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**A
Wood
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Plant**

M J Stevenson

A WOOD PRODUCTS PLANT

for

ST. REGIS, MONTANA

by

Michael J. Stevenson

A Thesis
submitted as partial requirement
for the degree of
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Introduction

Industrial design has always fascinated me and I suppose that is the main reason I have chosen it as an area for my thesis. Much of my introduction has been devoted to such as Alvar Aalto, Albert Kahn and Louis Kahn, who have done a great portion of their best work in industrial design. Industry, through its factories, is our means, schools, and concert halls, is a very important part of our architecture and has sponsored some of the best architecture of the last few years. By introducing I'm not referring to a "factory" or a "plant" of handling of the problem; I am referring to some very serious and more expressions that are excellent examples of simplicity and clarity. A high degree of sophistication is required in order to approach this problem, and there are many levels of input that must be made in order to deal with a more understanding of the whole.

There is the goal of the designer myself and the one that challenges us most. I don't pretend to have it together like some of the masters, but one must start by setting the highest goal possible in order to make it worthwhile. Their attention towards the people working in a plant, towards the environment it is located in, towards the process being designed around, towards the spirit of the times, all are things that must be understood and reacted to in order to even think about design. A deep sense of the here and now of what the problem involves is important; questions like what materials are available, what is their cost, labor involved, effect on the environment, effect on people, etc. I believe this is a very valid approach to architecture in 1975.

I have chosen a well known plant as a subject to test my thesis. Steel production is an important part of thing in Montana and involves one

Industrial architecture has always fascinated me and I suppose that is the main reason I have chosen this area for my thesis. Much of my inspiration has come from people such as Alvar Aalto, Albert Kahn and Louis Kahn, who have done a good portion of their best work in industrial design. Industry, though not as flattering as museums, schools, and concert halls, is a very open minded patron of architecture and has sponsored some of the most uninhibited design solutions seen today. By uninhibited I'm not referring to a 'fad' or 'camp' type of handling of the problem; I am referring to some very serious and mature expressions that are excellent examples of simplicity and clarity. A high degree of sophistication is required in order to approach a problem this way, and there are many levels of input that must be analyzed and responded to with a deep understanding of the whole.

This is the problem I've assigned myself and the one that challenges me most. I don't pretend to have it together like some of the masters, but one must start by setting the highest goal possible in order to make it worthwhile. Their compassion towards the people working in a plant, towards the environment it is sited in, towards the process being designed around, towards the spirit of the times, all are things that must be understood and reacted to in order to even think about design. A deep sense of the here and now of what the problem involves is important; questions like what materials are available, what is their cost, labor involved, effect on the environment, effect on people, etc. I believe this is a very valid approach to architecture in 1975.

I have chosen a wood products plant as a subject to test my thesis. Wood production is an indigenous sort of thing in Montana and involves one

of the only renewable resources being used in construction, and elsewhere today. As the environmental costs of other building materials become realized, this resource will come into its own and become a major factor in the lives of Montanans. Sawmills are traditionally left to an engineer, or more often to whoever is building them to be designed. With sensible and mature architects this could change and become just as exciting and prestigious as banks, galleries, or high rise office buildings. It is certainly more to the point.

Understanding a Need

Before a foreman goes to a wood products plant a responsible designer should know a bit about the resources that he's preparing to use and/or exploit. The foreman is likely to lead to the forests and forest managers and to the men who manage them. This requires is going to be able to be harvested and the forest manager is likely to be convinced that this resource is renewable and that it can be managed in a conscientious manner and with continuing resource management techniques. Some good examples in private industry are the managed forests are Meyerhouser, St. Regis (not a company name) and for example, in its 109 year history, has increased its production of managed forest to supply what could be considered a very large demand. Most of the forests operated by these companies are now in private recreation, except where actual logging is being done, and are managed with little or no apparent cost.²

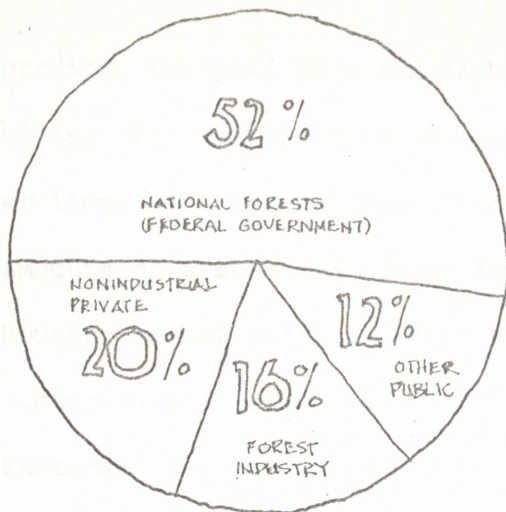
As demand for lumber up, the Federal Government is cutting back available sawtimber supplies, which may be justified by items like recreation, social, and economic measures. This is fine if their forest management improves and the available sawtimber supplies. I have faith that as slow as the bureaucratic wheels of the government turn, they will finally get around to what private industry has been doing for years. The Federal Government's forests have two or three times the potential they presently are utilizing and so cutting back is fine as they have the ability to be managed. The circle graphs on the next page illustrate my point a bit more graphically.³

LOGGING AND THE FOREST INDUSTRIES

Before plowing ahead with a wood products plant a responsible designer should know a bit about the resource that he's proposing to use and/or exploit. This should logically lead to the forests and forest management and to the decision as to whether this resource is going to be able to be harvested and re-harvested as a crop. I'm convinced that this resource is renewable and infinite when managed in a conscientious manner and with continuing research on growing and harvesting techniques. Some good examples in private industry of well handled forests are Weyerhouser, St. Regis(not connected), and Potlach; Weyerhouser for example, in its 109 year history has operated completely on its own managed tree farms to supply what could be considered a rather large demand.¹ Most of the forests operated by these companies are open to public recreation, except where actual logging is being done, and are heavily used with little or no apparent conflict.²

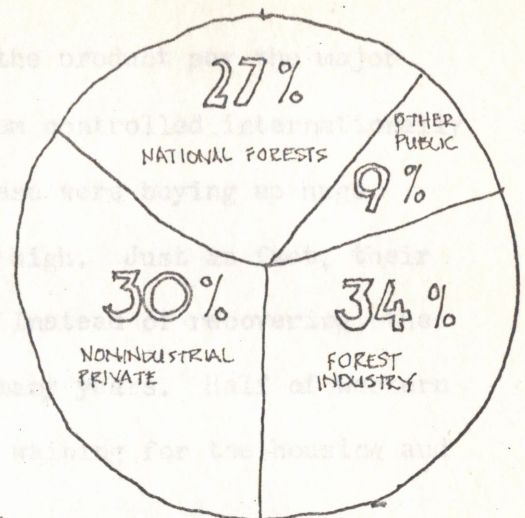
As demand for wood goes up, the Federal Government is cutting back available sawtimber supplies, which may be justified by items like recreation, social, and economic pressure. This is fine if their forest management improves with the shrinking available sawtimber supplies. I have faith that as slow as the bureaucratic wheels of the government turn, they will finally get around to what private industry has been doing for years. The Federal governments' forests have two or three times the potential they presently are being utilized at, so cutting back is fine as they have the ability to do much better.³ The circle graphs on the next page illustrate my point a bit more graphically.⁴

Where the wood is



1.9 Trillion Board Feet

Where the wood comes from



(1970) 47.7 Billion Board Feet

The timber and technology is available (or at least the timber is) in western Montana and Mineral County in particular, where 82% of the county is federally owned timberland.⁵ With research on so called "super trees" going well and management practices improving every day, I see good possibilities, if a slight change in attitude occurs amidst our government. That change in consciousness could be brought about by a well thought out plant operating efficiently and with the purpose of letting the public see what is happening and how it all fits together in a very intricate cycle.

THE LUMBER MARKET

Approximately 15% of a mills' output is absorbed 'locally' in Montana, the majority going to large population centers in the Midwest and Western regions.⁶ Just this fact makes the location of a plant independent of major population centers in Montana and more dependent on major routes of transportation, ie; freeways and railroads. Knowing this, we find St. Regis, or any of a host of similar towns along their routes to be suitable for the location of a wood products plant.

Understanding where the market is does not help if you can't sell the product or if you cannot get timber, as discussed previously. This has been a major problem of sawmills everywhere; one year they are making huge

profits, the next they are unable to even make the product pay the major bills. The market is an extremely complex system controlled internationally at times, ie; several years back when the Japanese were buying up huge amounts of timber and lumber the market was sky high. Just as fast, their housing market fell, and down came the prices. Instead of recovering, the lumber market is in one of its worst slumps in many years. Half of western Montana's wood employed people are out of work, waiting for the housing and the construction industry to come back.

I could write a paper just on the lumber market alone, but the point would still be the same. Wood products plants operating in a traditional manner are a less than stable industry. This is part of the reason I propose later on in this discussion to have the plant owned, partially if not eventually all by the town it is located in - by the people working in it and feeling the affects of a very fickle market. The union as it is known today, would have to be modified if not altogether removed, so the whole plant, managers and laborers alike could act as a single body. Wages would slide (with some lag) with the market, so even when it is down people are still working, producing a competitive product, and paying the bills. Being out of work causes more community problems than are seemingly bearable, as is pointed up by what is going on in Mineral county now. Being flexible is what it is all about, being able to meet the present and move with the changes.

ECONOMICS

Some questions the architect must answer are: How does a new product compete with older products, and what economic consequences are there when introducing a plant of this size into a small community?

The first part has been investigated quite thoroughly by the U.S.

Forest Service. They feel that with press lam able to use shorter logs, and logs of low quality to produce what essentially is a No. 1 structural product, that it can compete quite favorably.⁷ It being a new product though, one must expect five to ten years introduction and acceptance in the field which means some slow starting years.⁸ It also means such plants should be being built now in order to get the idea of maximum utilization of a resource into public view as fast as possible.

Wood processing has been found to be a very good industry to have, locally as well as in the state. They make most all of their purchases in state, and in almost every sector of the economy, while most sales are out of state which brings outside money into circulation.⁹ This sort of a situation is usually encouraged by economists and is a sign of a healthy economy. One also finds that one dollar spent in wood products multiplies out to something like \$3.14 in its direct and indirect effects.¹⁰ This is one of the highest of any of the sectors studied and again indicates an industry that would be good to have in a community. Wood processing does not create a lot of jobs as a direct or indirect effect of its own hiring.¹¹ This can be seen as a minus, but in a small town where you would like to see it growing, yet still remain a small town, it can be considered as a plus. In the event of the plant shutting down the whole town isn't out of a job, again a factor worth considering. I think Detroit and other automobile cities are now wishing that so many people weren't so dependent on the auto workers having jobs.

