ENVIRONMENT CANADA
CONSERVATION AND PROTECTION
ENVIRONMENTAL PROTECTION
PACIFIC AND YUKON REGION
WEST VANCOUVER, BRITISH COLUMBIA

AN ASSESSMENT (1987) OF WOOD PROTECTION (ANTI-SAPSTAIN) FACILITIES IN THE BRITISH COLUMBIA LOWER MAINLAND AREA

REGIONAL PROGRAM REPORT 87-20

By

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ADDENDUM

"Compliance Assessment of Wood Protection (Antisapstain) Facilities in British Columbia (1987) Audit Report on the Lower Mainland Region."

An update of the data in this report was planned to include the results of a second assessment survey to be undertaken during the winter of 1988/89, for publication in the spring of 1989. Other program priorities necessitated a change to this plan and the second survey was not conducted.

The report is an assessment of the voluntary implementation of the recommendations in the document "Chlorophenate Wood Protection, Recommendations for Design and Operation (or the "Code of good Practice.") published by Environment Canada and the B.C. Ministry of the Environment in 1983. The report finds that the average mill implemented 60% of the Code of Practice recommendations. When the design criteria were given a weighted value of risk to the environment, the average mill score dropped to 33%.

The direct wash-off of antisapstain chemicals and the disposal of Chlorophenol contaminated sludges to pulp mill feed stock were found to be common practice. The report concludes that voluntary implementation of the recommendations in the Code of Practice has failed to produce a satisfactory level of environmental protection.

In April 1988, Environment Canada and the B.C. Ministry of the Environment conducted a series of regional workshops in British Columbia to educate mill managers and operators on the proper use of antisapstain chemicals. The workshops included information on the state of the art designs and the environmental risks associated with improper use of antisapstain chemicals.

May 1989

ABSTRACT

In 1984, Environmental Protection of Environment Canada conducted a mailout survey of wood protection operations at sawmills and export terminals in British Columbia. The survey was intended to determine the degree of implementation of the recommendations made in the document "Chlorophenate Wood Protection, Recommendations for Design and Operation", (The Code). The survey found that of 80 plants reporting the use of antisapstain chemicals, the average mill implemented 70% of the environmental design recommendations (i.e., excluding human health criteria). The survey was repeated in 1986 and indicated that the number of mills using antisapstain chemicals had increased to approximately 100. On site audits of 26 of the B.C. Lower Mainland mills in 1987 found that the degree of implementation was actually lower at 60%.

The decrease in the implementation score was attributed to several factors including failure to report all antisapstain application units, inadequacy of procedures adopted by the mill or reduction in benefits from the containment measures due to structural damage.

When the design criteria were given a weighted value of risk to the environment the average mill score dropped to 33%. Individual mill scores ranged from -22% to +85%. The negative scores at five mills indicated failure to adopt virtually all aspects of the Code recommendations, and that chemical releases to ground, air or water were likely to occur on a regular basis. Mills which scored 60% or higher could still present a significant risk to the environment due to contamination of stormwater runoff from treated lumber storage yards.

The code criteria which were most often overlooked were the posting of clear and concise chemical handling and spill contingency plans at the chemical application units. This occurred most often at diptank units which contain the greatest liquid volumes and present the greatest environmental risk. Satisfactory dyking was achieved at 47% of the mixrooms and chemical concentrate storage areas and only 25% of the diptank and drip pad areas. The level indicators were operational on 54% of the chemical storage tanks.

It was determined that voluntary implementation of the Code recommendations by antisapstain facilities from December, 1983 to September, 1987 had not resulted in a satisfactory level of achievement.

RÉSUMÉ

La Protection de l'Environnement d'Environnement Canada, région du Pacifique, a conduit, en 1984, un sondage par la poste sur les opérations de préservation du bois aux scieries et aux dépôts de bois destinés à l'exportation de la Colombie-Britannique. L'étude avait pour intention de déterminer le degré d'accomplissement des recommandations faites dans le document intitulé "Chlorophenate Wood Protection, Recommendations for Design and Operation" (Le Code). L'enquête a trouvé qu'aux 80 usines rapportant l'utilisation de produits chimiques contre la décoloration de l'aubier, la moyenne d'accomplissement des recommandations environnementales aux usines (i.e. excluant la santé humaine) était de 70%. L'étude fut répétée en 1986 et a montrée que le nombre d'usine utilisant les produits chimiques contre la décoloration de l'aubier, avait augmenté jusqu'à peu près 100. Les études sur le terrain de 26 des usines de la partie inférieur de la vallée du Fraser en Colombie-Britannique, entreprises en 1987, ont trouvés que le degré d'accomplisssement avait actuellement baissé à 60%.

La diminution de la marque d'accomplissement fut attribuée à plusieurs facteurs incluant le manque de dénoncer toute les unités d'application du décolorant d'aubier, l'insuffiance des procédures adoptées par l'usine ou la réduction des bénéfices des mesures de rétention due à des dommages structurels.

Quand une valeur de risque à l'environnement fut donnée aux critères d'accomplissement, la marque moyenne des usines tombait à 33%. Les marques individuelles allaient de - 22% + 85%. Les marques négatives à cinq usines indiquaient un manque d'adoption à pratiquement tout les aspect des recommandations du code et que les produits chimiques rejettés au sol, l'air, ou à l'eau devaient vraisemblablement se présenter sur une base régulière. Les usines qui marquaient 60% ou plus haut pouvaient encore présenter un risque significatif à l'environnement due à la contamination des eaux de ruissellement provenant des cours d'entreposage de bois de construction traité.

Les critères du Code qui furent le plus souvent négligés furent l'affichage des plans sur la manutention des produits chimiques, et

RÉSUMÉ
(Continued)

l'affichage des plans d'urgence clairs et concis aux unités d'application des produit chimiques. Ceci se présentait le plus souvent aux unités de bassins de trempage qui contiennent les plus grandes quantités de volumes liquides et présentaient les plus grand risques environnementaux. Des fossés satisfaisants furent réalisés dans 47% des chambres de mélange et des aires d'entreposage en béton pour produit chimiques et seulement dans 25% des aires de dégoutage et bassins de trempage. Le niveau des indicateurs fut opérationnel dans 54% des réservoirs d'entreposage de produit chimiques.

