THE PRACTICAL IMPLICATIONS OF ACCELERATED FIXATION OF CCA TREATED WOOD

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SUMMARY

Environmental pressures and regulations from Customers, Neighbors, Banks and Government Agencies will not allow CCA Treaters to continue to operate their plants as in the past, not even the recent past. New approaches to handling freshly treated wood must be found to avoid soil and water contamination from our plants and finished treated inventories. Over the past decade nearly all treating plants have eliminated plant related contamination sources. The challenge for the future is from unfixed finished inventories. Expanding traditional approaches by enlarging and heating drip pads, more dedicated fork lifts and covered finished inventories are not a practical solutions for most Treaters. In addition to the massive cost involved, this approach only passes the problems down the line most of the year. Ground water and soil contamination can be greatly reduced by the use of accelerated fixation. The literature suggest that three general methods of accelerated fixation are currently in use around the world. These are: 1) Steam 2) Hot Air 3) Hot Water . All three approaches appear to have merit . Hot Water's unique ability to fix unstickered packaged lumber and relatively short processing time makes it the most compatible with a modern treating plant. When hot water fixation is combined with a transfer deck and conditioning bays the resulting combination is the most attractive alternative for CCA Treaters.

1. INTRODUCTION

Because Canadian and US environmental regulations appear to track each other I will quickly review recent developments south of the border.

Effective December 24,1992 the US EPA put forth the Modified Listing Rule which put CCA drip pads under RCRA jurisdiction by classifying all chemical drippage, rain water and snow that falls on drip pad as FO35- Listed Waste. Depending on the interpretation of the mixture rule drip pads , liner and fill material may also be considered FO35 Listed Waste.

Effective Oct 1 1992 US CCA treating plants were required to submit NOI for NPDES storm water Permits. This permit requires storm water monitoring of plant sites along with many other features. Treaters must also have submitted a storm water plan by April 1993. The various states are responsible for issuing maximum run off limits. About half the states have established limits so far . Washington State has given Treaters three years to comply with:

ARSENIC..... 360 ppb
CHROMIUM ..... 16 ppb
COPPER ..... 18 ppb

These limits are for storm water run off from plant discharge points and are for total metals not TCLP.

2. IDENTIFYING THE PROBLEM

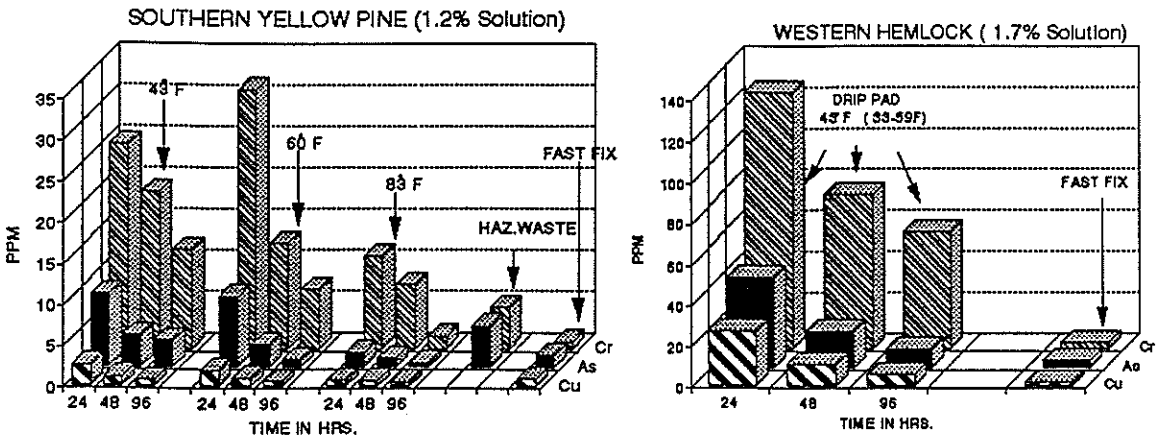
Many of our customers have been collecting soil and run off data for a long time. We in many cases have helped with these in house monitoring programs and analysis. They and we have been concerned by the very low but steady build up in these readings. These studies for the most part are from well run modern plants who used dedicated lifts, covered drip pads and followed the rules. The new storm water run off limits have focused every ones attention in this area. Our first step several years ago was to review the scientific data from around the world. We found that a lot of work had been done in this area, much of it in Canada . (See *Table 2.*) After reviewing the data we found that most of the studies on fixation understandably used small lab sized wood pieces or saw dust. They were for the most part trying to better understand the reduction of Cr6 to Cr3 and its importance to fixing CCA in the wood. This data was very helpful in our work. Government regulations make no distinction in the different types of Cr and are based on total metals in the ground or water. We also were concerned that the total metals washed from tightly banded dead pack dressed treated lumber found in a Treaters yard in February was likely to be very different from the amount of Cr3 leached from a small piece of wood or saw dust in a lab. There was a real need to proceed with a full scale study of potential contamination from CCA treated wood inventories. The results from this study are not pretty and left little doubt that if treated wood is moved from the drip pad too soon serious contamination is likely to occur. The real surprise came when we attempted to determine how soon is *too* soon. We found that even for southern US plants the minimum drip pad holding times were over 96 Hrs. in the heat of summer. The further north the plant is located the more extreme the times needed to be. Our work was all done in Maryland during summer, fall and winter conditions. We fully recognize that Canadian winters are quite a different matter. A Canadian chemical supplier published the following data several years ago.

