood
Træart: Skovfyr, splintved

CONCENTRATION: _____ 4.8%
Koncentration: - - - - - 3.6%
- - - - - 2.4%
- . - . - . 1.8%
- 1.2%
..... 0

TEST FIELD
Forsøgsplads

INDEX OF DECAY
Rådfaktor



Concentration	Retention	Index of decay and average service life ($\bar{x}$)											
Koncentration	Optagelse	Rådfaktor og gennemsnitlig funktionstid ($\bar{x}$)											
% w/w	kg/m ³	Vaasa Finland			Sørkedalen Norway			Simlångsdalen Sweden			Tåstrup Denmark		
		Year - år			Year - år			Year - år			Year - år		
		5	10	$\bar{x}$	5	10	$\bar{x}$	5	10	$\bar{x}$	5	10	$\bar{x}$
4.8	32.7	0	3		0	0		0	0		0	0	
3.6	24.2	0	10		0	0		0	1		0	5	
2.4	15.9	3	8		3	5		0	0		0	8	
1.8	12.0	5	20		5	8		0	1		0	13	
1.2	8.1	33	35		0	13		0	4		0	25	
0	0	100	100	1.0	85	100	4.7	100	100	3.4	78	100	5.1

Fig. 8. Tanalith C - The development of index of decay during a 10-year period
Rådfaktor gennem 10 år

WOOD PRESERVATIVE: Wolmanit CB

Imprægneringsmiddel:

WOOD: Pinus sylvestris L., sapwood

Træart: Skovfyr, splintved

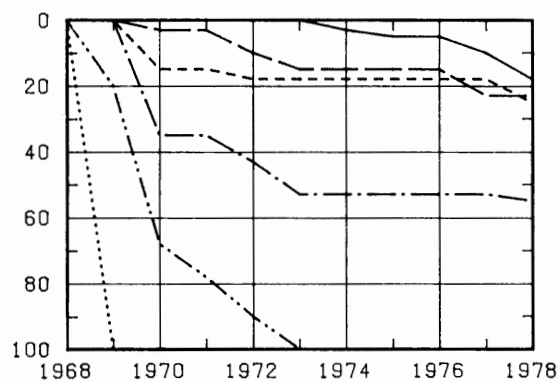
CONCENTRATION: ————— 6.0%
 ————— 4.5%
 - - - - - 3.0%
 - · - · - · - 2.25%
 · · · · · 1.5%
 ········· 0 %

TEST FIELD

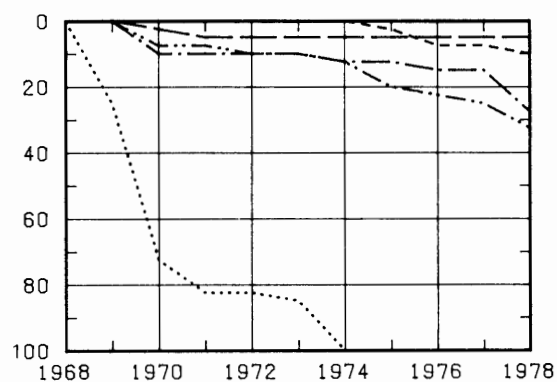
Forsøgssplads

INDEX OF DECAY

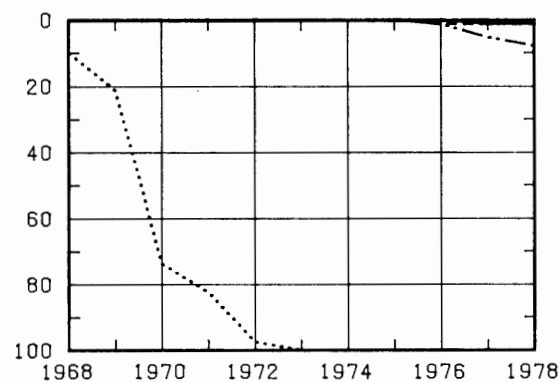
Rådfaktor



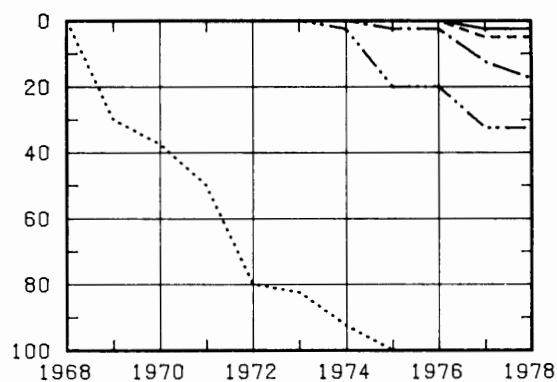
Vaasa, Finland



Sørkedalen, Norway



Simlångsdalen, Sweden



Tåstrup, Denmark

Concentration	Retention	Index of decay and average service life ($\bar{x}$)											
Koncentration	Optagelse	Rådfaktor og gennemsnitlig funktionstid ($\bar{x}$)											
% w/w	kg/m ³	Vaasa Finland			Sørkedalen Norway			Simlångsdalen Sweden			Tåstrup Denmark		
		Year - år			Year - år			Year - år			Year - år		
		5	10	$\bar{x}$	5	10	$\bar{x}$	5	10	$\bar{x}$	5	10	$\bar{x}$
6.0	41.2	0	18		0	0		0	1		0	0	
4.5	30.7	15	23		5	5		0	0		0	0	
3.0	20.1	18	25		0	10		0	1		0	5	
2.25	15.2	53	55		10	28		0	0		0	15	
1.5	10.0	100	100	3.3	10	33		0	8		0	30	
0	0	100	100	1.0	85	100	4.7	100	100	3.4	78	100	5.1

Fig. 9. Wolmanit CB - The development of index of decay during a 10-year period
 Rådfaktor gennem 10 år

Table 2: Index of decay after 10 years' testing
- average for the 4 test-fields.