Il fut déterminé que la réalisation volontaire des recommandations du code par les installations de décoloration de l'aubier, du mois de décembre 1983 au mois de septembre 1987, n'a pas eu pour conséquence de réaliser des niveaux satisfaisants d'accomplissement.

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CONCLUSIONS

Based on the observations made during the inspections of 26 B.C. Lower Mainland antisapstain facilities in 1987, it can be concluded that:

1) The 1987 on site inspection of 26 B.C. Lower Mainland antisapstain facilities showed a 60% implementation of the environmental recommendations in the document "Chlorophenate Wood Protection, Recommendations For Design And Operation".

2) When environmental risk or adequacy to fulfill the intent of the code recommendations was included the average mill implementation score should be downgraded to 33%.

3) Mills which scored 60% or higher still presented a high to extreme risk of contamination of stormwater with antisapstain chemicals. The most significant factor was the failure to provide the minimum 30-minute drip period under covered storage immediately after treatment.

4) Five of the 26 mills had negative implementation scores which indicated that releases of antisapstain chemicals to ground, air or water likely occurred on a regular (daily) basis and were especially aggravated during rainfall events.

5) Voluntary implementation of the environmental design criteria (in the document "Chlorophenate Wood Protection, Recommendations for Design and Operation") by antisapstain facilities has failed to meet a satisfactory level of achievement.

1 INTRODUCTION

In 1984 Environmental Protection, Pacific and Yukon Region conducted a mailout survey of wood protection operations at sawmills and lumber-export terminals in British Columbia. The survey was designed to measure the degree of implementation of the recommendations made in the document "Chlorophenate Wood Protection, Recommendations for Design and Operation" (the Code) which was jointly published and distributed by Environment Canada and the British Columbia Ministry of the Environment and Parks in December 1983.

The survey found 73 facilities (sawmills and export terminals) reported the use of chlorophenates, seven used alternative chemicals, and four plants used surface wax. The number of facilities operating diptanks had decreased since 1982 and there was a 47% increase in the number of spray boxes in operation. Most mills had installed containment and recycle systems. The provincial average implementation of environmental design recommendations (excluding all human health criteria in the code) was estimated at 70%. The 1984 assessment criteria was based on 14 general environmental criteria and rated on a linear (yes/no) basis not on a degree of risk or adequacy of the criteria implemented.

The mailout of questionnaires was repeated in 1986 and it was found that the number of facilities using antisapstain chemicals had increased from 80 to one hundred with 12 using alternative chemicals. A detailed report on this questionnaire survey has not been completed.

This report is based on an audit of 26 British Columbia Lower Mainland mills which had been previously surveyed by the 1984 and 1986 questionnaires (Figure 1). The 1987 audit increased the number of criteria against which a mill could be scored from 14 to 22 and assessed each criteria on a weighted scale of risk to the environment. (How well a mill met or exceeded the intent of the code recommendation on which they were based.)

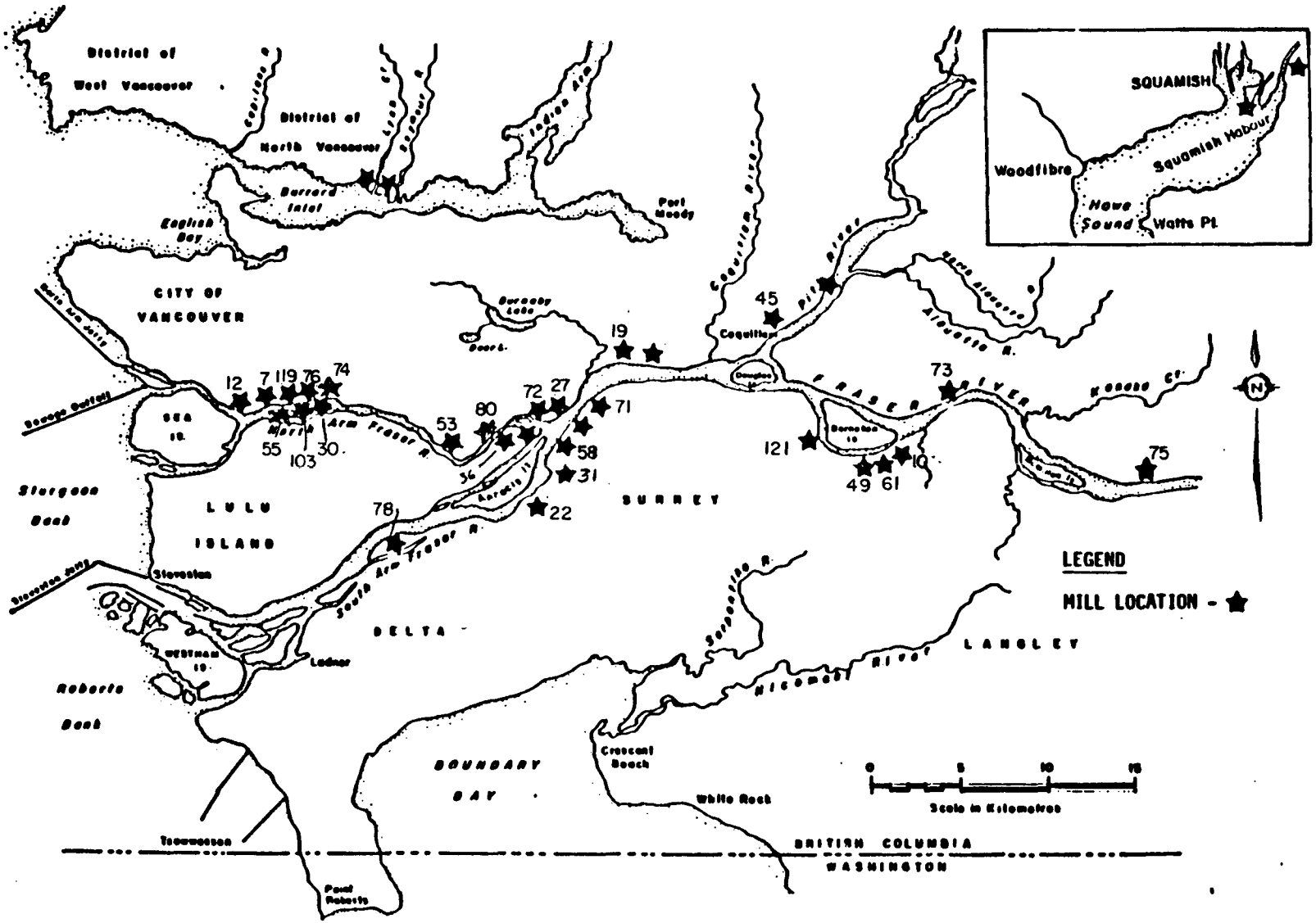

FIGURE 1 LOCATION OF SAWMILLS AND LUMBER EXPORT TERMINALS IN THE LOWER MAINLAND USING CHLOROPHENATE ANTI-SAPSTAIN CHEMICALS