Time to completely fix CCA Treated wood:
5 Days @ 25°C or 78°F
30 Days @ 10°C or 50°F
55 Days @ 3°C or 35°F
>4 Hrs. @ 88°C or 195°F

We believe these findings are important to treaters. We have informed our customers and have given several talks explaining these findings to many industry meetings. We presented a formal paper at the 1993 AWPA annual meeting. Table1 illustrate CSI's findings.

TABLE 1

CCA FOUND IN RAIN WATER



3. POTENTIAL SOLUTIONS

The ramifications of these findings on our business and yours are far reaching. Most Treaters are faced with no simple or inexpensive solutions. Expanding current drip pads to accommodate 96 Hrs production, inclosing and maintaining them @30° C is prohibitive. Covering 100% of finished inventory only passed the problem on to your customers. We believe that a much more positive, controllable and predicable answer is needed.

a. STEAM

Our first attempt was the use of live steam introduced directly into the treating chamber. This was a logical choice due to our experience in steam condition poles and timber for oil borne processes. We also have experience with the APM process used in NZ and Australia. Steam is a great way to heat things in a hurry but we and others have been successfully in penetrating dead pack units of lumber with out the use of separation sticks. We also experienced sap bleeding problems at steam temperatures over 100°C. We were able to improve on the sap bleed problem by introducing the steam under vacuum there by lowering the temperature. This lower temperature steam did no better at penetrating dead packs and required more time to fix. We also learned that using the treating cylinder as the steaming vessel presented some very large cost problems. The most obvious is the lost production. You can't use your expensive treating plant to treat with if you are using it as a steamer. The second is that the BTU requirements to heat the metal of the cylinder is similar to the amount needed to heat the wood and each time you treat with CCA the cylinder is cooled and must be reheated to fix . This problem more than doubles the energy required. The third problem is that the organic matter concentrated in the steam condensate is to high to be recycle or used as make up water.

b HOT AIR

The use of Kiln Drying After Treatment (KDAT) is a well understood process. Treaters have offered KDAT to customers for many years. I understand that some Canadian Treaters are using a variation on KDAT with some success. The process involves placing stickered lumber in long narrow modified kiln equipped with powered rollcases. Live steam is injecting heating the wood as it moves slowly through the chamber. I have not seen one of these systems but with adequate holding times this should be a great improvement. In the case of KDAT cycle times vary from a few days to up to a week in some type of kilns. Some studies indicate that care must be given to insure that sufficient moisture is present during the drying process for the proper formation of the CCA molecule. If moisture is not present the resulting wood is many times more likely to leach and subsequently fail in service prematurely. Direct fired kilns could present a problem in this area. KDAT and similar processes requires stickering and the processing times are not compatible with treating cycles. Attempting to KDAT 100% of a modern treating plant would require a very large investment in forklifts, stackers and kilns. It is very doubtful that a Treater could recover the cost of KDAT across his product line. KDAT may be a solution for those products which allow the Treater to recover all or most of his additional cost. Wood Foundation material FDN could be an example but landscape timbers, poles and fence post are another story.