My conclusion is that a wood products plant, in an economic sense, is a very worthwhile industry to be considering as far as rural Montana is concerned.

SAWMILLS AND WOOD PRODUCTION

In 1900 12.1 billion cubic feet of timber were harvested for use in the United States.¹² In 1973 12.3 billion cubic feet were harvested.¹³ Something obviously has been happening in efficiency of production and those figures illustrate quite readily that it has been much for the better. In the 1950's the efficiency of an average mill was between 20 and 25 percent; today it is between 40 and 45 percent.¹⁴ I think there has been and will continue to be a very concerted effort on the part of the forest industry to improve the efficiency of their mills. Right now many mills in western Montana use over 90% of the log as the residue from production - chips, shavings, trimmings, etc. - are sent to be used in paper production in Missoula.¹⁵ The 40-45 percent figure above merely represents conversion to useable lumber. Wood is many more times valuable as lumber than as chips and so the object is to try and get as much lumber as possible from the tree. For example: using 1000 cubic feet at a cost of \$300 you will find this typical breakdown.¹⁶

	<u>Percent</u>	<u>Worth</u>
Bark	11	\$ 0
Planer shavings	10	34
Trimmings	26	36
Sawdust	13	9
Lumber	40	1,158

There are production systems available composed of equipment from different lines being used now such as "comply" and "press-lam". These systems, "comply" in particular, claim 100% conversion to lumber.¹⁷ "Press-lam" is looking at a theoretical 75-80% efficiency and has the advantage of being faster and less complicated, besides producing a much more versatile commodity.¹⁸

Besides advance forestry available today, there are wood production systems ready to match them and I believe that the problem of a wood products

plant then becomes a viable one; one that makes it valuable for the designer to investigate.

Planning

Planning

...the architect's first responsibility is to the client. Obviously time and circumstances may make it too detailed, but I have considered it and it will carry with me.

A good local population statistic can give us a rough idea of the size of the stabilization factor. A good county statistic is probably the total answer, but should give a poor idea of the local situation.

19

1970 census

	19-24	25-44	45-64
Male	100	151	123
Female	115	134	299

Population by age

Division	Pop.	Town	Change
Alberton	1,000	(1963)	11.9
St. Albans	1,500	(1963)	7.6
W. of St. Albans	700	(1966)	2.6
			2.6 overall

Employment by sector

Manufacturing	24.7%
Wholesale	31.4%
Government	11.7%
Rest of county	10.0% (mostly Alberton people working in Miscoula)

Median income: \$1,955.00 Per capita income: \$1,972 (State: \$2,942)

Unemployment: 14.5%

57 marriages 28 marriages/11 divorces

These figures indicate a poor rural population used to an economically depressed standard of living, and subject to a large out migration of its young people. People are leaving simply because there isn't any work for

THE POPULATION

A study of the overall situation should be the architect's first responsibility in doing a project of this magnitude. Obviously time and circumstances don't allow me to get too detailed, but I have considered it as very important and something that I will carry with me.

A general overview of Mineral county population statistics can give us a rough idea of the need for some sort of stabilization factor. A wood products plant certainly wouldn't be the total answer, but should give a good base from which to start.

Statistics per 1970 census¹⁹

Mineral county population: 2,958; Density: 2.4/sq. mi.

	<u>5-14</u>	<u>15-24</u>	<u>25-44</u>	<u>45-64</u>
Males	353	202	352	323
Females	355	245	334	299

Population by division

<u>Division</u>	<u>Pop.</u>	<u>Town</u>	<u>Change</u>
Alberton	600	(363)	13.9
Superior	1580	(993)	7.8
West end (St. Regis)	778	(496)	2.4
			<u>2.6 overall</u>

Employment by sector:

Manual	24.7%
White collar	35.5%
Government	31.7%
Out of county	10.0% (mostly Alberton people working in Missoula)

Median income: \$8,495.00 Per capita income: \$1,972 (State: \$2,942)

Unemployment: 13.9%

57 births/28 deaths 28 marriages/14 divorces

These figures indicate a poor rural population used to an economically depressed standard of living, and subject to a large out migration of its young people.²⁰ People are leaving simply because there isn't any work for

them; they get married and half of them find they cannot make it, mostly from money related problems. Mineral county becomes a tough place to live in, even though the scenery is some of Montana's finest. It becomes a place you would like to call home, but can't. To look at some of the statistics, say the birth through age 14, one would expect the county to be growing modestly and to be composed of young energetic people. The area still has that potential, and I would like to see it realized. These thoughts are expanded on in the following discussion of services important to the function of the community.

SERVICES

Health Care:

Presently there is a small hospital in Superior with a new ambulance and good services. A new 20 bed hospital is almost completed along with a 10 bed nursing home.²¹ These services should be able to handle any county needs up to about 5000 population and as projections aren't anywhere near that, it should continue to meet the needs of the area, ie; St. Regis.²² On the question of physicians, there is adequate service now, but perhaps as development occurs a small clinic should be planned and the services of a physician obtained. There is a public health nurse in Superior who makes the rounds of the county and ends up giving not too good of service to anyone. I would suggest a nurse based at the plant who takes care of health and safety of plant workers and perhaps works 3 days a week or afternoons in St. Regis and immediate area, in schools, and with old people. This service would establish a person to person relationship between plant and community that will be important in its effectiveness.

If my plant does boost the economy of the area and enhance a healthy in-migration of people it could also substantially reduce the worth of older peoples savings and income.²³ There would naturally be some inflation

a wood products plant: st regis montana

[illegible]

of living costs and the old are the first to be hurt. A nurse in touch with these potential problems could perhaps through some plant sponsored fund to head off any difficulties. There are many ways of handling the situation, and I think in this case it is important to be aware of it and know it exists.

Education:

The elementary school presently carries about 150 pupils while the high school only has about 65 - where a certain portion of the high school students go after grade school is a good question.²⁴ It indicates a large out migration and with 14% unemployment (1969) I wouldn't wonder. The question of what to do with the schools after expansion is a tough one. I would suggest consolidation with Superior which has a brand new high school. This would give St. Regis students a better education, but also has side effects, such as taking away the only social event in town - the High school sports events. In its place perhaps a community center with recreation facilities would turn this attention. It would also solve the lack of adult recreational facilities available.

Law Enforcement:

Law enforcement is handled by a sherrif in Superior who has deputies that live in Alberton and St. Regis.²⁵ St. Regis has one deputy; which is adequate protection, although during the tourist season he may be a bit overworked. Another deputy would be needed if my proposed development went through. An influx of new people, especially in the first years, like construction crews, causes some friction resulting in higher use of the bars and jails.²⁶

Fire protection:

Fire protection is provided by a 15 man, volunteer fire department

with a new large truck and a pickup.²⁷ This is above average for the size of the town and the influx of 25-30 new homes shouldn't alter this drastically.²⁸

Utilities:

Public utilities service is limited to some garbage collection and it would be wise for St. Regis to get something going on this score.²⁹ Water and sewer, even for its present size, should be seriously considered.

Fuel and Food:

The truck driving industry is part of what has made this town. The Husky truck stop is what St. Regis has developed along with the tourist industry and some now extinct mills. There is the truck stop plus 3 other stations - in a town of this size you might expect two service stations at the most. There are two grocery stores, 5 bars, and a state liquor store, 3 or 4 restaurants and 6 motels with about 50 units.³⁰ I would have to say that in fuel, food, and lodging, St. Regis is well taken care of and should be able to handle the expansion predicted.

Transportation:

Public Transportation is good with I-90 and two rails going through. These support Greyhound service and Amtrak so St. Regis is isolated only in a small sense of the word and transportation is the main factor. This sector is a major item in siting a plant such as I am proposing.

Social Services:

County welfare and social services I don't know a lot about as they are handled through Superior. This is another area a nurse could help in as social services are mainly concerned with working with senior citizens.

Planning:

Town planning is zero and should be one of the first things pushed as a "must do".³¹ In this case the plant should expect to absorb some proportion

of town planning, offer the services of a professional, something to make it known that the towns' concern is the plant's concern.

SOCIOLOGICAL CONSIDERATIONS

We find that services meet most of the physical needs of a community, but very important too, are the sociological needs; the needs that are hard to pin down in facts and figures. The chart below gives some indication of what is desirable and what is not.³²

- | | | | |
|----------------------------------|-------------|----------------|-----------|
| 1. Local autonomy: | Independent | <u>1 2 3 4</u> | Dependent |
| 2. Coincidence of service areas: | Coincide | <u>1 2 3 4</u> | Differ |
| 3. Psychological identification: | Strong | <u>1 2 3 4</u> | Weak |
| 4. Horizontal pattern: | Strong | <u>1 2 3 4</u> | Weak |

Local autonomy in a small town is virtually non-existent nowadays. Freeways that cut off the town, extension agents, county welfare, industry, shops, church organizations, all with decisions made on a higher level in the larger society of which the community is a part. How people perceive their autonomy is a different story. One thing that has people upset is the Forest Service owning nearly all of Mineral county and unable to sell to people after taking away their land for a freeway.³³ A plant could provide the link to that outside world that controls St. Regis, and give it a little control of its own. There is a possibility that an industry could promote growth and strengthen the next item - coincidence of service areas, which basically is the use by people of local services for their existence. The more services available in the town, the more people can identify with the community and feel a part of it. Many of the important services are in St. Regis now, in some form or another. With economic stimulation more of

them would be encouraged to enter the community and the ones already there could be strengthened. The wood products plant would provide the base to support this sort of expansion.

Psychological identity deals with perceived autonomy - taking pride in the community and supporting improvement programs. Do the people feel a part of the community, a part of the whole? Does the group hear their voice? These are important questions in this area. A thing I am investigating is the possibility of the community owning a share of the mill so that its direction and decisions are not completely out of their hands; so people understand why jobs are gone and what they can do to get them back, so wages can go up or down with some understanding. The idea may be a little 'pink', but the thought of a communal unit operating in a free enterprise society has some sociological and economic implications that are not all bad. I would like my plant to be an integral part of the community and the environment that contains it all.