2 ENVIRONMENTAL DESIGN CRITERIA AND WEIGHTING RATIONALE

2.1 General Criteria

The antisapstain Facility Assessment Report was divided into six sections: mix room, spraybox area, diptank area, sorting chain, sludge and waste handling and storm water risk. (See Appendix 1). Each section includes criteria which are unique to that stage of the treatment process as well as features which are common among two or more sections. The assessment form contains the major items recommended in the Code. Each mill situation is unique and the assessment form is designed to be general enough to contain all the vital components of the Code recommendations. For instance, a spill contingency plan posted at a diptank operation need not contain the exact wording in the Code but should contain the major components in a similarly logical sequence. Stormwater risk was given a qualitative rather than numerical assessment since the Code requirements were given as interim recommendations pending further research. This research is now documented in Reference #2.

Human health questions in the assessment report were included for several reasons:

1) The health assessments were general in nature and could easily be done during the environmental inspection.
2) A copy of the assessment report would be left with the mill manager. Human health deficiencies would be highlighted to the manager during the review of the assessment prior to leaving the mill site. The mill manager could then initiate corrective action.
3) If, in the opinion of the inspector, a serious condition existed it could be noted and the local Workers' Compensation Board office notified for follow-up investigation.
4) Human health criteria were not included in the mills final environmental assessment score.

2.1.1 Mixroom Criteria. All chemical application units of either spray or dip type require the dilution and mixing of commercial chemical concentrates with water. If the mill did not have a chemical handling procedure available it was assessed a score of zero. If the procedure was available at the mill or foreman's office, but not at the mixroom itself a

score of "1" was assessed. Posting of the procedures at the mixroom was scored at "2" as this was considered the best location to re-inform trained personnel and to promote awareness for untrained personnel who may access the area. If the posted procedures contained all the essential elements recommended on page 57 of the Code, a score of "3" was awarded.

Spill contingency plans and chemical hazard warning signs were assessed according to the same criteria as chemical handling procedures.

Security of the mixroom was considered important in spill prevention as acts of vandalism/sabotage have caused major chemical releases in the past. A mixroom that did not have a door or a lock on the door or flow control valve was assessed at "0". A lock on the door or flow control valves on the storage tank(s) was awarded a score of "1". An additional score of "1" was awarded for millsite security which would include a fence around all land access points and a gate or guard at all entrance points.

Mixroom ventilation was assessed based on odour. A detectable odour of chlorophenate solution indicates an air concentration above the Workers' Compensation Board acceptable 8-hour limit of 0.5 mg/m^3 (1). The categories include: no ventilation or a strong choking odour, a slight odour and no odour.

Personal protection equipment included rubber gloves, glasses and face shield, rubber boots, face mask respirator and washup sink.

Emergency protection included an eyewash and shower. A shower was consided important due to the possibility of being sprayed by leakage of pressurized spray systems. (Odours, personal protection, and emergency protection were considered human health criteria and no score was assessed.)

Concentrate storage tank connections were rated at "0" for open lid tanks and "1" for a bolted-on lid. Proper connections for bulk delivery required a fitting that can connect to the bulk delivery system and was rated at "2". Bolted lids were rated higher as they restrict unauthorized access and reduce high loss due to overfilling or back pressure. The open lid should not be used as a level detection system during fill operations.

The distance of the concentrate or working solution storage tank location from the nearest water body was rated at "1" for 50 m or greater and down to "-2" for 0 - 10 m. This reflected the increased risk of accidental loss of chemical to the aquatic environment with the decreasing distance to

the water body. Secure mounting of the concentrate tank included either direct contact of the entire tank bottom with a concrete floor or bolted to an adequate metal stand which is bolted to a concrete floor.

Containment dyking capacity around the concentrate and/or working solution tank was rated from "-1" for no dyking to "+3" for greater than 100%. The dykes may consist of a separate berm, metal pan or foundation of the room in which the tank is situated.

Roof coverage (of concentrate tanks) ratings ranged from "-1" for no coverage to "+3" for greater than 100%. If the tank was not covered the flooding of the containment area and contamination of the runoff was a significant environmental risk factor.

Storage tank isolation from high traffic was rated at "-1" for the possibility of accidental impact from machinery, vehicles (especially fork lifts) or stored lumber. Isolation from traffic was rated at "+1" and could be achieved by berms, bumper guards or preferably by storage in an enclosed room.

Storage tank level indicators were rated "0" for absent or not operational or "1" for present and operational. Open holes with dip sticks were not considered proper level indicators. Float valves or clear tubing with woven steel sheath reinforcement were considered adequate.

Collection and recycle systems were rated at "1" for a sloped concrete floor which directed all spillage to a sump plus "1" for automatic recycle to a storage tank. A maximum score of 42 could be achieved in the mixroom.

2.1.2 Spraybox Criteria. Chemical handling procedures and chemical hazard warning signs were rated the same as for mixrooms.

Emergency protection was rated the same as for mixrooms because of the possibility of pressurized working solution leaking from the system. Exhaust system efficiency was rated similar to mixrooms based on odour. A maximum score of 10 could be achieved at the spraybox.

2.1.3 Dip Tank Criteria. Chemical handling and hazard warning signs, spill contingency plans and personal protection were rated the same as for mixrooms. Emergency protection was rated the same for eyewash, however,

a full body shower stall was deemed important due to the significantly higher risk of personnel falling into the tanks.

Diptank and Drip Pad roof coverage were rated at "-4" for no coverage, "-2" for coverage of the tank but not drip pad, "+2" for 100% coverage of pad and tank and "+4" for greater than 100% coverage. The hydraulic equipment used to handle dip-treated lumber requires a high roof for clearance of the lift equipment. If the roof does not extend beyond the tank and drip area perimeters there will be significant infiltration and flooding by precipitation.

