

PRELIMINARY SURVEY REPORT:

Particleboard and Plywood Plants
Springfield Wood Products Facility
Weyerhaeuser, Inc.
Springfield, Oregon

SURVEY CONDUCTED BY:
Vincent D. Mortimer, Jr.

DATE OF SURVEY:

~~June 24, 1981~~

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REPORT WRITTEN BY:
Vincent D. Mortimer, Jr.

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NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
Division of Physical Sciences and Engineering
Engineering Control Technology Branch
4676 Columbia Parkway
Cincinnati, Ohio 45226

PURPOSE OF SURVEY:

To observe the processes involving adhesives, with emphasis on the method of application and the associated occupational health hazard controls.

EMPLOYER REPRESENTATIVES CONTACTED:

Mr. Joe Wendlick, Corporate Industrial Hygienist
Mr. Robert Brown, Safety Engineer, Springfield Plant
Mr. Chuck Cooper, Acting Safety Coordinator, Springfield Plant

EMPLOYEE REPRESENTATIVES CONTACTED:

Mr. Lowell Long, Shop Steward, IWA Local #2541

STANDARD INDUSTRIAL CLASSIFICATION CODE OF PLANT:

2436: Softwood Veneer and Plywood
2492: Particleboard

ABSTRACT

A preliminary survey of the fiberboard plant of Medford Corporation was conducted as part of a NIOSH study of occupational health hazard controls associated with the industrial use of adhesives. The production processes, especially those involving the urea/formaldehyde resin, were observed.

The resin formulation used by Medford Corporation may contribute significantly to maintaining the low ambient levels of formaldehyde. Engineering controls included control rooms for process operators, a canopy hood over the board cooling unit, and roof fans above the press.

Introduction

Industrial adhesives may involve agents, such as formaldehyde, organic solvents, and a variety of additives, which pose potential occupational health hazards. An appropriate implementation of control technology may prevent the overexposure of workers to these substances.

The Engineering Control Technology Branch of NIOSH is conducting a research study to document control methods associated with the industrial use of adhesives. The first phase of this project involves preliminary surveys to assess the application of control technology in conjunction with the use of adhesives in a number of industries. The information gathered will be used to focus future efforts on the industry which can benefit most from further study and to plan for a second, more detailed survey at those plants which are selected for in-depth study.

The primary contact for this visit was the Corporate Industrial Hygienist, Mr. Joe Wendlick. At the plant, we met and toured the facilities with Mr. Robert Brown, a safety engineer, and Mr. Chuck Cooper, who had been the acting Safety Coordinator. In the plywood plant, I talked briefly with Mr. Lowell Long, a shop steward of the International Woodworkers of America Union Local 2541, to explain the purpose and scope of the study.

Description of Facilities

Weyerhaeuser performs all operations on this site on the eastern side of Springfield to turn felled trees into finished wood products. The particleboard and plywood plants flank a joint finishing area as shown in Figure 1. Here both particleboard and plywood panels are filled, sanded, and trimmed to the desired size. Storage and shipping of these two products are also handled from this central area.

The layout of the particleboard plant is diagrammed in Figure 2. The equipment for making particleboard requires considerable space. There are two main production lines side by side, each approximately 300 feet long. The structure is about 100 feet wide with a 40 foot ceiling height. The press loader and unloaded of the original line are flush with the floor of the building. The new line is situated over pits to handle the loading and unloading racks as the index down. There is a common resin/wood particle blending area in the southeast corner, and both lines share the board cooling facilities along the west wall. There are some offices along the inside east wall.

The plywood plant, diagrammed in Figure 3, is much older, and now a ply-veneer production operation is also housed in this building. The glue application and veneer laying up process is set up as an elevated line with the three stations, each with an enclosed spray applicator. This one line feeds two hot presses. The glue mixing facilities are situated on elevated platforms adjacent to the presses. Veneer patch machines are located along the wall leading to the joint finishing area. Some office and break areas are also located in this section.