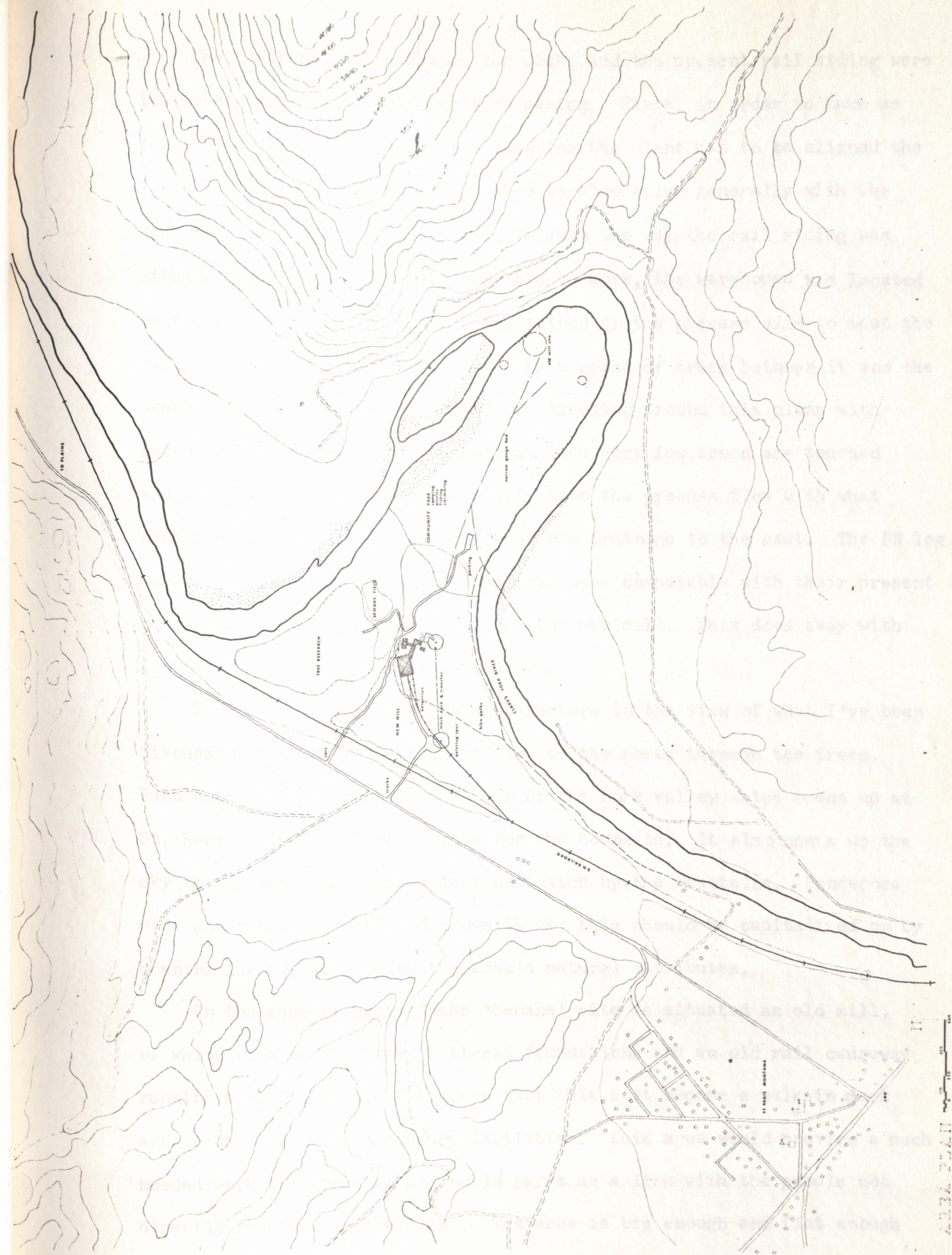
The horizontal pattern is the way in which individuals and groups interact and how their behavior patterns, sentiments, and "social systemic interconnections" work.³⁴ Small towns generally have pretty strong horizontal patterns because their interests, likes, and dislikes, are usually less varied than in larger areas. A large group of new people entering St. Regis to work in the new plant is bound to disturb this pattern, although I figure only slightly because the lumber industry is common to the area. Still, I propose that its hiring and training be geared to use as many local people as possible and bring in only those new people that are necessary, and whose positions couldn't be filled by people in the area. My discussion above, in "Psychological Identification" is aimed at this problem. The rough population increases (about double present population) I've shown include

a projected increase in services and people employed by them. These people combined with new plant people will disturb to some extent this horizontal pattern, and a transition of 4-5 years should be something the architect is aware of when dealing with the situation.³⁵ He should make the town aware of what is going to happen also.

SITE PLANNING

St. Regis is a small town situated 35 miles west of the Montana-Idaho border on Interstate 90. The site I have chosen is a large banana shaped piece of land one mile north of the center of town and separated from it by the highway to Plains, by the BN rails, and by a slope of land covered with trees. Visually the site is not discernible from town and is also a place where the town would logically not grow, given the above barriers. Included on the site is a siding and a log deck operated by the BN. With all of these facts the site chosen seems to be the only appropriate one, given the conditions.

This banana shape comes about by a form of oxbow in the Clarks Fork river which points directly up a small stream drainage, and from the site of the mill one is very aware of this small and steep valley. This draw is covered solidly with full grown fir and ponderosa pine and seems to be bearing down on the site with a flood of greenery. This flood is a point of importance in my design and one that I have tried to make apparent in my solution. It becomes a good tool in helping the people experiencing the plant to realize the cycle of trees, and their place in the cycle. By gearing my design toward this spirit it should become evident as the plant goes into operation that such things as efficiency, worker moral, community spirit, and plant office interaction are increased appreciably.



The clearing, the existing log deck, and the present rail siding were the other major factors in decision making. First, in order to take as few trees out as possible in the clearing the plant had to be aligned the length of the clearing which happened to also align generally with the drainage I've been talking about. Between the way the rail siding was situated and the way the warehouse had to work, the warehouse was located on the west end of the clearing and turned on the process axis to meet the rails. The site clearing is formed by a group of trees between it and the present BN log yard to the south. By circling around this clump with incoming logs going to the mechanical deck very few trees are touched and the raw logs enter coincidentally into the process flow with what could be called the spiritual flow of the drainage to the east. The BN log yard could be converted to a mechanical deck compatible with their present requirements and the requirements of the new mill. This does away with about 80% of the present area required.

There are other important site factors in the view of what I've been discussing such as the excellent view to the north through the trees. Running north and south is the main Clarks Fork valley which opens up at St. Regis to provide enough room for the townsite. It also opens up the sky to the west and becomes less dominated by the mountains. Ponderosa pine dominates the site and grows thick; this should be capitalized on by opening the building up to the area's natural attributes.

On the eastern half of the 'banana' site is situated an old mill, of which remains the heavy battered foundations and an old rail causeway running east and west. I suggest that this part become a walk-in park area with perhaps some camping facilities. This area would provide a much needed park for the town and would serve as a link with the people not directly involved in the plant. The area is big enough and flat enough

to contain a number of recreational fields and out buildings. To the northwest of the old mill site on the river is a nice sand bar which could be developed into some sort of water oriented area ie; swimming and fishing.

North and adjacent to the plant site is a large clearing that I have suggested become a tree experiment farm operated by a biological researcher. This area would be an extension of the green house activities done by the research department. A tree farm would be important as a public relations tool and also as a tool for understanding more about the product being used. On the east end of this clearing a sewage field would be located, operating on a set of 2000 gallon septic tanks in series.³⁶ The soil is of a shale and gravel composition and excellent for a septic type situation.

Sun, wind, and precipitation are very important factors in designing and should be accounted for. Both the sun and wind are modified greatly by the mountain climate and the thickly forested hillsides. One finds that the sun is not quite as hot and intense in this area and is something to be enjoyed as much as possible rather than be shielded from it. Winds rarely reach high velocity in St. Regis as they are forced over the Continental Divide to the west and don't drop down till past Superior to the east. Winds generally are from the west and the north and because of the trees do not pose any serious problems. Precipitation on the other hand is heavy compared to the rest of Montana: snow gets deep and the rains can be viscious. Good drainage for the site and building must be considered and designed for.

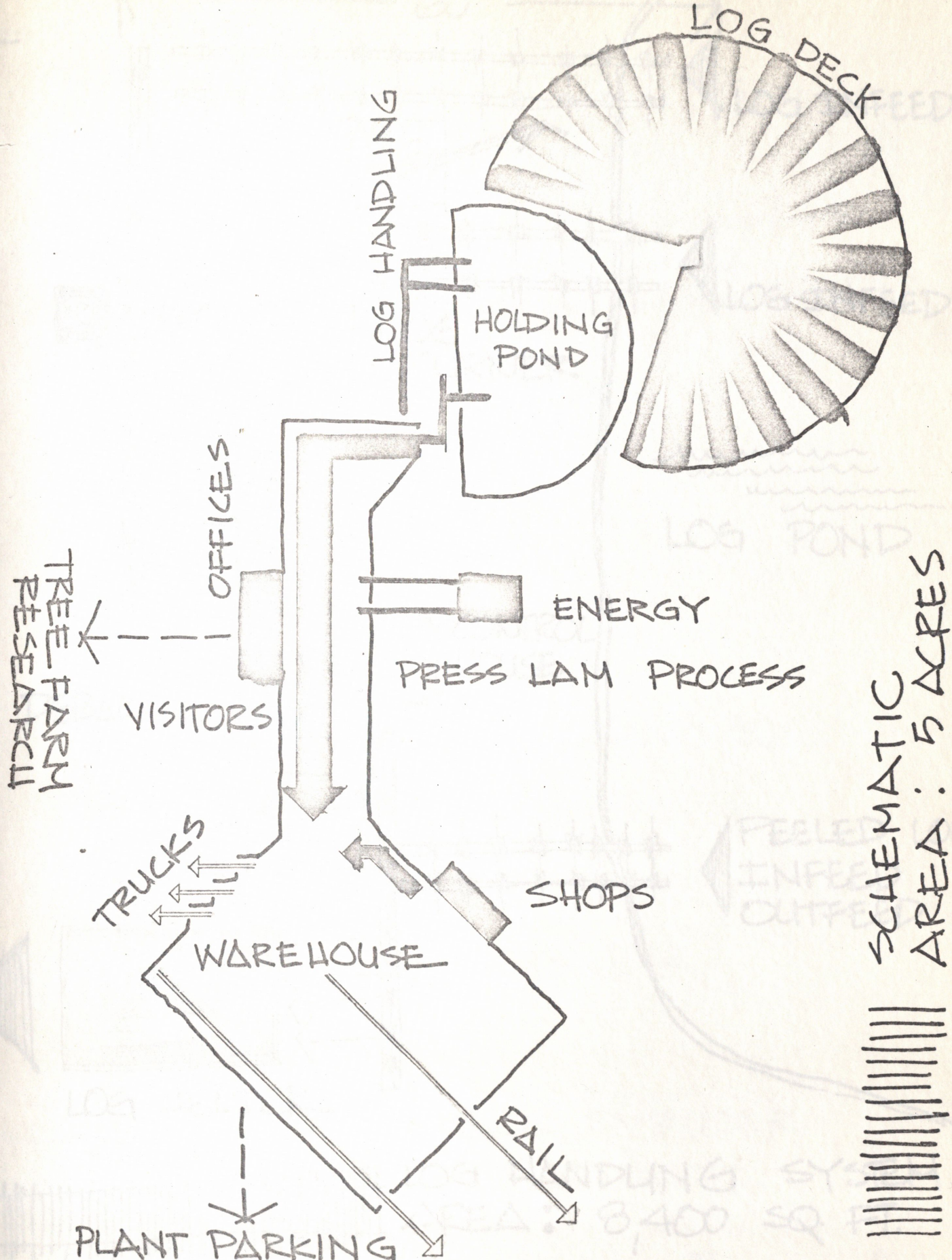
The plant is situated in a comparatively unspoiled mountain environment and should be as unobtrusive on the landscape as possible. If anything it should amplify the site's beauty and play down its attachment to humanity.