Diptank containment dyking capacity was rated at "-4" for none, "-2" for diptank but not drip pad, "2" for 100% of working solution (and possibly concentrate if it is stored in the same area), and "+4" if greater than 100% of all solutions stored in the dip area. A maximum score of 16 could be achieved at the diptank area.

2.1.4 Sorting Chain Criteria. Lumber sorting chains on spray and dip systems were either of the enclosed room or open air type. Enclosed room types usually consisted of 3 or more walls which significantly restricted airflow. Open air sorting chains were located where there were three or fewer walls which did not restrict airflow. Personal protection included rubber gloves and rubber aprons for both types of rooms. Enclosed rooms required additional good ventilation (i.e. no detectable odour) and a dust/vapour filter mask.

The over-application of spray (or dip) solution can result in dripping from treated lumber. This has been observed for all application systems including high-pressure spray. Paving and dyking of the sorting chain is therefore necessary and was rated at "-2" for not paved, "1" for paved and "2" for paved and dyked.

Lumber sorting bay roof coverage is one of the most significant factors in chemical loss prevention. Freshly treated wood will lose most of the treatment chemical due to washoff (2) so that even partial roof coverage was rated at "-4" and total roof coverage of freshly treated lumber was rated "+4". A maximium score of 6 could be achieved at the sorting chain.

2.1.5 Sludge and Waste Handling Criteria Diptank, spraybox or mixroom sludges which were disposed of by mixing with wood ends, hogfuel shavings, or dumped at unknown locations were rated at "-3". Sludges which were stored in drums but not securly on an impervious floor, or had no coverage by tarp or roof, or were vulnerable to impact by traffic were rated at "1". Sludges which were stored in drums, adequately labelled, stored on an impervious floor with adequate dyking, covered by tarpaulin or roof and isolated from impact by traffic were rated at "3". A maximum score of 3 could be achieved for sludge and waste handling.

2.1.6 Storm Water Risk At The Unit. The contamination of storm water runoff can be controlled by implementing the following practices. Note that 3) below was not specified in the Code, however, for those mills that implement the practice there would be a lower stormwater contamination risk. This rating is not included in the percent implementation score.

1) Freshly treated wood is allowed a 30-minute drip period under cover and all drippings are recycled.
2) The treated wood is stored under cover for an additional minimum 2-hour fixation period. (This may be revised to a longer period in further editions of the Code).
3) The lumber is covered with a water repellant (usually plastic) wrap before long-term storage on a mill yard that is exposed to rainfall or the long-term storage area is paved, roofed, and dyked.
4) Contaminated drippings and infiltrating precipitation to roofed areas are collected and reused as makeup water.

Mills implementing recommendations 1, 2, 3, and 4 were rated as low risk. Mills implementing #1, #2, and #3 only were rated as low to moderate risk. Mills implementing #1 and #2 only were rated as moderate. Mills implementing only #1 were rated as high risk and mills which did not implement any of these procedures were rated as extreme risk. Extreme risks will usually occur at lumber sorting chains where the lumber is pulled from the chain and immediately exposed to rainfall or at diptank areas where the drip pad is not covered.

3 MILL SCORES FOR IMPLEMENTATION OF ENVIRONMENTAL DESIGN CRITERIA

The 26 mills in the 1987 audit sample operated 42 units which represented all the common technologies of chemical application including the most modern high-pressure spray systems. The chemical application systems included:

- Dip operations such as drive-in dip, hydraulic dip and cross-chain roller dip tanks. The lumber entering these systems is totally immersed and exits with a large excess of liquid on the surface.
- Low pressure spray systems which operate at less than two atmospheres of line pressure. Lumber that exits these systems is moist to the touch.
- High pressure spray systems which operate at greater than two atmospheres of line pressure. Lumber that exits these systems is dry to the touch. (NOTE: Complete descriptions of technology can be found in Reference #4).

The mills in the 1987 audit sample were scored on a linear (yes/no) basis to compare with the results in the 1984 survey as well as on a weighted score to determine environmental risk (See Appendix II). The 1987 linear implementation score was 60% of the Code criteria which is lower than 71% assessed in 1984 (See Table 1). This is attributed to several factors such as:

- Failure by some mills in 1984 and 1986 to report all units. In some cases only the best unit at a mill was reported while others failed significantly to meet Code criteria.
- Procedures implemented by some mills were not up to the standards intended by the Code.
- Benefits from the installation of equipment or mitigation measures such as paved floors, berms and vents had been negated by accidents causing structural damage.

TABLE 1 CHEMICAL HANDLING AND CONTAINMENT PROCEDURES AT WOOD PROTECTION FACILITES IN THE LOWER FRASER VALLEY AND VICINITY: 1984 SELF ASSESSMENT VS. 1987 AUDIT.

TYPE OF PROCEDURE	PERCENTAGE OF MILL UNITS IMPLEMENTING ENVIRONMENTAL CRITERIA	
	1984*	1987 (AUDIT)**
Chemical Storage		
- Dyked	78%	80%
- Covered	69%	88%
Spray Units		
- Aerosol Control	82%	34%
- Collection/Recycle	94%	81%
Mix Rooms		
- Spill Collection/Recycle	76%	80%
- Dyked/Sloped	71%	80%
Dip Tanks		
- Covered	77%	50%
Drip Areas		
- Dyked/Sloped	92%	75%
- Covered	46%	51%
- Runoff Collection/Recycle	100%	48%
Lumber Storage		
- Covered	4%	0%
- Paved	67%	67%
Chemical Handling Procedures	70%	62%
Spill Plans	61%	37%
Average Implementation $\bar{x}$	71%	60%

* Based on a Province-wide mail in survey
** Based on inspections by Environment Canada of 26 Lower Mainland facilities.

3.1 Individual Weighted Average Scores

The sawmills in the study area had from one to three complete antisapstain units per mill. A unit was defined as having four stages which include:

: One chemical mix area (usually a separate mixroom)
: One chemical application area (spray box or diptank)
: One lumber sorting area (sorting chain or drip pad)
: One sludge storage area

Some of these stages may be shared by two or more units, especially mix rooms and sludge storage areas. Each unit was scored separately and the scores for all units were added and averaged to give an overall mill score (See Appendix III).

The average weighted mill score in the lower mainland area was found to be 33 $\pm$ 32%. The high standard deviation in the score indicates a wide range in scores which was from -22% to +85%. The negative score indicates a failure to adopt virtually all aspects of the Code recommendations and that chemical releases to ground, receiving water or air likely occur on a regular basis.