A total of almost 250 people are employed in these areas, spread over three shifts, and roughly 90% of them are production workers. Approximately the same number work each shift in the particleboard plant, while only about half as many are on the graveyard shift as are on each of the other two shifts in the plywood plant. The particleboard operation is highly automated; the plywood and the finishing operations are more labor intensive.

Description of Processes

The wood particles for the particleboard are first graded, coarse particles for the core and the finer particles for the face. The resin is sprayed and mixed into the particles. The resin-coated particles are then conveyed to bins from which layers are coated onto large, caul plates; two core layers between two face layers.

Using an indexing mechanism, the caul plates carrying unformed boards are loaded into a magazine from which the press will be loaded with a stack of particle-laden caul plates. At the conclusion of the press cycle, the stack is pushed out of the press and automatically unloaded one at a time onto a conveyor belt. A blast of compressed air blows loose particles from the press at the end of the cycle.

Having been separated from the caul plates, the newly formed boards are conveyed to the joint finishing area, being cooled en route. The cooling path includes a wheel-type board cooler and a cooling tunnel. The board cooler is not used for the thinnest (1/4 inch thick) boards due to warping.

After cooling, the boards are sanded and sized in the joint finishing area. They may also be stored here until being shipped from the loading docks in the building. For all operations, the boards are either moved in stacks with forklift trucks or transported singly on mechanical conveyors.

In the manufacture of plywood, veneer sheets coming from the "green end" are first dried, then graded and stacked. The appearance of a veneer may be improved by patching imperfections. Using special machines, an experienced operator cuts a hole in the veneer; and, at the same time, the machine cuts a like-shaped patch from a strip of veneer of the same thickness. The plug is then pressed into the hole to complete the process. The best pieces are used for the face sides of high-grade plywood. The cross-grained cores and parallel center plies are, in some cases, several narrow widths joined together.

These layers are assembled as the panel being formed is conveyed through the stages of the panel lay-up line. At each station, the adhesive is spray applied to the top side of the panel moving along the line. Then the next layer of veneer is laid in place. The panels are fed through the spray applicator by a conveyor belt, and the veneer sheets are lifted over and positioned manually.

At the end of this lay-up line, the panels are prepressed. An entire stack of panels is placed under pressure without heat to develop some bonding of the plies. This prevents the shifting of the veneers, aiding in loading the boards into the hot press.

The panels are loaded into the press manually. A stack of prepressed panels is placed on an elevator platform. Two workers ride this platform up to the level of the uppermost slot of the press. They slide the top panel off the stack into this opening; then the platform is indexed down to the next opening. This process is repeated until the stack is loaded into the press.

One crew can work both presses. One press can be loaded while the other is applying heat and pressure and being unloaded. Unloading is accomplished automatically. At the conclusion of the press cycle, the panels are discharged from the press. While the press remains open for loading, the unloading mechanism deposits the boards one at a time onto a stack. From here the panels go to the joint finishing area for filling, sanding and sizing, prior to storing and shipping. In the filling operation, surface imperfections are filled with a liquid, isocyanate-based resin. The resins used by Weyerhaeuser contain either methylene bisphenyl isocyanate or polymethylene polyphenyl isocyanate, and permissible environmental concentrations are reported not to be exceeded.

Description of Controls

Curtains have been hung around the particleboard press and the board/caul plate separator. These effectively contain the rising, heated emissions from these operations for removal by the roof fans above these areas. A detector tube (Drager 0.5/a) sample taken close to the press required sixteen pump strokes, indicating less than one half part formaldehyde per million parts of air. Another sample taken above the caul plate separator developed the color change after approximately 10 pump strokes, indicating about 1 ppm formaldehyde.

Control rooms have been built for the press operators and the operators who control the layering of particles on the caul plates. Now only a few workers involved in maintenance and clean-up regularly work outside these booths. An air conditioner has been installed in each control room for cooling during hot weather. The units are small, commercially available, window models which are vented to the indoor workplace air just outside the booth. They were not operating on the day of the survey, and it is not known what effect, if any, they would have on formaldehyde levels in the control rooms.