People working in the plant will be encouraged by the way the building affects them to experience the natural cycle of things. These responses to feelings and a pragmatic way of meeting the actual plant needs have made this a very real and exciting problem for me.

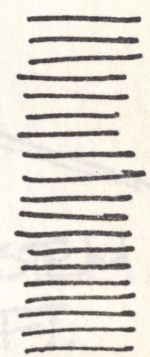
Programming was done on a fairly simple plane in order to get to the problem as quickly as possible. Much industrial architecture, including this problem, lends itself to this approach since spaces and volumes become pretty well established by the process. One cannot articulate the building much beyond these established lines so the problem becomes one of a very subtle and controlled nature. The architect must start to think; probably much harder than he would on something he is able to mass into pretty forms and interesting but meaningless patterns. The following describes briefly what sorts of elements established my building for me, using the schematic as a guide.

Log Handling:

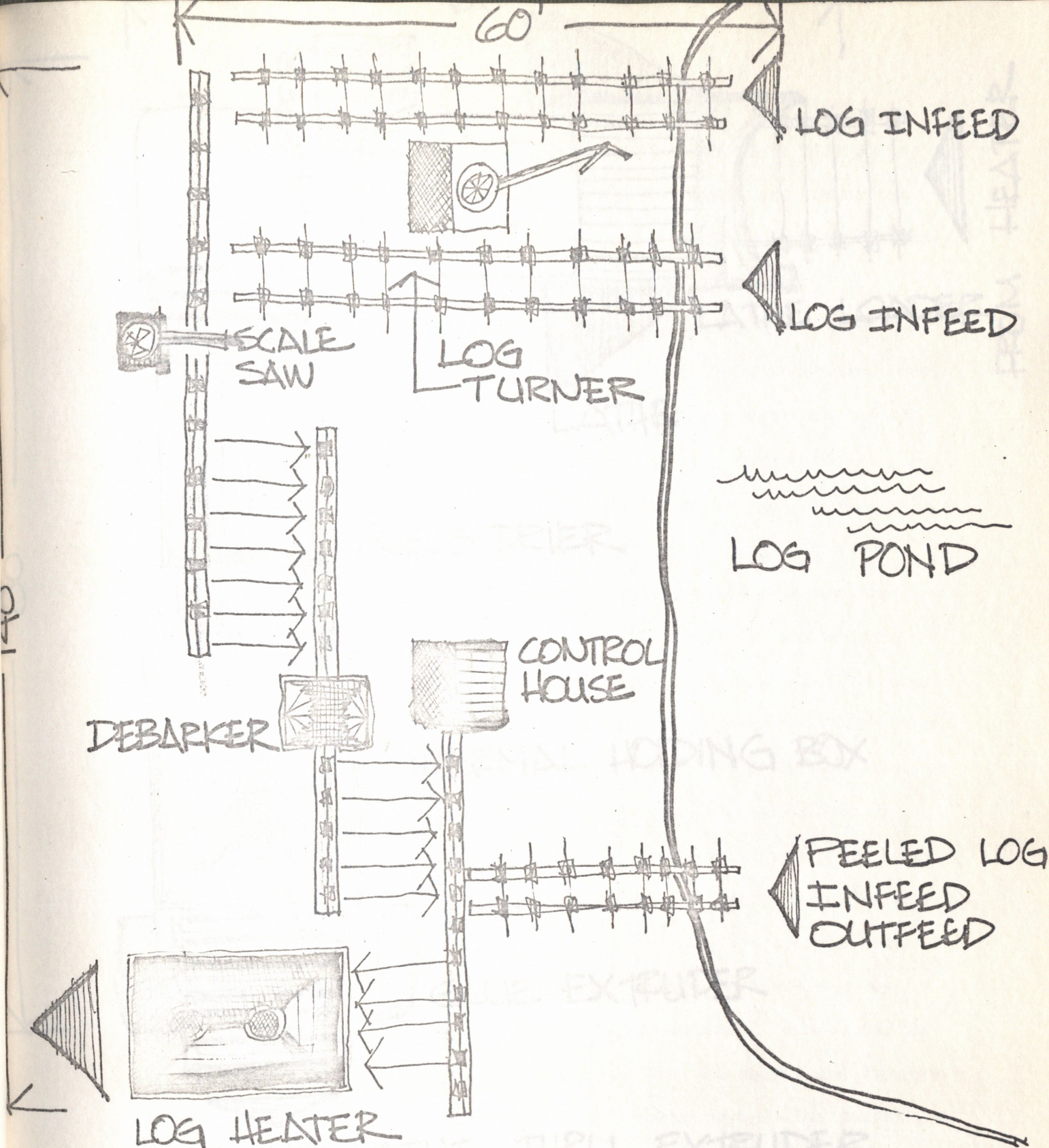
A log crane dumps logs into the holding pond where snow, dirt, ice, etc. begin to wash off the bark. A person working in the pond then guides these raw logs into feeder chains. On these chains the logs are turned butt forward for maximum utilization, dumped onto the scale chain where they are pressure sprayed clean and automatically scaled into appropriate lengths. "Lilly pads", the ends left after scaling, are dumped into the lilly pad chipper and sent by pneumatic tube in the form of chips to the hog fuel bins. Scaled logs are debarked and sent into the process which starts with the log heater. Bark is also tubed to the hog bins. If the debarker is running ahead of the process, debarked logs can be put back into the pond for later use while being kept clean and unfrozen. All logs except douglas fir,³⁷ which by the way is abundant in the area, must be heated by steam to 140 degrees before being lathed into sheets for use. Heating takes about an hour so the heater must be a unit about 40' long for a continuous supply of hot logs. Douglas fir would be sorted out in the deck area and run through in special runs.



SCHEMATIC
AREA: 5 ACRES

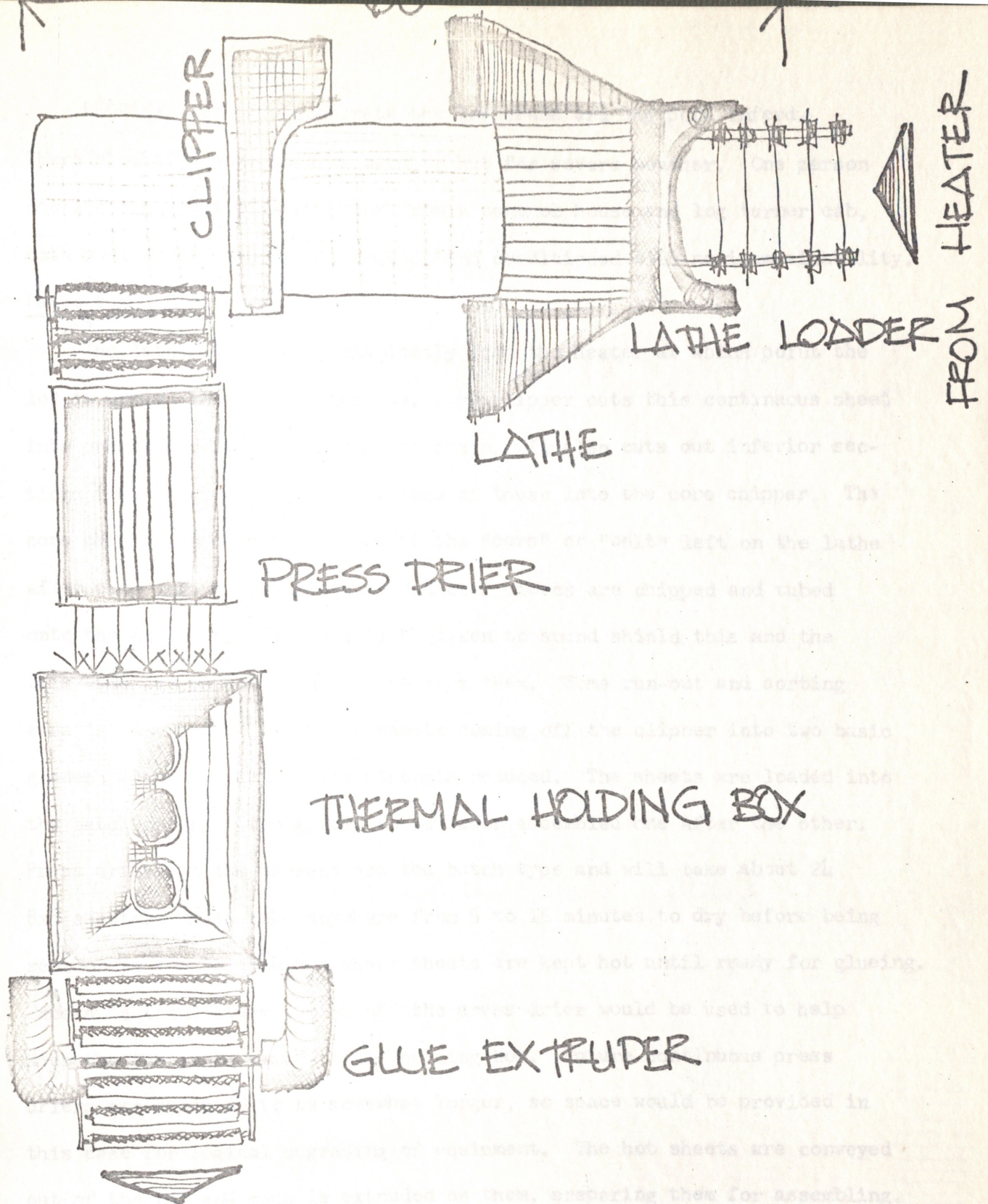


Program analysis



LOG HANDLING SYSTEM
AREA: 8,400 SQ. FT.

program analysis



AREA: 4800 SQ. FT.