3.2 Risk Of Contamination Of Storm Water Runoff.

The risk of contamination of storm water runoff by antisapstain chemicals was given a qualitative rating of low to extremely high based on the criteria currently in the Code. (See Section 2.1.6). This rating is not included in the % implementation score.

Each unit was scored individually for these criteria and the results are listed in Table 2.

TABLE 2 Storm Water Risk Of The Antisapstain Units of B.C. Lower Mainland Region

Storm Water Risk	Number of Units	Percent Of The Total
Low	1	2%
Low to Moderate	1	2%
Moderate	3	7%
High	15	36%
Extreme	22	52%

Mills which implemented 60% or more of the environmental design criteria may still present a significant pollution risk from storm water runoff if proper coverage of treated lumber is not achieved (See also Ref. 2).

3.3 Implementation Scores For Specific Code Criteria.

Table 3 shows the percentage of all the units which meet or exceed the individual Code criteria.

The Code criteria which were most often overlooked were the posting of chemical handling procedures and spill contingency plans at the units. Only 7% of the mixrooms, 25% of the sprayboxes and 8% of the diptanks had proper signs. There appeared to be a reluctance by management at many facilities to have these procedures posted in a clear, simplified form at the active unit. In most cases, they are "available" somewhere in the mill or

foreman's office.

This was considered inadequate in an emergency (spill or personal injury) when time is of the essence.

TABLE 3 Implementation Scores For Specific Code Criteria

STAGE OF OPERATION	CODE OF PRACTICE ENVIRONMENTAL DESIGN CRITERIA	UNITS MEETING OR EXCEEDING REQUIREMENTS OF THE CODE (PERCENT)
Mix Room	Posting of Chemical Handling Procedures	16.3 %
	Posting of a Spill Contingency Plan	7.0%
	Posting of Chemical Hazard Warning Signs	53.5%
	Good Security	25.4%
	Chemical Containment Dyking	46.5%
	Concentrate Storage Tank - Proper Bulk Delivery Connections	46.5%
	Concentrate Storage Tank Located 50 Meters From The Nearest Water Body	81.4%
	Concentrate Storage Tank - Securely Mounted To The Floor	81.4%
	Concentrate Storage Area Chemical Containment Dyking	46.5%
	Concentrate Storage Area Roof Coverage	70%
	Concentrate Storage Tank Isolated From High Traffic	83.7%
	Storage Tanks Level Indicators - Operational	53.5%
	Collection/Recycle Systems Operational	72.1%

TABLE #3 **Implementation Scores For Specific Code Criteria**
(continued)

STAGE OF OPERATION	CODE OF PRACTICE ENVIRONMENTAL DESIGN CRITERIA	UNITS MEETING OR EXCEEDING REQUIREMENTS OF THE CODE (PERCENT)
Spray Box Area	Posting Of Chemical Handling Procedures	28.1%
	Posting Of Chemical Hazard Warning Signs	34.4%
	Spray Box Unit Overspray Collection and Recycle	81.3%
	Spray Box Exhaust System Efficiency	34.4%
Dip Tank	Posting Of Chemical Handling Procedures	8.3%
	Posting Of A Chemical Spill Contingency Plan	8.3%
	Posting Of Chemical Hazard Warning Signs	58.3%
	Diptank And Drip Pad Roof Coverage	25%
	Diptank And Drip Pad Containment Dyking	25%
Sorting Chain	Dyking Around The Drip Area	57%
	Lumber Sorting Bay Roof Coverage	51%
Sludge And Waste Handling	In Drums, Secure And Isolated From High Traffic	14%

The lack of signs was most obvious at diptank operations which hold the greatest volume of chemical and have the highest risk of accidental release. The diptank operations also had the lowest score in terms of adequate roof coverage and containment dyking of the tank and drip area.

Hydraulic and fork lift diptanks generally had roofs which were much higher than is necessary to give clearance to the lift equipment. In several cases the roofs were so high relative to the area covered that rainfall caused flooding of the berms designed to contain concentrate or working solutions.

Containment dyking at diptanks was often in a damaged state due to impacts from fork lifts or falling lumber. Breaks in the dykes and floor surface were common. Dyking at mix rooms, spray boxes, and drip areas at sorting chains were in better condition. This was largely due to the lack of vehicle movement and smaller size of the lumber packages handled. Approximately 80% of the concentrate storage tanks were located 50 meters or more from the nearest water body and isolated from high traffic. Most tanks were securely mounted. Approximately 80% of the mix rooms and 81% of the spray boxes had collection and recycle systems.

Sludge and waste handling practices were deficient at 64% of the units. Sludges were disposed of by mixing with wood ends for pulpmill feed stock, hog fuel or wood shavings for incineration. In one case, highly contaminated sludges were routinely washed to produce low-level sludges for incineration and the contaminated wash water was discharged to a storm sewer. (This washing practice has been discontinued). At some sites the unit operators did not know how sludges were disposed of. Mill ends and shavings can be significant sources of contamination. It is preferable to plane the sides and trim the ends of lumber prior to application of antisapstain chemicals. This will eliminate the introduction of contaminated mill ends and shavings into pulp mill feed stocks, animal stalls, and for horticultural uses.

Some of the mills had severe soil and groundwater contamination due to repeated releases of chlorophenols from concentrate, working solution and sludge handling areas. Only 14% of the units had sludges in drums, properly labelled, inventoried and stored in a roofed and secure area.

REFERENCES

1) Workers' Compensation Board - Personal conversation re: Industrial Health and Safety Regulations, Workers' Compensation Board of British Columbia.
Handbook, July 1, 1980 pp. A-13, "Pentachlorophenol - Skin."

2) Krahn, P.K., Shrimpton, J.A., Glue, R.D. (1987) "Assessment of Storm Water Related Chlorophenol Releases From Wood Protection Facilities In British Columbia".
Environment Canada, Regional Program Report 87-14

3) Wilson, D.M., Liu, S., "Compliance Assessment Report on Wood Protection (Anti-Sapstain) Facilities in British Columbia (1984)
Environment Canada Conservation and Protection, Pacific Region, Regional Program Report 86-08, June 1986

4) Environment Canada/B.C. Ministry of the Environment "Chlorophenate Wood Protection, Recommendations for Design and Operation", 1983

APPENDIX I

ANTISAPSTAIN FACILITY ASSESSMENT REPORT

UNIT INFORMATION FORM

Antisapstain Facility Assessment Report

Directions

1) Use one form for each UNIT at the mill. A UNIT will have a minimum of four stages;

   :One chemical mix area (Usually a separate mixroom)
   :One chemical application area (Spray box or dip tank)
   :One lumber sorting area (Sorting chain or drip pad)
   :One sludge storage area

2) Common areas such as;

   Chemical mix rooms or sludge storage areas which serve two or more UNITS in the mill should be associated with one spraybox or diptank. (Do not repeat mix room or sludge storage data at a second UNIT if it is already covered in the first).