The board cooler and cooling tunnel have been built onto the outside of the particleboard plant. The air passing over the boards does not enter the building. The odor of formaldehyde was noticeable at the end of the new line where the boards were being conveyed to the board cooler; however, this is not an area usually occupied by workers.

In the plywood plant there are roof fans above the presses. Detector tube samples taken both alongside the press and alongside the loading platform did not develop significant coloration after 16 pump strokes indicating less than 0.5 ppm formaldehyde.

The workers handling the plywood as it is being assembled and loaded into the press wear gloves. The gloves protect their hands from splinters and reduce skin contact with the phenolic resin.

Although at this time, there is no acceptable substitute for urea/formaldehyde resin, the resins being used today are modified to reduce formaldehyde emissions. The effectiveness of this resin modification can not be assessed without comparison data for resin not containing these additives. Workplace sampling data from the state of Oregon revealed that during two surveys in 1978, the average work place concentrations were around less than 2 ppm. In March of 1978, 9 area samples and 1 personal sample ranged from 0.21 to 4.39 ppm. On another survey later that year, the concentrations measured by 2 area

and 2 personal samples ranged from 0.83 to 2.82 ppm. These measurements were taken before some of the current control measures were instituted. Similar data is not available for later years.

Other Factors Affecting Occupational Health

No single personal protective equipment item is required for every worker. Hearing protectors and safety glasses are required for some jobs. Respirators are not mandatory for any worker, but are available if the worker wants to wear one.

There is a plant medical department staffed by four Occupational Health Nurses. Medical care is contracted to a local physician who used to be employed by Weyerhaeuser. Each employee is covered by a hospitalization plan, and each is given a pre-employment physical. The state provides an industrial accident compensation program, which includes some inspection and monitoring services.

Weyerhaeuser has a corporate industrial hygiene program, and each plant has at least one person in charge of safety and fire prevention. The foreman for each shift is responsible for promoting job safety and holding a monthly meeting to cover safety items.

Each employee is responsible for keeping the workplace clean, which contributes to explosion prevention. There are no contract janitorial services in the workplace, except for the restrooms. Each weekend, a Weyerhaeuser crew performs a blowdown of the particleboard press.

Conclusions and Recommendations

Although pockets of air were encountered in which the formaldehyde odor was stronger than the mild ambient level, the workplace concentrations of formaldehyde were measured to be quite low on the day of the survey. Using

color comparison detector tubes to obtain a rough estimate of the numerical value of formaldehyde vapor in air, no sample was taken which exceeded the Threshold Limit Value of two parts formaldehyde per million parts of air proposed by the American Conference of Governmental Industrial Hygienists. Only the sample taken above the board/platen separator was near the NIOSH recommended standard of 1 ppm; however, detector tube measurement is not equivalent to the sampling method on which the NIOSH recommended standard is based. The OSHA permissible exposure limit is 3 ppm.

If the wood products industry is selected for in-depth study, this plant should be considered a prime candidate for a detailed survey. The provision of curtains around areas of relatively high formaldehyde emission is an important technique to be evaluated. The opportunity to simultaneously sample a plywood operation is another plus. It is known that there is inherently less liberation of formaldehyde from the phenolic resin. However, the documentation of the lower levels of workplace formaldehyde concentrations in spite of fewer control measures is consistent with the objectives of this study. Sampling, which could be done without interfering with production, should include sites around, above and below the press and the cooling path, around stacks of boards in the storage area, and in the control rooms with the door closed and both with and without air conditioning. Accessibility to the fans and above the press could be a problem.