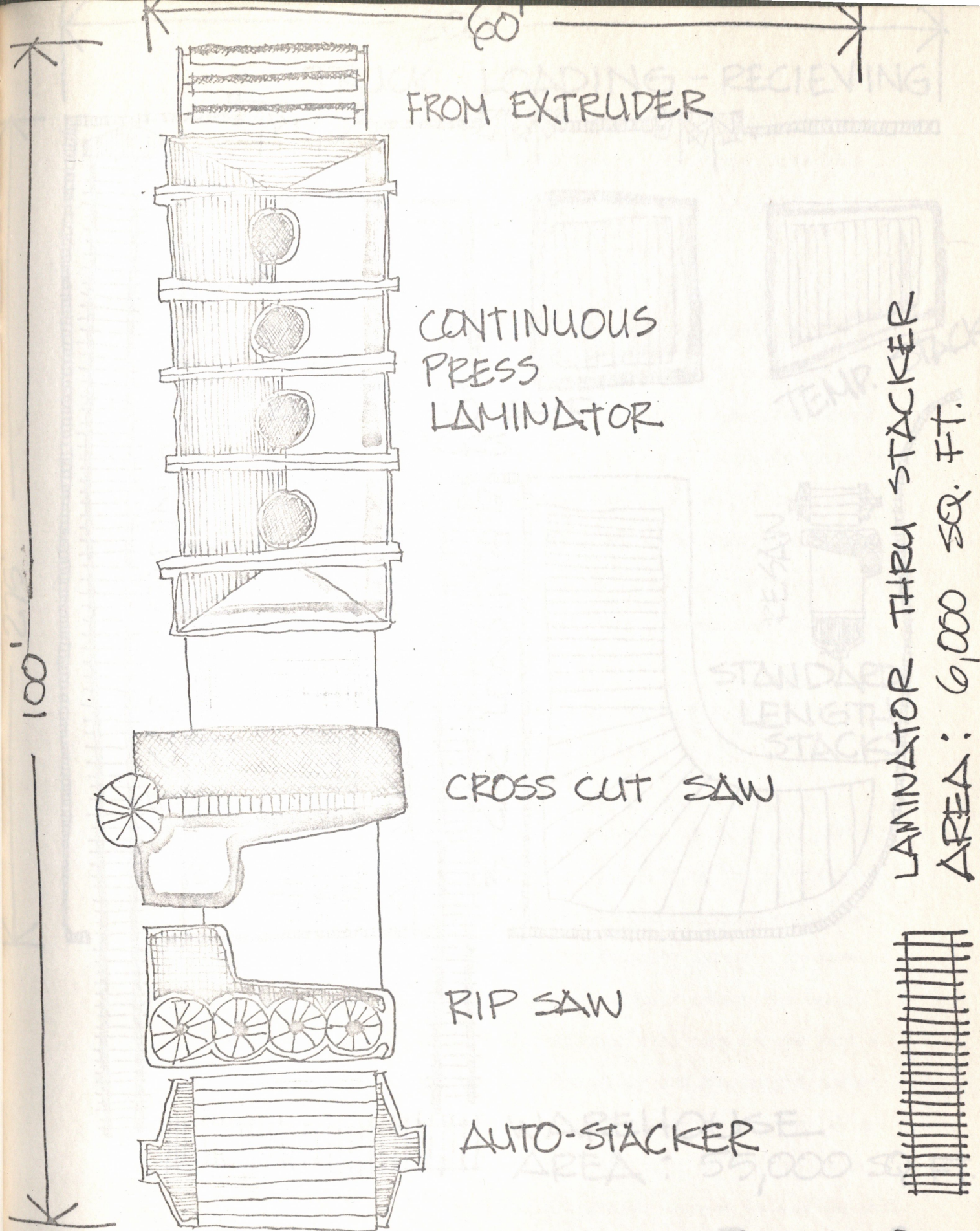
program analysis

PEOPLE: Two people operate the log crane and log pond infeed.

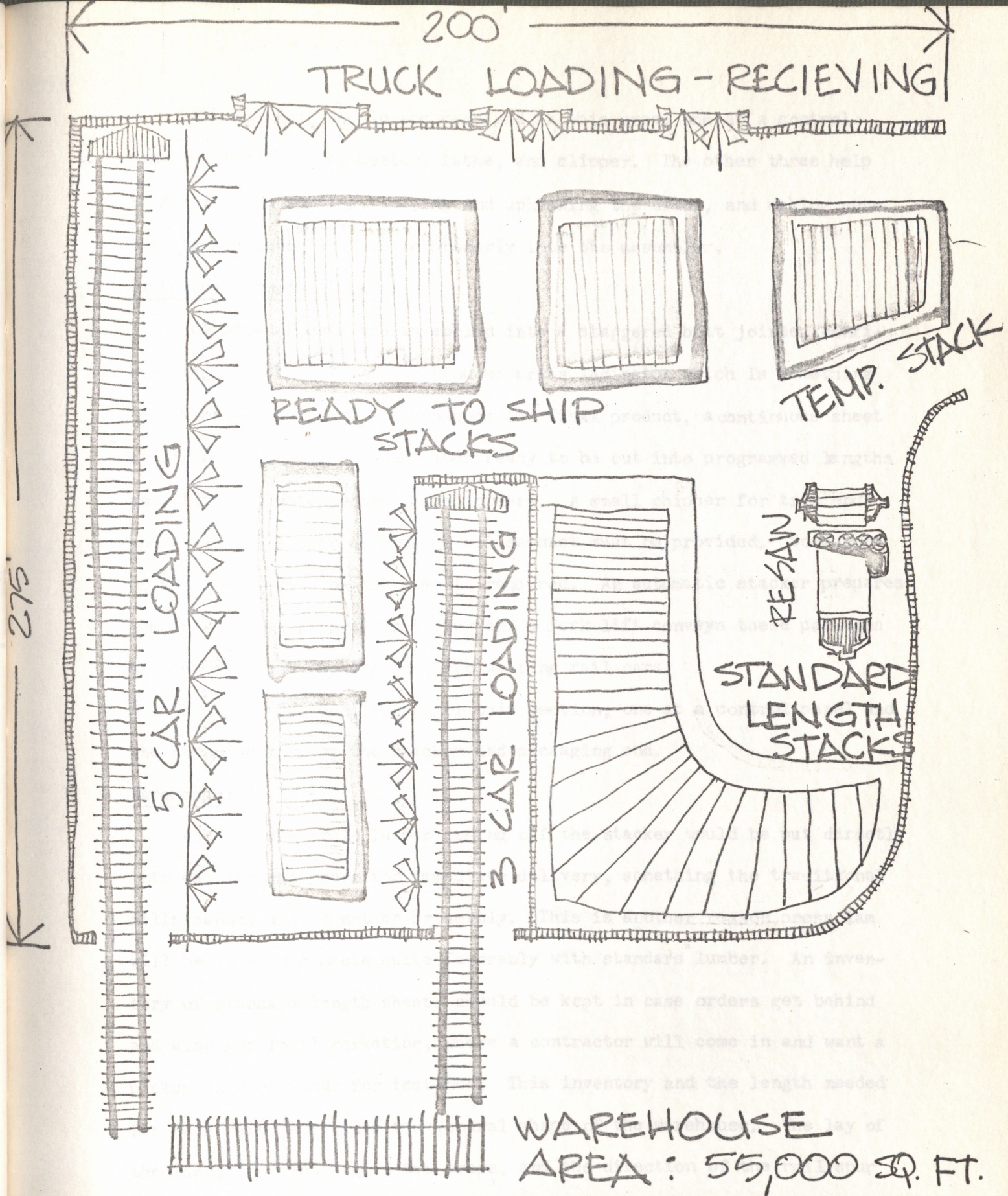
There should be some sort of warming hut for severe weather. One person operates the rest of the system from a control house and log turner cab, both should be sound proof, heated, and conditioned with maximum visability.

Lathe through extruder:

The lathe is loaded mechanically from the heater at which point the log is peeled into sheets for use. The clipper cuts this continuous sheet into programmed sections along the grain. It also cuts out inferior sections inherent in a log and disposes of these into the core chipper. The core chipper is used to dispose of the "core" or "bolt" left on the lathe after each log. These 4" to 6" diameter pieces are chipped and tubed onto the hog bins. Care should be taken to sound shield this and the trim ends chipper to reduce noise from them. Some run-out and sorting area is required to grade the sheets coming off the clipper into two basic grades: clear structural and strength reduced. The sheets are loaded into the batch drier in two grades to be later assembled one after the other. Press driers at the present are the batch type and will take about 24 8x8 sheets. These take anywhere from 5 to 15 minutes to dry before being sent on to the holding box where sheets are kept hot until ready for glueing. Excess heat and steam coming off the press drier would be used to help keep the temperatures up in the holding box. Future continuous press driers are expected to be somewhat longer, so space would be provided in this case for logical upgrading of equipment. The hot sheets are conveyed out of the box and glue is extruded on them, preparing them for assembling. Phenol recorcinol is the glue base normally used, but I am proposing using an equally suitable glue derived from the black liquor waste process in the pulp mill in Missoula.³⁸ It would be much cheaper eventually, and it is a wood derivitive.



program analysis



program analysis

PEOPLE: Four people are required in this area; one at a control panel controlling the heater, lathe, and clipper. The other three help in grading and sorting, loading and unloading the drier, and making sure the glue extruder is feeding properly into the assembler.