Rådfaktor efter 10 år i feltforsøg
- gennemsnit for de 4 forsøgsmålinger

Preservative	Index of decay after 10 years' testing of				
Imprægnerings- middel	Rådfaktor efter 10 års prøvning af				
	50	75	100	150	200
	per cent of the retention expected in 1968 to give acceptable protection in ground contact.				
	% af den i 1968 forventede nødvendige saltoptagelse til beskyttelse i jordkontakt.				
Tanalith C	19	11	5	4	1
Boliden K33	21	13	5	2	3
Celcure A	27	17	8	7	5
Wolmanit CB	43	25	10	7	5
Basilite CFK	57	30	18	13	9
KP-Cuprinol	59	47	32	16	11

SAMMENDRAG

I 1968 indledte Nordisk Træbeskyttelsesråd (NTR) i samarbejde med Teknologisk Institut (Danmark), Statens Tekniske Forskningscentral (Finland), Norsk Treteknisk Institutt og Skogshögskolan (nu indgået i Sveriges Lantbruksuniversitet) prøvning af imprægneringsmidler til beskyttelse af træ i kontakt med jord.

NTR's markforsøg nr.1 omfatter splintvedsstave af fyr, som er trykimprægneret med 8 imprægneringsmidler (tabel 1) til 5 optagelsesniveauer (side 2). Prøvningen, der fortsætter, udføres i overensstemmelse med NTR Standard nr.1.4.2.1./74: "Feltforsøg med stave".

Ens imprægnerede stave er udsat på 4 forsøgsfelter (Fig. 1):

<u>Sted</u>	<u>Jordtype</u>	<u>Klima</u>	
		<u>Kontinental-</u>	<u>Kyst-</u>
Finland, Vaasa	Humusrig	x	
Norge, Sørkedalen	Sandjord, humusrig	x	
Sverige, Simlångsdalen	Sandjord		x
Danmark, Tåstrup	Moræneler		x

I denne rapport redegøres for resultaterne af de første 10 års prøvning (side 8 - 15). - Tabel 2 indeholde gennemsnitsværdier for de vandopløselige imprægneringsmidler.

CCA-midlerne: Boliden K33, Celcure A og Tanalith C har vist den bedste beskyttelsesevne pr. kg imprægneringsmiddel (handelsvare).

Basilit CFK og Wolmanit CB fulgt af KP-Cuprinol viser bedre beskyttelsesevne i Simlångsdalen end på de øvrige prøvningspladser.

BP-Hylosan og kreosotolie (begge organiske midler) viser bedre beskyttelsesevne i Vaasa end på de øvrige

prøvningspladser. Imidlertid er der iagttaget svampeskader (= høje rådfaktorer) på stave med høje optagelser af kreosotolie på alle prøvningspladserne. Skaderne modsvares ikke af praktiske erfaringer med kreosotolie-imprægnerede master. Årsagerne til disse skader er ikke opklaret. Der peges på uventet omfordeling af kreosotolie i stavene efter afdunstning af fortyndingsmidlet (Toluene), som benyttedes for at opnå forskellige optagelser af kreosotolie i stavene.

De registrerede rådfaktorer for BP-Hylosan og for kreosotolie er af nævnte årsager ikke medtaget i tabel 2.

STANDARDS/ DOKUMENT

NTR Dokument 1.2.1. 1980

Regler för godkännande av impregneringsmedel för användning i träskyddsklasserna M, A, B och BX.

NTR Dokument 1.6.1. 1980

Regler för kvalitetskontroll av impregnerat trä i klasserna M, A, B och Bx

NTR Standard 1.4.1.1. 1970

NWPC Standard for testing of wood preservatives. Mycological test. Jord-burk method — a soil block test with wood-rotting Basidiomycetes.

NTR Standard 1.4.1.2. 1970

NWPC Standard for testing of wood preservatives. Mycological test. Mullåde method — a soil block test in unsterile soil.

NTR Standard 1.4.1.3. 1979

Mykologisk provning av träskyddsmedel mot blånad och mögel på nysågat virke. Minibräddmetoden.

NTR Standard 1.4.2.1. 1971

NWPC Standard for testing of wood preservatives. Mycological test. Field test — a field test with stakes.

NTR Standard 1.4.2.2. 1973

NWPC Standard for testing of wood preservatives. Marine test — a test against marine wood-boring organisms in sea water.

INFORMATIONER

NTR Information nr 1 1972

Klem, G. S. Trebeskyttelse

NTR Information nr 2 1972

Nordiska Träskyddsrådet

NTR Information nr 3 1972

Klem, G. S. Kvalitetskontroll av tryckimpregnerat trevirke

NTR Information nr 4 1972

Träskydd, begrepp och definitioner avseende biologisk förstöring av trävirke

NTR Information nr 5 1973

Produktion av tryckimpregnerat virke i Finland, Norge och Sverige 1972

NTR Information nr 6 1974

Henningsson, B. NTR fältförsök nr 1 med tryckimpregneringsmedel. Resultat efter 5 års provningar

NTR Information nr 7 1977

Träskyddsordlista

NTR Information nr 8 1979

Produktion av impregnerat virke i Norden 1978

NTR Information nr 9 1979

Borsholt, E. NTR fältförsök nr 1 med tryckimpregneringsmedel. Resultat efter 10 års provningar

NTR Information nr 10 1979

Jermer, J, Kuusamo, M. Nordiska Träskyddsrådet 10 år 1969—1979

NTR Information nr 11 1981

Jermer, J. Impregnerat trä i Norden