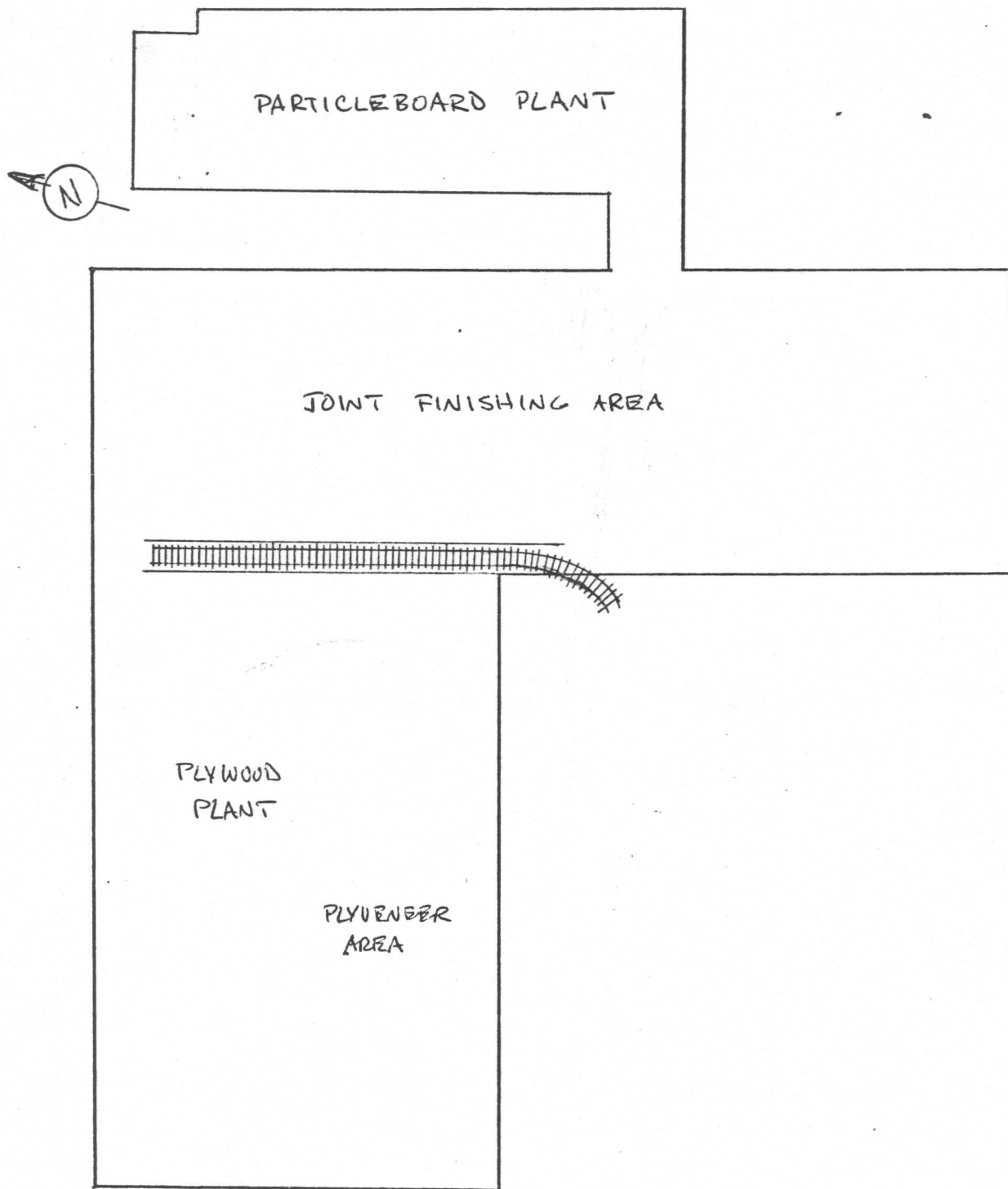


FIGURE 1. WBYBRHAUSER PANEL PLANT COMPLEX AT
SPRINGFIELD WOOD