Laminator through stacker:

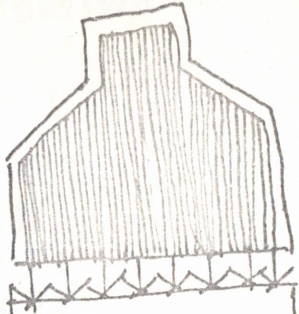
Hot glued sheets are assembled into a staggered butt jointed configuration and fed into the continuous press laminator which is something like a printing press. It produces the final product, a continuous sheet of 4' to 8' wide dimension lumber ready to be cut into programmed lengths and widths to match computerized orders. A small chipper for trim ends and a sawdust blower to pick up all sawdust must be provided. Some sort of audio protector on the saws is required. An automatic stacker prepares lumber for packaging and shipping and a fork lift conveys these packages to the warehouse, most going into waiting rail cars.

PEOPLE: Two people control this section; one at a control panel and the other working on the stacker and packaging end.

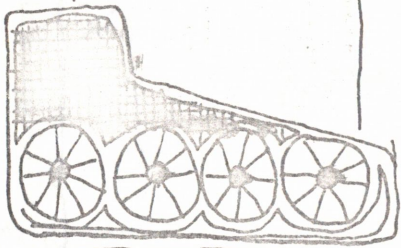
Warehouse:

As a general rule lumber coming off the stacker would be put directly into waiting rail cars for immediate delivery, something the traditional mills cannot and do not do presently. This is another reason press lam will be able to compete quite favorably with standard lumber. An inventory of standard length sheets should be kept in case orders get behind and also for local marketing, where a contractor will come in and want a pickup load of studs for instance. This inventory and the length needed for rail cars determines the general shape of the warehouse. The lay of the land, the clearing in the trees, and the direction of the rail spur determine the orientation. Truck loading has been changed to a mechanical

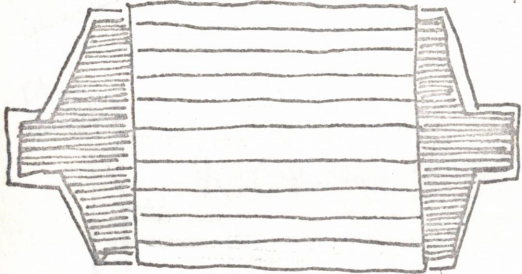
40'



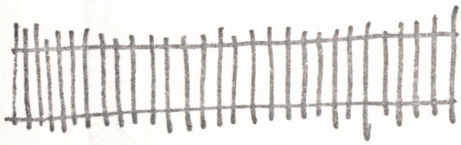
AUTO. LOADER



RIP SAW

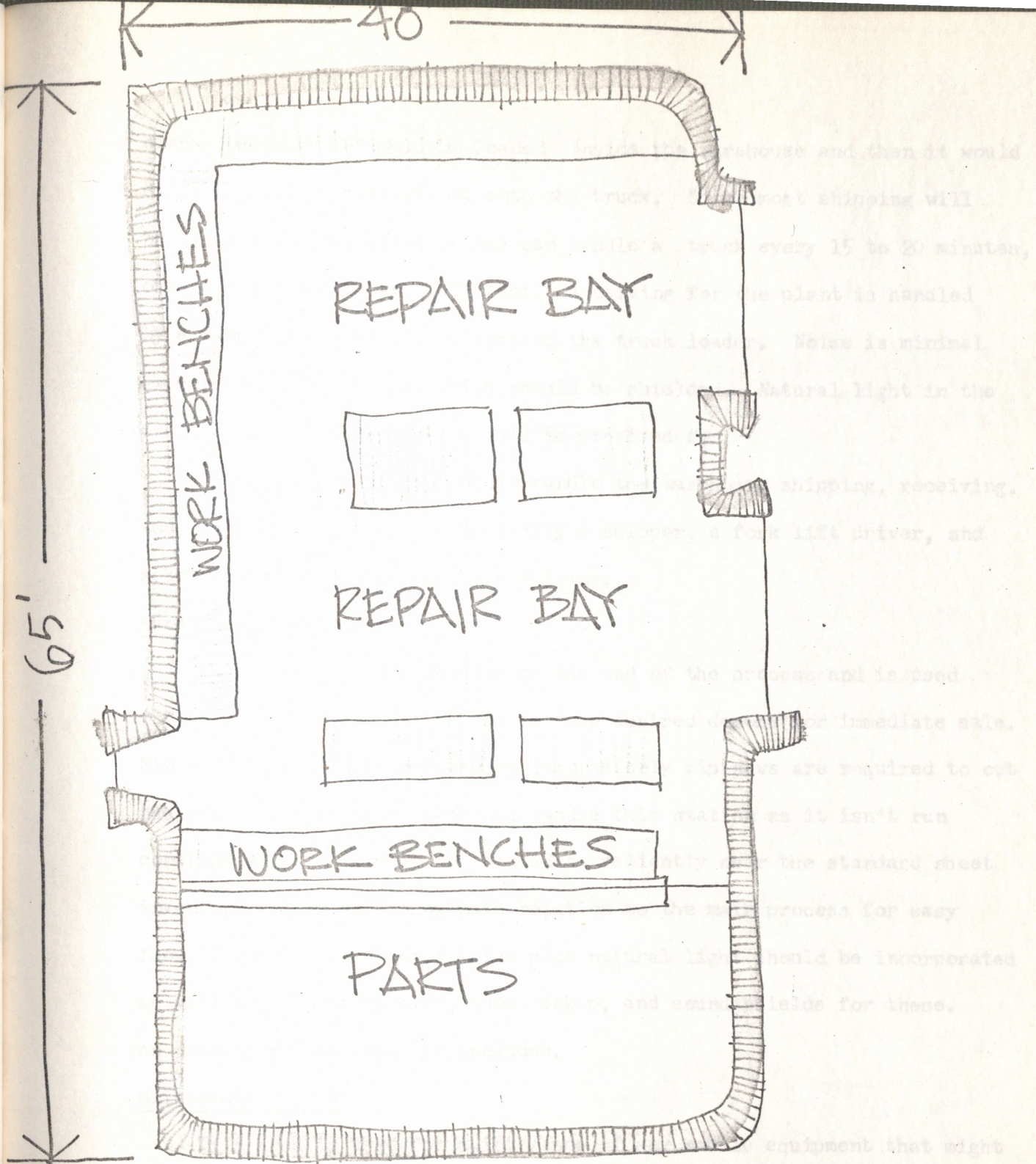


AUTO - STACKER



WAREHOUSE RESAW
AREA: 2,400 SQ. FT.

program analysis



MAINTENANCE SHOPS
AREA: 2,600 SQ. FT.

program analysis

crane loader which would be loaded inside the warehouse and then it would slide the lumber package out onto the truck. Since most shipping will be by rail and the crane loader can handle a truck every 15 to 20 minutes, one of these should be sufficient. Receiving for the plant is handled by a ramp and overhead door next to the truck loader. Noise is minimal except in the resaw area which should be shielded. Natural light in the areas where the fork works should be provided for.

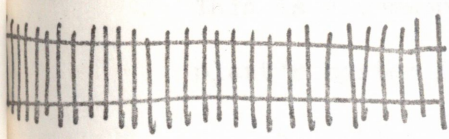
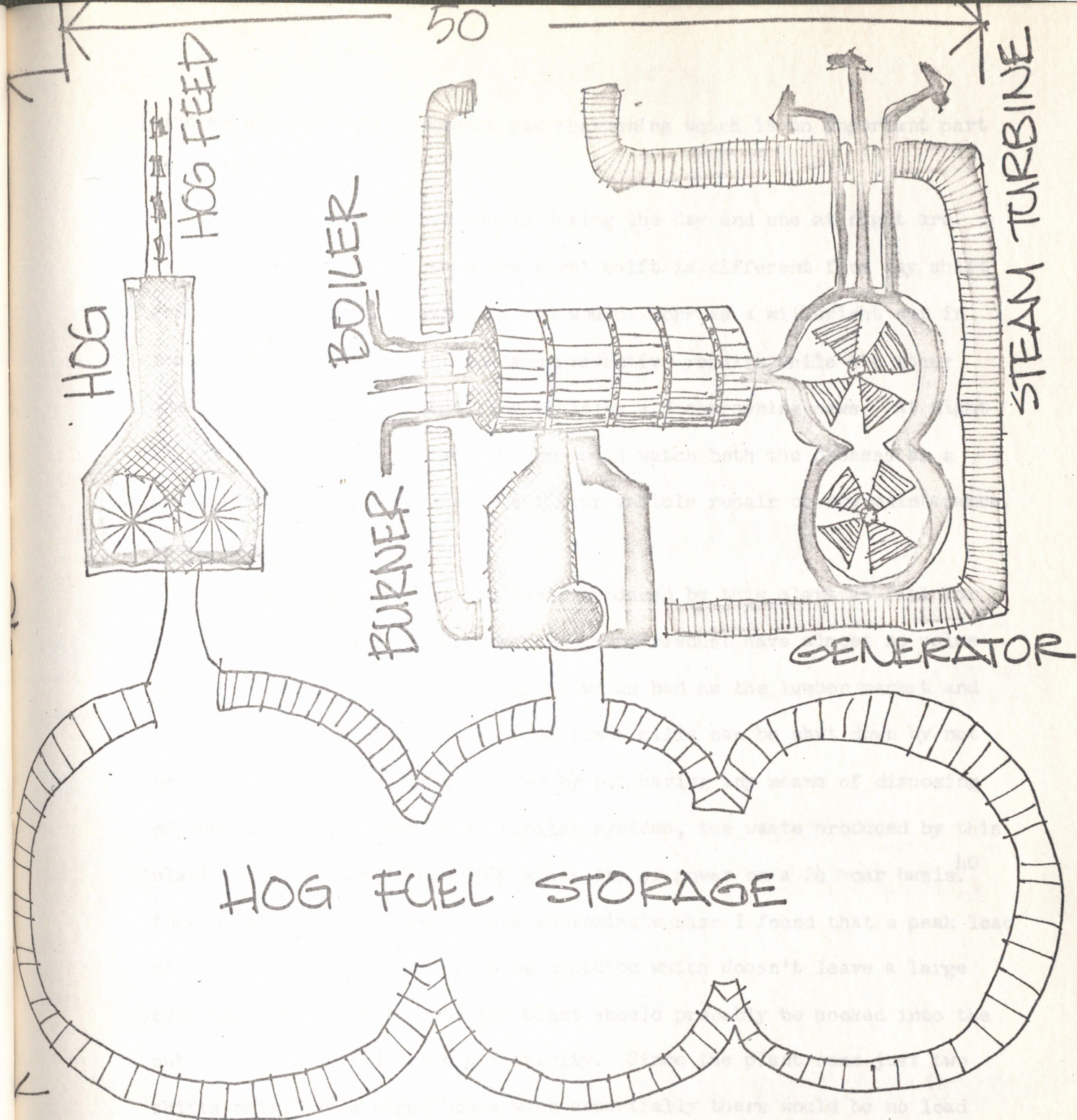
PEOPLE: Three people would handle the warehouse shipping, receiving, and resaw. There would be basically a shipper, a fork lift driver, and a helper who would do some fork driving.