c HOT WATER

Hot water proved to be the most attractive approach. This is due to two major advantages the first being its ability to penetrate dead pack lumber and quickly heat the center of the pack. Water has enough mass that after passing through a pack of lumber it still has sufficient BTUs to heat the wood. Simple soaking the wood in hot water does not produce the speedy results we wanted but with powerful circulation of the fix water we were able to achieve rapid heating in the center of the pack. The second benefits is from the washing effect gained from the fast moving hot water which tend to remove surface residues. Temperatures can be easily controlled to avoid sap bleed problem and a simple bag filter is used to remove accumulated debris. Build up of soluble organic material in the fixwater is controlled by a combination of chemicals and use of the fixwater as makeup water. Our work with hot water fixation included a series of lab scale and full production plant operations. One additional benefit of hot water fixation is the pleasing consistent uniform color of the wood.

4. MATERIAL HANDLING

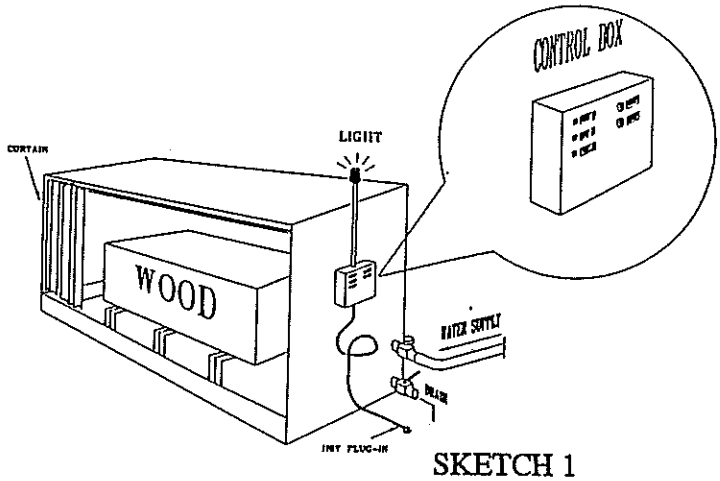
Regardless of the fixation approach chosen the need to move the wood to kilns, sheds or additional cylinders create material handling cost and problems. We first looked to conventional sawmill material handling technology for possible answers. We looked at powered rollcases in the cylinders and chain decks. Both of which have been tried in Canada and the US. These approaches proved to have several serious limitations in treating applications. The weight of treated lumber limits the use of single long chain conveyors and long multi-drive system are very costly. In cylinder powered rolls preclude material tie downs and rely on mill bands or double banding to contain the packs during treatment and fixation. The largest problem is the great variability of the wood typically treated in the modern treating plant. As freshly treated wood transverses across a chain conveyors deck one after another the "drippiest" charge will stop production until it quits dripping. With some species that could be 24 hours. A more likely scenario is that the still dripping charge must be removed from the system prematurely. This puts you back in the drip pad, dedicated lift business or worse. All date indicates that the degree of fixation is dependent on both time and temperature. With this knowledge, moving hot wood to the yard is wasteful. It is desirable to store the freshly fixed (heated) wood in a protected contained area until the heat has completed it's job. This involves another handling of the wood with all the related cost involved. We looked at the possibility of using overhead bridge cranes but speed ruled them out. All these task could be handled with the use of dedicated lifts and drivers and lots to space to work in but both capital and operating cost were problems. Considering the flexibility, speed and ruggedness required we chose a variation on an old idea. I'm sure you have all seen a transfer deck used with large dry kiln operations. We have enlarged and updated this basic idea (*Drawings 1,2&3*) ***WOODTEC's*** *TransDeck* consist of two parallel sets of track attached to a rail mounted frame. The *TransDeck* is equipped with an onboard hydraulic system which provides power for moving the deck and the two independent automatic tram winching systems. The control station is equipped with a PLC to aid the operator with alignment with the various cylinders and bays. The speed is quite fast with transverse speeds of 40 FPM and Winch speeds of 60 FPM. Change out times are approximately. 5-7 minutes. These times are very close to conventional double door systems and an improvement over single door operations .