3) General mill information, example;

   Mill/Division : BCFP/Mackenzie Mill
   Mill Number : 10 (From the Environment Canada list attached, if it is not on the list then please leave blank.)
   Unit Name : Planer Mill #1
   Inspector : Your Name
   Inspection date : Year/Month/Day
   Unit Number : 2

4) Discuss questionnaire results with the mill manager before leaving the mill. Leave a photocopy with the manager so that improvements can be initiated as soon as possible.

5) Please send the original copy of the form to;

   Mr. Stan Liu
   Environmental Protection
   Environment Canada
   Kapilano 100, Park Royal
   West Vancouver, B.C.
   V7T 1A2

6) If you have any questions please call;

   Peter K. Krahn (604) 666-3057
   Stan liu (604) 666-2104

ANTISAPSTAIN FACILITY ASSESSMENT REPORT UNIT INFORMATION

Mill/Division: _____
Mill Number: _____
Unit Name: _____
Inspector: _____
Inspection Date: _____

Please circle appropriate score and/or enter information required.

1. Chemical Delivery _____
   a) Tanker truck, b) Tote tank, c) Drums, d) Other
   e) Chemical name _____

Chemical Mix Room	Score
2. Chemical Handling Procedure a) None (0), b) Available (1), c) Posted but not comparable to code pg. 57 (2), d) Posted and Comparable to code page 57 (3)	_____
3. Spill Contingency Plan a) None (0), b) Available (1), c) Posted but not comparable to code page 77-79 (2), d) Posted and comparable to code page 77-79 (3)	_____
4. Chemical Hazard, Warning Signs a) None (0), b) Posted but not comparable to code page 58 (1), c) Posted and comparable to code page 58 (2)	
5. Security (Can have two correct) a) No locks and no doors (0), b) Lock on valve or mix room locked (1), c) Millsite secure (1)	_____
6. Mixroom Ventillation (Circle Appropriate) a) None or poor operation, ie. strong odour b) Slight odour c) No odour	

7. Personal Protection
   a) Rubber gloves (yes,no), b) Glasses and shield, or goggles (yes,no), c) Facemask respirator (yes,no), d) Rubber boots (yes,no), Wash up sink (yes, no)

8. Emergency Protection at the Unit
   a) Eyewash (yes,no), b) Shower (yes,no)

9. Mixtank Volume _____ (m^3).

10. Mixroom Containment Dyking (% of Total Volume stored) _____
    a) No dyking (-1), b) Less than 100% (0), c) 100% (2) d) Greater than 100% (3)

11. Mixroom Containment Volume_____(m^3).

12. Concentrate Storage Tanks Connections _____
    a) Open top lid (0), b) Bolted on lid (1), c) Proper connection for bulk delivery (2)

13. Concentrate/Working Storage Tanks Distance to the closest waterbody.
    a) 0-10 m. (-2), b) 11-30 m. (-1), c) 31-50 m. (0) d) Greater than 50 m. (1)

14. Secure mounting for concentrate/working storage tanks _____
    a) None (0), b) Secure (1)

15. Concentrate/Working Containment Dyking Capacity(% of the total volume stored.) _____
    a) No dyking (-1), b) Less than 100% (0), c) 100% (1), d) Greater than 100% (3)

16. Roof Coverage over the Concentrate/Working Storage Area _____
    a) No coverage (-1), b) Less than 100% (0), c) 100% (2), d) Greater than 100% (3)

17. Concentrate/Working storage tank volume
    Concentrate = _____ (m^3).
    Working tank = _____ (m^3 .

18. Storage tank isolated from high traffic
    a) Yes (1), b) No (-1)

19. Storage tank level indicator operational _____
    a) yes (1), b) no (0)

20. Collection/Recycle (Can have two correct) _____
    a) Sloped (yes=1, no=0), b) Automatic Recyle (yes=1, no=0)

Total Score _____
Maximum Score Possible 28

Spraybox Area	Score
1. Chemical handling procedure a) None (0), b) Available (1), c) Posted but not comparable to code pg 57 (2), d) Posted and comparable to code page 57 (3)	_____
2. Chemical Hazard Warning signs a) None (0), b) Posted but not comparable to code pg 58 (1), c) Posted and comparable to code page 58 (2)	_____
3. Emergency protection at the Unit a) Eyewash (yes,no)	
4. Spraybox overspray collection/recycle a) None (-3), b) Collection only (-1), c) Collection and automatic recycle (1)	_____
5. Type of spray unit exhaust system (Please Circle), a) None, b) Impingement box, c) Demister, d) To air, e) To burner, f) To pneumatic cyclone	
6. Exhaust system efficiency (Please Circle). a) None/or poor operation, i.e. strong odour (-4), b) Slight odour (-2), c) No odour (2), d) Meets Provincial Emmission Criteria (4)	_____
Total Score	_____
Maximum Score	10

Dip Tank

Score

1. Chemical Handling Procedure _____
   a) None (0), b) Available (1), c) Posted but not comparable to code pg 57 (2), d) Posted and comparable to code page 57 (3)

2. Spill contingency plan _____
   a) None (0), b) Available (1), c) Posted but not comparable to code pg 77-79 (2), d) Posted and comparable to code page 77-79 (3)

3. Chemical hazard warning signs _____
   a) None (0), b) Posted but not comparable to code pg 58 (1), c) Posted and comparable to code page 58 (2)

4. Personal Protection at Tank or Drip Pad

   a) Gloves (yes,no), b) Apron (yes, no), c) Rubber boots (yes, no), d) Wash-up sink (yes, no)

5. Emergency Protection at Tank or Drip Pad
   a) Eyewash (yes, no), b) Shower (yes, no)

6. Diptank and Drip Pad Roof Coverage _____
   a) None (-4), b) Diptank covered but not drip pad (-2), c) 100% coverage (2), d) Greater than 100% coverage (4)