Warehouse resaw:

This is just a duplication of the end of the process and is used for cutting standard length sheets into desired depths for immediate sale. Since the sheets are in standard lengths only rip saws are required to cut the product. Warehouse personnel handle this station as it isn't run continuously. It should be located conveniently near the standard sheet inventory and in an approximate relation to the main process for easy flow of material. Views outside plus natural light should be incorporated as well as a small chipper, tube pickup, and sound shields for these. An operators panel will be included.

Maintenance shops:

This area is used for maintenance of any mobile equipment that might be incorporated in the mill. Since most mobile equipment is either in the warehouse or out in the log deck area it should be located on the end of the warehouse nearest the decks. The remoteness of St. Regis causes the need for a large parts room to handle any repairs. Most of the mill is mechanized, so there isn't a need for a large shop area, and this would



ENERGY PRODUCTION
AREA : 2000 SQ. FT.

program analysis

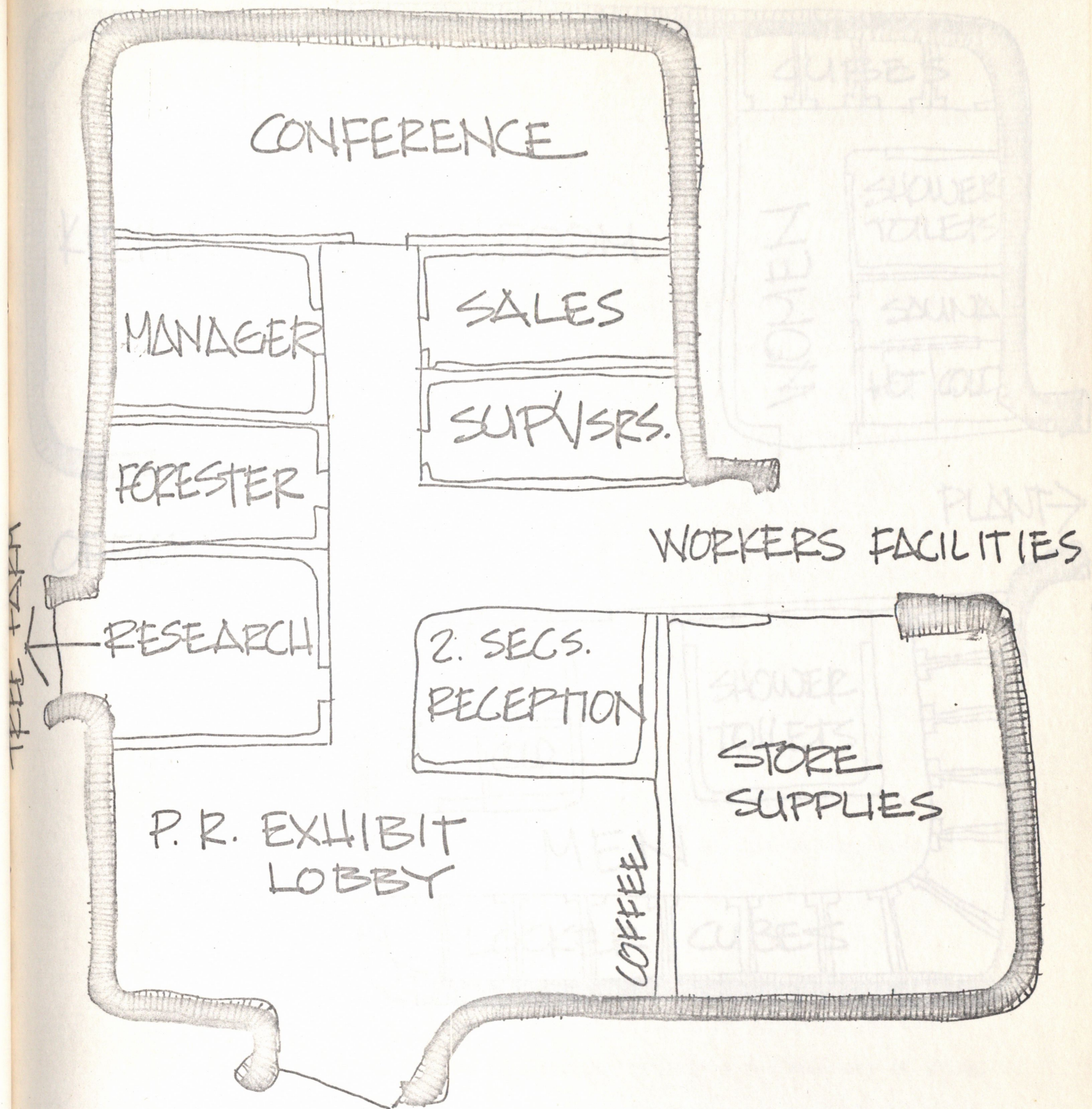
also enable the shop to handle saw sharpening which is an important part of a mill.

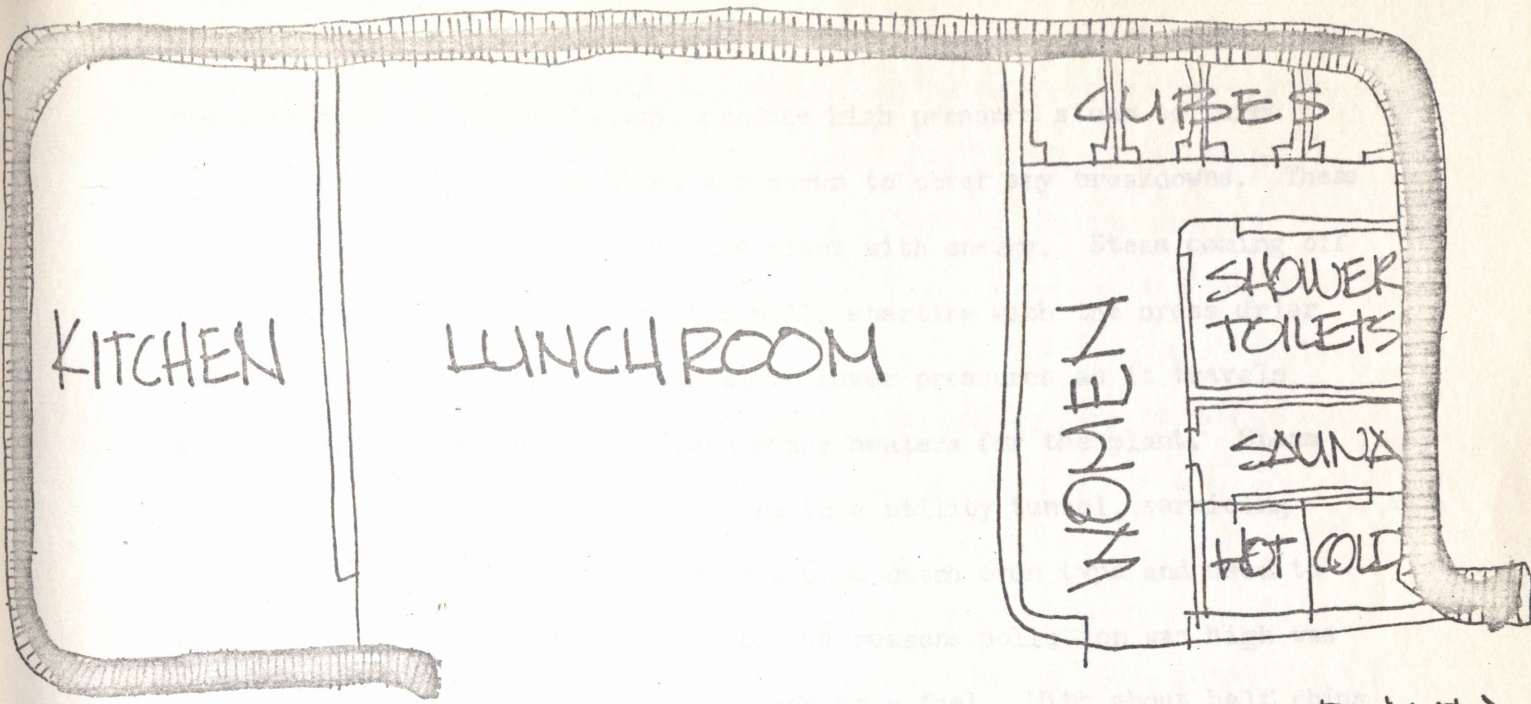
PEOPLE: Probably two people during the day and one at night are required. This is an area where night shift is different from day shift and should be noted. Basically one would work as a millwright out in the process making inspections and preventive repairs while the other would work in the shop repairing vehicles and sharpening saws. At night things slow down and the one person would watch both the process as a millwright and pick up on any left over vehicle repair or saw maintenance.