5. CONTAINMENT SYSTEMS

The *TransDeck* is equipped with steel collection pans to catch any drippage from either the freshly treated wood or from the *FixTube.* The elevated Conditioning (cool down or drippage) Bays are also fabricated of steel and contained with a steel pan. This arrangement allows for very simple and positive inspection and repair. Both units serves as the primary containment and concrete is used for secondary containment only. The need for dedicated lifts and drivers are eliminated. If you have had experience with CCA, Fork lifts, cold weather, switch gear and concrete slabs you can appreciate these advantages. I am not aware of a satisfactory solution for Treaters with CCA contamination in their secondary containment system due to leaking concrete drip pads.

6. DEVELOPING A STANDARD

At the time we started looking at the question of fixation and storm water run off we realized that the question of what and how to measure the run off from yards had not been addressed by Canadian or US authorities. AWPA does require that treated wood be "fixed" before leaving the treating plant. Drip pad holding times are based on drippage not fixation. AWPA offers a Chromatropic Acid Test which is useful to determine if Cr6 is present in treated wood. This test is able to detect down to approx. 15,000 ppb Cr3 but does not address Cr6, Cu or As. Canadian and US limits do not distinguish between Cr 3 & 6 nor between As 5 or 3 for that matter. Some requirements go as low as 10 ppb. We felt that a more direct method needed to be found to determine the amount of chemical being washed from commercially treated CCA lumber. Indirect approaches such as the Chromatropic Acid test present the treater with unnecessary problems. We took a very straight forward narrow approach to this task. We built an inclosed booth large enough to place two standard packages of treated lumber up to 20 feet long. The booth is equipped with spray nozzles which can simulate rain fall on the wood. There is a collection pan that collects all the run off for analysis. A PLC controller was used to insure that the volume and time of the simulated rain could be closely controlled. Full details on the equipment and test protocol are found in our AWPA paper . We believe this test provides results which reflect real world treating operations. We are first to point out that many variables effect the final concentrations found in each plants soil and storm water but the run off finished inventory is the major starting point. A simpler test for production testing is still needed. (*Sketch 1)*



SKETCH 1

7. RESULTS OF HOT WATER FIXATION vs DRIP PADS

It was necessary to measure current drip pads performance to compare with various fixation results. The two different approaches must be measured with the same "Yard Stick" for the results to be meaningful. We did just that. We looked at both southern yellow pine and western hemlock. The basic results indicated that rain water from dead pack SYP and Hemlock CCA treated lumber exceed Canadian and US Federal Hazardous Waste limit even after 96 hours in summer time optimum conditions. Chrome is by far the largest problem. Concentrations in hemlock run off is much greater than SYP. (*Table 1*)

8. MARKET CONSIDERATIONS

Retailers, end users and their attorneys are demanding greater levels of assurance that our products are "Safe". I won't attempt to define "Safe" but a major part of how safe CCA treated wood is depends on how tightly CCA is bound to the wood and how much is released into the environment. I fear that attempting to defend rain water leachate that exceed Hazardous Waste limits is beyond our best marketing people and maybe even some lawyers. A few knowledgeable purchasers already require certification and methods of fixation and they will grow in numbers. Treaters who can supply certified fixed products will have a competitive advantage. We believe this advantage will be exploited and become even more important in the future.