PRODUCTS FACILITY

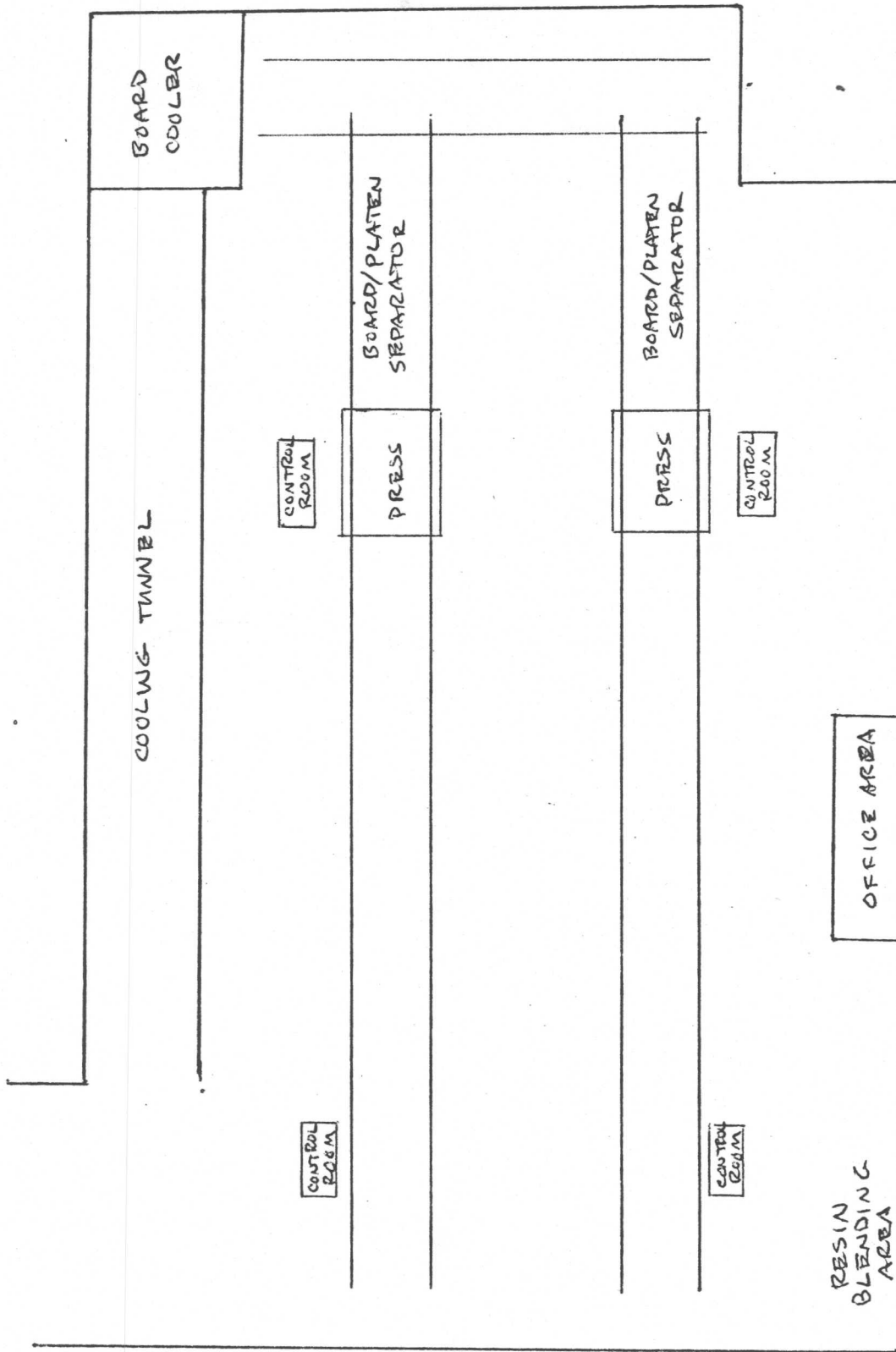


FIGURE 2. WEYERHAEUSER/SPRINGFIELD PARTICLEBOARD PLANT