7. Diptank and drip pad containment volume _____ (m^3).

8. Dip Tank Containment Dyking Capacity (% of Total Volume Stored. _____

a) None (-4) b) Dip tank dyked but not drip pad (-2)
c) 100% dyking of dip tank and drip pad (2)
d) Greater than 100% dyking of pad and tank, plus concentrate and/or working solution volume (4)

Total Score _____
Maximum Score 16

Sorting Chain	Score
1. Sorting chain personal protection	
Open air - a) Rubber gloves (yes, no) b) Rubber apron (yes, no)	
Enclosed room - a) Rubber gloves (yes, no), b) Rubber apron (yes, no), c) Filter mask (yes, no), d) Proper ventilation (yes, no)	
2. Paving and Dyking around drip area a) Not paved (-2), b) Paved (1), c) Paved and dyked (2)	_____
3. Lumber sorting bay roof coverage a) None or partial exposure of treated wood (-4), b) Completely covered (4)	
Total Score	_____
Maximum Score	6

Sludge and Waste Handling

1. Total sludge generated at unit _____ (Barrels/yr)

2. Volume of sludge and contaminated waste currently in storage _____ m^3.

3. Sludge handling practices _____
   a) Mixed with wood ends, hogfuel, shavings, etc. or they don't know (-3), b) In drums, but not secure (1) c) In drums, secure on site (labelled, inventory, dyked and covered etc.) or sent to secure landfill (3)

4. Mill Ends and Shavings
   a) Are boards trimmed before application of antisapstain chemical (yes,no),
   b) Are ends chipped and sold as pulpmill feed stock (yes,no), landscape use (yes,no), bedding in animal stalls (yes,no)

Total Score _____

Maximum Score 3

Stormwater Risk at Unit

Rating is based on the following criteria:

Rating	Code of practice recommendations implemented
LOW	= (1) 30 minute drip period under cover. (2) Treated wood is stored under cover for an additional two hour fixation period. (3) The long term storage area is roofed, paved and dyked or all treated lumber is wrapped prior to storage in exposed areas. (4) Drippings and infiltrating precipitation to roofed areas is collected and reused as make up water.
Low - Mod	= (1) & (2) & (3)
Mod	= (1) & (2)
High	= (1)
Extreme	= NONE OF THE ABOVE PROCEDURES ARE IMPLEMENTED.

Stormwater risk - _____

Comments _____

ANTISAPSTAIN FACILITY ASSESSMENT REPORT SCORE SHEET

Unit Name _____ Actual Score Maximum Possible Score

Stage 1) _____ _____ _____
2) _____ _____ _____
3) _____ _____ _____
4) _____ _____ _____

5) Total Score A=_____ B=_____

6) % Implementation $\frac{A}{B} \times 100 = \_\_\_\_\_ \times 100 = \_\_\_\_\_$

Unit Name _____ Actual Score Maximum Possible Score

Stage 1) _____ _____ _____
2) _____ _____ _____
3) _____ _____ _____
4) _____ _____ _____

5) Total Score A=_____ B=_____

6) % Implementation $\frac{A}{B} \times 100 = \_\_\_\_\_ \times 100 = \_\_\_\_\_$

Mill Implementation = $\frac{\text{Sum of Unit Implementation}}{\text{Number of Units}} \times 100$

= _____ x 100

= _____ %

APPENDIX II

EXAMPLE OF AN INDIVIDUAL MILL

SCORE SHEET

UNIT INFORMATION

MILL NO	: 142	MILL	:
UNIT NO	: 1	UNIT NAME	: PLANER MILL
INSPEC. DATE	: 15-Dec-87	INSPECTOR	: JOE KEENER INSPECTOR

Chemical Delivery Tanker Truck

M I X R O O M

Chemical Handling Procedures	Available	(1)
Spill Contingency Plan	Posted but not comparable to code page 77-79	(2)
Chemical Hazard Warning Signs	Posted and comparable to code page 58	(2)
Security	No lock & no doors, Mill site secure	(1)
Mixtank Volume	0.7500 [m3]	
Mixroom Containment Dyking	Less than 100%	(0)
Mixroom Containment Volume	0.7000 [m3]	
Concentrate/Working Storage Tanks Connections	Open top lid	(0)
Concentrate/Working Storage Tanks/Dip Tanks - Distance from Waterbody	Greater than 50m	(1)
Secure Mounting for Concentrate/Working - Storage Tanks	Secure	(1)
Concentrate/Working Storage Area Dyking	Greater than 100%	(3)
Concentrate/Working Storage Area Roof Coverage	Less than 100%	(0)
Concentrate/Working Storage Tanks Volume	0.5000 [m3]	
Storage Tank Isolated from High Traffic	Y (1)	
Storage Tank Level Indicator Operational	N (0)	
Collection/Recycle - Sloped	Y	(1)
Recycle	Y	(1)

S P R A Y B O X A R E A

Chemical Handling Procedures	Posted but not comparable to code page 57	(2)
Chemical Hazard Warning Signs	Posted and comparable to code page 58	(2)
Spraybox Overspray Collection/Recycle	Collection & automatic recycle	(1)
Spray Unit Exhaust System	Demister	
Exhaust System Efficiency	No odour	(2)

D I P T A N K

Chemical Handling Procedures	None	(0)
Spill Contingency Plan	Available	(1)
Chemical Hazard Warning Signs	Posted but not comparable to code page 58	(1)
Diptank & Drip Pad Coverage	Diptank covered but not drip pad	(-2)
Diptank & Drip Pad Containment Volume	75.0000 [m3]	
Diptank & Drip Pad Dyking Capacity	Diptank dyked but not drip pad	(-2)

UNIT INFORMATION

MILL NO	: 142	MILL	:
UNIT NO	: 1	UNIT NAME	: PLANER MILL
INSPEC. DATE	: 15-Dec-87	INSPECTOR	: JOE KEENER INSPECTOR

S O R T I N G C H A I N

Dyking Around Drip Area	Not paved	(-2)
Lumber Sorting Bay Coverage	None or partial exposure of treated wood	(-4)

S L U D G E & W A S T E H A N D L I N G

Total Sludge Generated at Unit	5.000 [Barrels/yr]	
Sludge Handling Practices	In drums, but not secure	(1)
Final Destination of Units Sludge	SECURE LANDFILL	