TABLE 2

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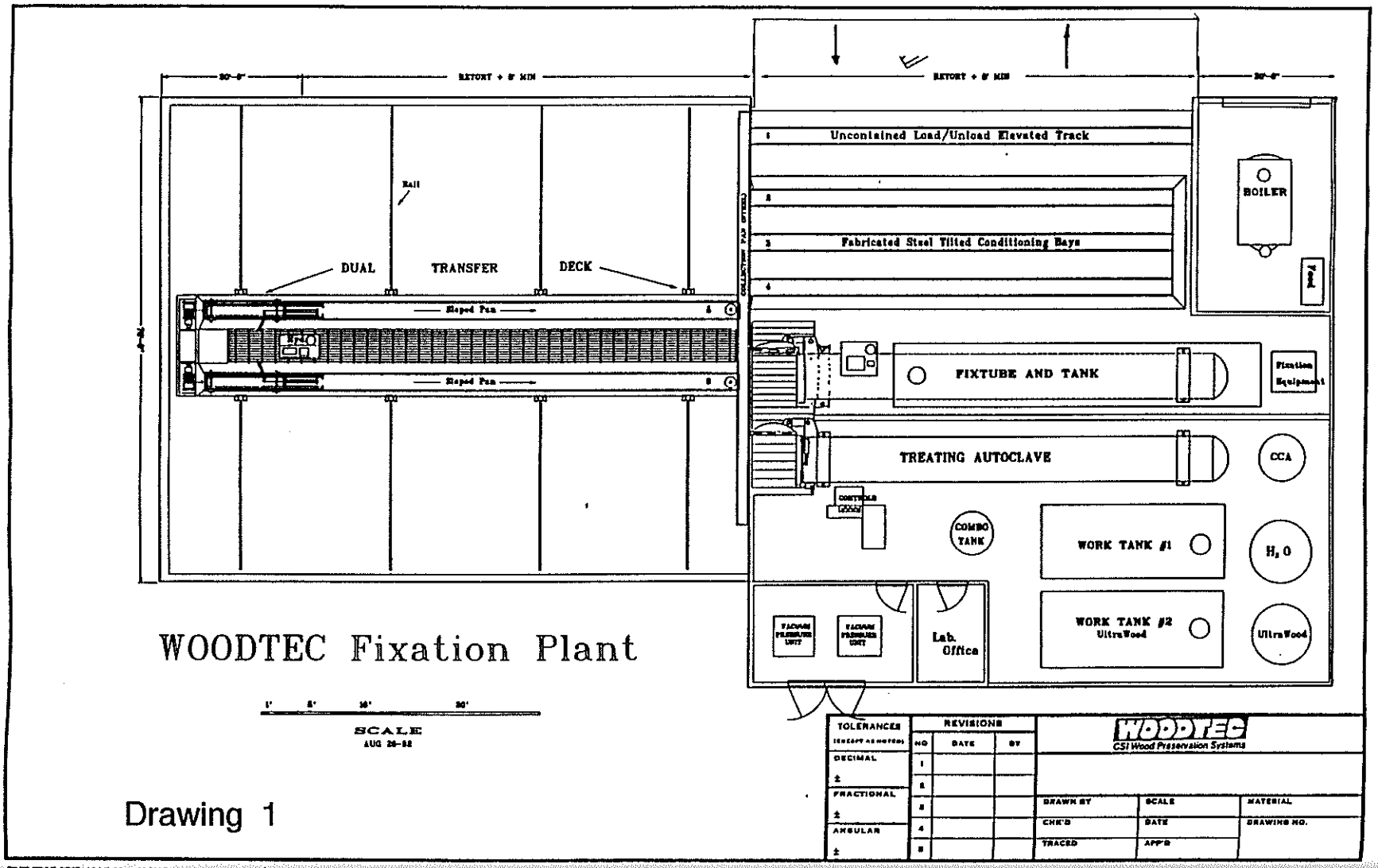
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RETORT + 8' MIN
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Fabricated Steel Tilted Conditioning Bays
BOILER
Rail
DUAL
TRANSFER
DECK
Sloped Pan
Sloped Pan
FIXTUBE AND TANK
Fixation Equipment
TREATING AUTOCLAVE
CCA
COMBO TANK
WORK TANK #1
H2O
WORK TANK #2
UltraWood
UltraWood
Lab. Office
WOODTEC Fixation Plant
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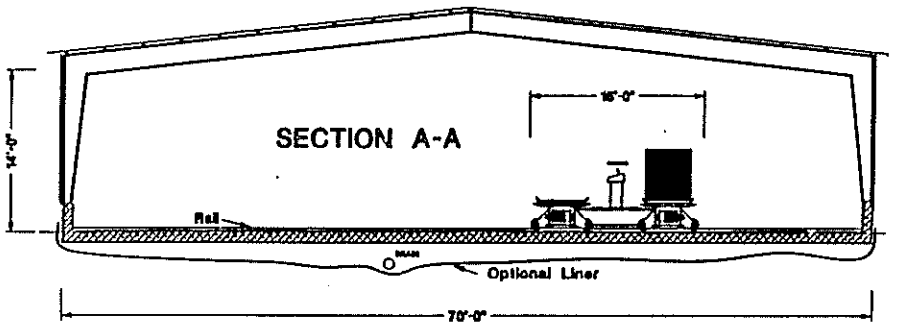
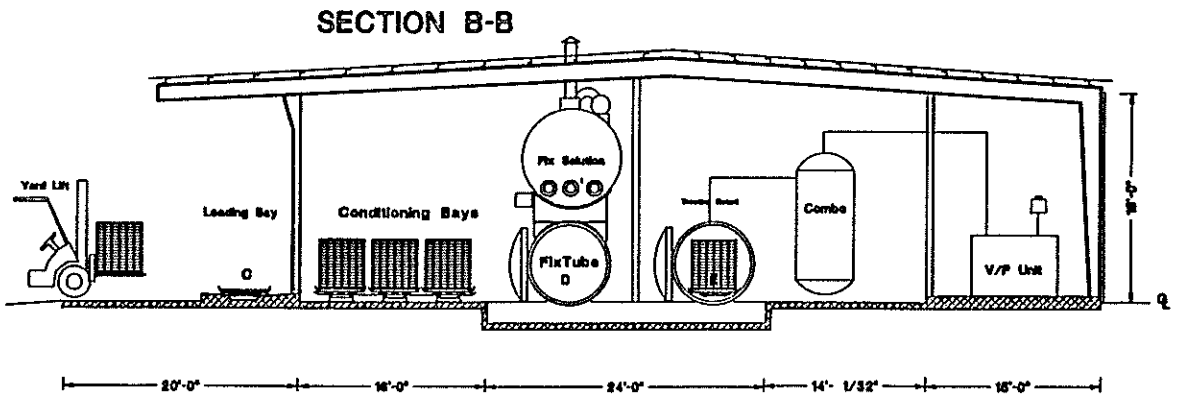
Drawing 1