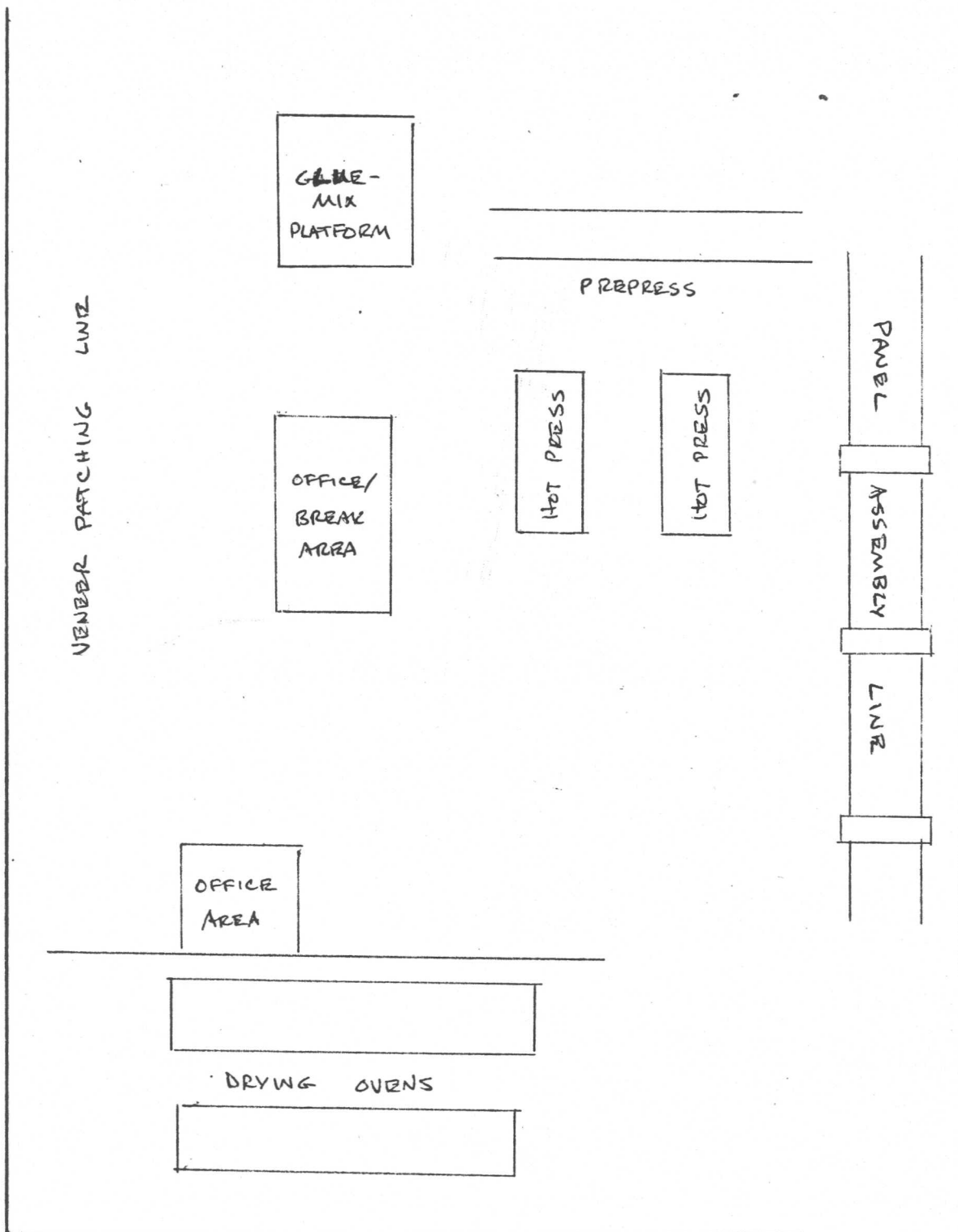


FIGURE 3. WEYERHAEUSER/SPRINGFIELD PLYWOOD PLANT