Are Boards Trimmed Before Application of Antisapstain Chemical	N
Are Treated Trim Ends Chipped and Sold as Pulp Mill Feed Stock	Y
Are Treated Trim Ends Chipped and Sold as Landscape Use	N
Are Treated Trim Ends Chipped and Sold as Bedding in Animal Stalls	N

Stormwater Risk: HIGH

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Total Score for Unit 14 out of a possible score of 62 = 22.6%

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APPENDIX III

ANTISAPSTAIN DATA BASE: IMPLEMENTATION OF ENVIRONMENTAL DESIGN CRITERIA, SUMMARY REPORT

MILL NO	MILL	INSPECTION DATE	UNIT	UNIT NAME	TOTAL SCORE	POSSIBLE SCORE	%
7	BCFP Limited, Harpole Sawmill Div.	23-Jun-87					
			1	HEAVY TIMBER DECK	22	46	47.8%
			2	PLANER MILL NUMBER 1	30	46	65.2%
			3	PLANER MILL NUMBER 2	30	46	65.2%
							59.4%
10	BC Millwork Manufacturing Limited	15-May-87					
			1	PAINT SPRAY CHAMBER	27	52	51.9%
							51.9%
12	CFP Limited, Eburne Sawmills Div.	23-Jun-87					
			1	PLANER MILL 1	10	46	21.7%
			2	PLANER MILL 2	14	46	30.4%
			3	TIMBER DECK	28	46	60.9%
							37.7%
19	CF Industries Limited, Fraser Mills	04-Jun-87					
			1	NEW SPRAY SYSTEM	40	46	87.0%
			2	OLD PLANER MILL	35	46	76.1%
							81.6%
27	Doman Forest Products Ltd, New Westminster Div.	10-Jun-87					
			1	PLANER MILL SPRAY B	15	46	32.6%
							32.6%
30	Fraser River Planing Mills Limited	17-Jun-87					
			1	PLANERMILL SPRAYBOX	-10	46	-21.7%
			2	PLANERMILL 2	-10	46	-21.7%
							-21.7%
31	Primex Forest Prod. Ltd.,Acorn Specialty Prod. Div	10-Jun-87					
			1	PLANER SPRAYBOX	19	46	41.3%
							41.3%
45	Pitt Timber Limited	03-Jun-87					
			1	DIP-TANK CROSS CHAIN	-2	52	-3.8%
							-3.8%
49	S & R Sawmills Limited	03-Jun-87					
			1	B-MILL/CAR WASH SYS.	20	46	43.5%
			2	A-MILL/CAR WASH SYS.	28	46	60.9%

MILL NO	MILL	INSPECTION DATE	UNIT	UNIT NAME	TOTAL SCORE	POSSIBLE SCORE	%
							52.2%
51	Seaboard Shipping company Limited	12-May-87					
			1	DIPTANK	30	46	65.2%
							65.2%
53	Stadco Forest Products Limited	11-Jun-87					
			1	PLANER	-4	46	-8.7%
			2	RESAW SPRAY UNIT	-12	46	-26.1%
							-17.4%
55	Terminal Sawmills Limited	19-Jun-87					
			1	ROUGH CUT X-CHAIN	36	46	78.3%
			2	ROUGH-CUT DIPTANK	13	46	28.3%
			3	PLANER MILL	10	46	21.7%
							42.8%
57	Weldwood of Canada Limited, Empire Lumber Div.	04-Jun-87					
			1	DRIVE IN DIPTANK	12	46	26.1%
							26.1%
61	West Langley Forest Products Limited	19-May-87					
			1	SPRAY UNIT	-4	46	-8.7%
			2	DIPTANK CROSS CHAIN	-14	52	-26.9%
							-17.8%
64	Repap Enterprises Inc., Terrace Lumber Operations	29-Sep-87					
			1	OLD PLANERMILL	34	46	73.9%
							73.9%
66	Western Stevedoring Company Ltd., LynnTerm Opers.	30-Aug-87					
			1	DIPTANK	35	46	76.1%
							76.1%
71	Whonnock Industries Limited, MacKenzie Mill	10-Jun-87					
			1	DRIVE-IN DIPTANK	4	46	8.7%
			2	PLANER MILL SPRAYBOX	14	46	30.4%
							19.6%

MILL NO	MILL	INSPECTION DATE	UNIT	UNIT NAME	TOTAL SCORE	POSSIBLE SCORE	%
72	Whonnock Industries Limited, Pacific Pine Div.	11-Jun-87					
			1	PLANER MILL	9	46	19.6%
			2	B-MILL SYSTEM	-8	46	-17.4%
							1.1%
73	Whonnock Industries Ltd.(& Sauder),Bay Lumber Div.	13-May-87					
			1	DIPTANK	28	46	60.9%
							60.9%
75	Whonnock Industries Limited, Whonnock Lumber Div.	15-May-87					
			1	DRIVE-IN DIPTANK	25	46	54.3%
			2	PLANER SPRAYBOX	7	46	15.2%
							34.7%
76	Westcoast Cellufibre Industries Limited	19-Jun-87					
			1	ROUGH CUT	19	46	41.3%
			2	PLANER MILL	16	46	34.8%
							38.1%
78	BCFP Limited, Tilbury Sawmill Div.	17-Jun-87					
			1	PLANER SPRAYBOX	30	46	65.2%
							65.2%
80	CIP Inc., Tahsis Pacific Region	08-Sep-87					
			1	PLANER SPRAYBOX	39	46	84.8%
							84.8%
103	Sawarne Lumber Company Limited	18-Jun-87					
			1	PLANER SPRAYBOX	25	46	54.3%
							54.3%
115	Port Mann Remanufacturing Limited	03-Jun-87					
			1	PLANER SPRAYBOX	10	46	21.7%
							21.7%
119	Mainland Sawmills Limited	24-Jun-87					
			1	DIPTANK	-7	46	-15.2%
							-15.2%

MILL NO	MILL	INSPECTION DATE	UNIT	UNIT NAME	TOTAL SCORE	POSSIBLE SCORE	%
121	Teal Cedar Products (1977) Limited, Stag Div.	04-Jun-87					
			1	SAWMILL SPRAYBOX	14	46	30.4%
			2	HEAVY TIMBER SPRAY	17	46	37.0%
							33.7%

Average for All Sawmills 34.0%