WOODTEC Fixation Plant

Page 2





Drawing 2

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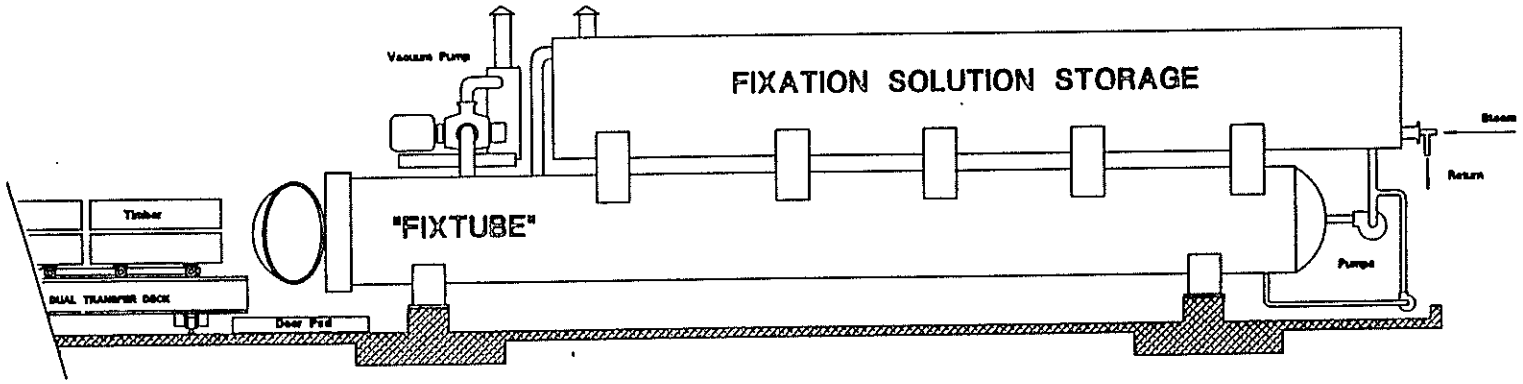

Drawing 3

TOLERANCES (EXCEPT AS NOTED)	REVISIONS			WOODTEC CSI Wood Preservation Systems		
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