Energy production:

I have decided to use the waste produced by this plant as fuel for steam and electrical production. Bark and sawdust have almost no value on the market and chips are up and down as bad as the lumber market and unfortunately not tied to it, so at times mills can be shut down by not being able to sell their chips and by not having any means of disposing of them.³⁹ Based on studies of similar systems, the waste produced by this plant would produce 1500 - 2000 kilowatts of power on a 24 hour basis.⁴⁰ Looking at several mills of this approximate size I found that a peak load of 1200 - 1400 kilowatts could be expected which doesn't leave a large cushion.⁴¹ With this in mind the plant should probably be hooked into the public utilities and trade electricity. Since the plant runs just two shifts this leaves eight hours when essentially there would be no load on the system, and any electricity used during the day could be paid back. This is a common arrangement in industry and eliminates problems if the plant's system fails for any reason.⁴²

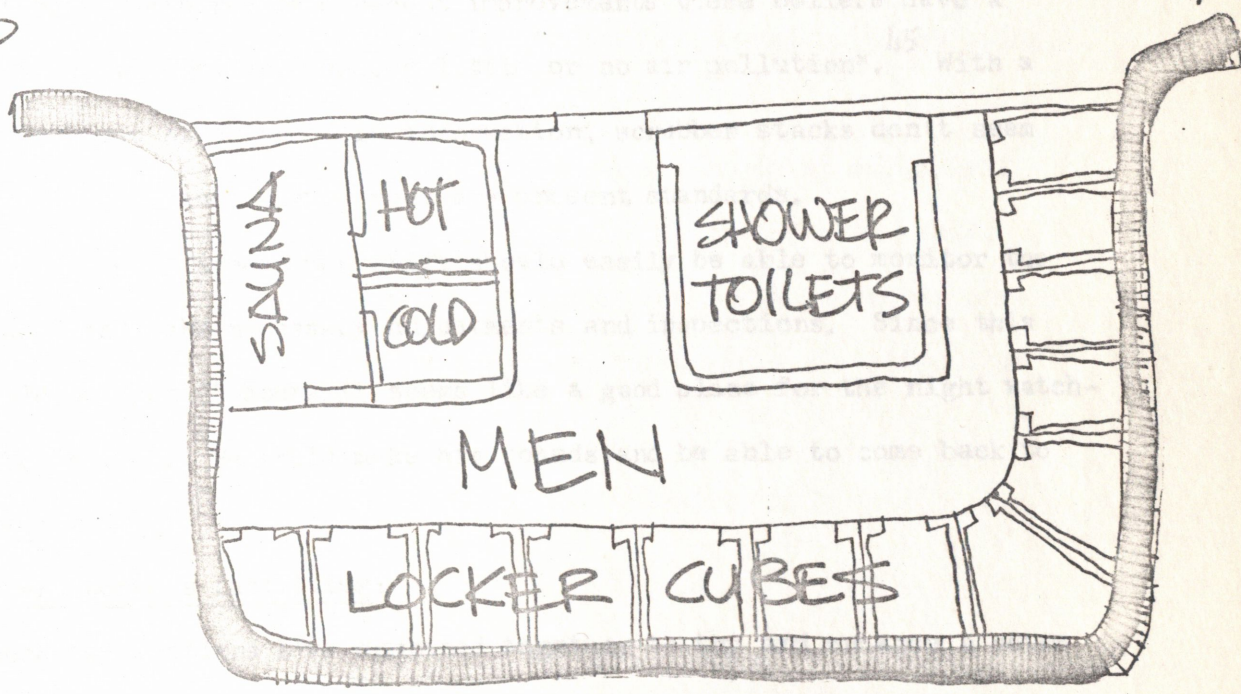
All chips, bark, and sawdust are delivered by pneumatic tube to a hog fuel storage bin. The bark is run through a "hog" to insure a uniform size and consistency for more efficient firing.⁴³ Two boilers,





OFFICES

PLANT →



WORKER'S FACILITIES
AREA: 4,500 SQ. FT.

program analysis

one a main and the other backup, produce high pressure steam to turn the turbines; again two turbines are shown to cover any breakdowns. These power the generators that supply the plant with energy. Steam coming off the turbines is used throughout the mill, starting with the press drier and log heater and being broken down to lower pressures as it travels a full circle, the last being steam space heaters for the plant. Steam and electrical lines would be included in a utility tunnel, servicing the whole plant. The boilers used are of a dutch oven type and used to be a high pollution producer.⁴⁴ One of the reasons pollution was high was because bark was about all that was used as a fuel. With about half chips and half bark, combined with recent improvements these boilers have a "high heat efficiency and produce little or no air pollution".⁴⁵ With a generous exhaust stack and this information, scrubber stacks don't seem needed and the exhaust should meet any present standards.

PEOPLE: One fireman per shift should easily be able to monitor the gauge panel and make necessary adjustments and inspections. Since this area would be open 24 hours it seems like a good place for the night watchman to be located. He would make his rounds and be able to come back to some company.

Offices and workers facilities:

These two sections I've combined together to try and enhance a sense of community so that everyone realizes what the other is doing and understands that the difference in jobs and pay is only a surface sort of thing. It is also to try and put across the idea of cycle which is what the whole plant is about, the idea that everyone is pulling together for a common end.

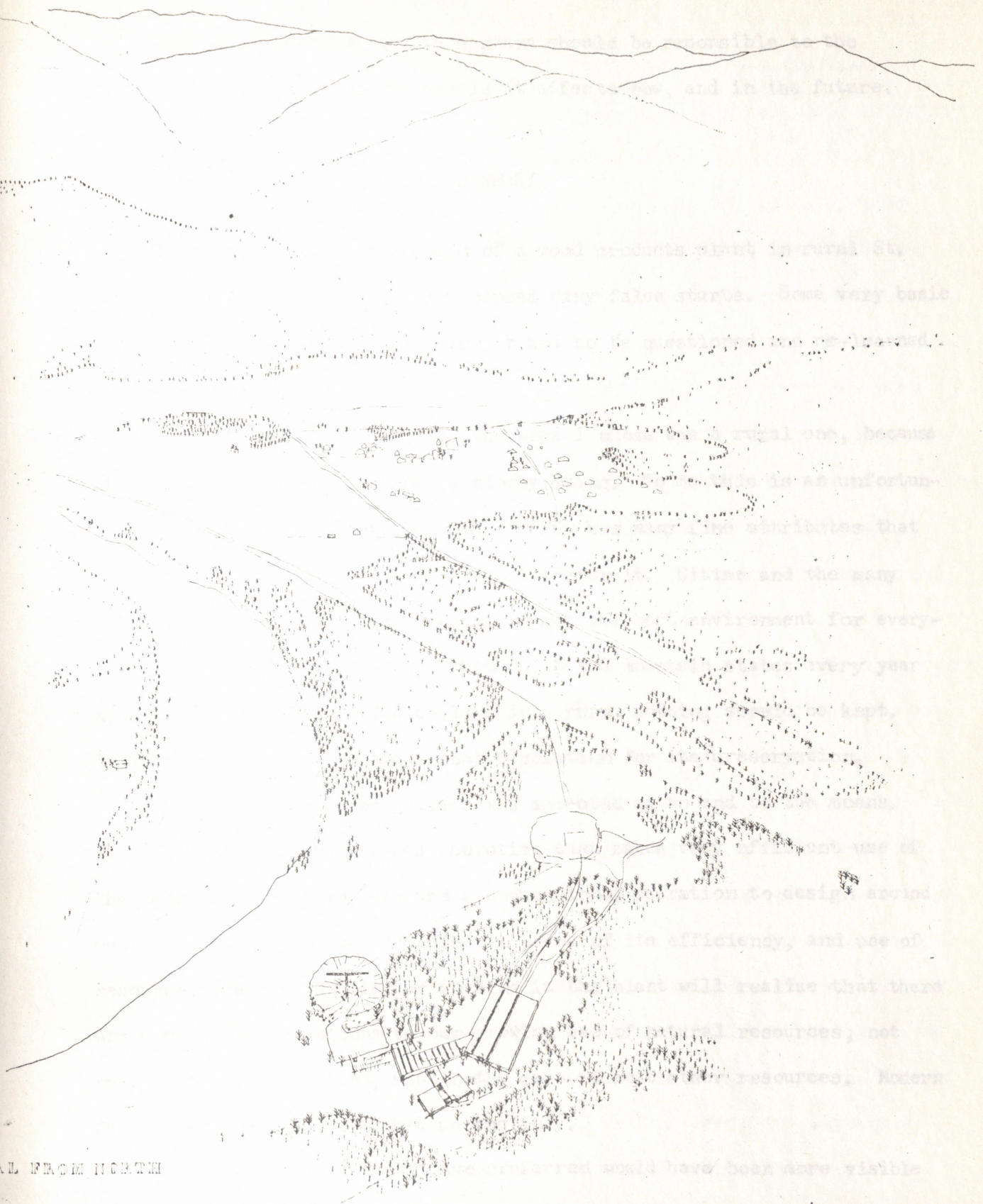
First, the offices have been changed to a simple open office plan with an office for the manager along with a small version of a conference

room. The public relations exhibit, along with research greenhouses I've used as a spine for offices and locker areas terminating in the plant. The research lab would be visible from the lobby and office, and the research personnel would guide tours of the plant and tree farm experiments.

In the worker's area, which is the common area for the whole complex, I have gone to locker cubes to give people some form of privacy and space. A sauna and common pool are included to encourage physical health. A "company store" sort of thing where work related items can be bought or requisitioned at cost is needed, due to St. Regis being somewhat isolated. A small kitchen for those who want to heat up lunches or cook dinner is included. The lunchroom is combined with the "greenhouse" area to let one experience the outside environment as much as possible without being uncomfortable.

The basement occurs under the office area and contains mechanical, store storage, janitor space, and receiving for office related goods. Yard equipment for the landscape around the office would be stored here also. Equipment for the tree farm would be contained in a storage shed adjacent to that area.

The Solution



AERIAL FROM NORTH

Industrial architecture in Montana should be responsible to the overall consciousness of the people it affects now, and in the future.

SOLUTION SUMMARY

The solution to this problem of a wood products plant in rural St. Regis was not an easy one, and included many false starts. Some very basic premises I had originally believed in had to be questioned and re-learned in the six month process.

Starting on a general note, the area I chose was a rural one, because it appears that rural Montana is slowly dying. To me this is an unfortunate thing because the agrarian way of life has many fine attributes that should be available to those who might prefer it. Cities and the many problems related to living in them are not the best environment for everyone. The millions of tourists that visit the mountain states every year attest to that. The option to live in a rural setting should be kept. Industry is a very real and probable solution for its preservation.

The "press-lam" wood process was selected as an end to the means. It is a versatile, high speed operation that makes very efficient use of the resource. To have selected a conventional operation to design around would not have been 'responsible' in terms of its efficiency, and use of resource. People visiting or working in the plant will realize that there are choices and solutions to our growing use of natural resources, not only in the case of wood, but in the case of most other resources. Modern man is growing.....slowly but perceptibly.

The actual site I might have preferred would have been more visible to the town and the freeway. There could have been more elements to respond to in an architectural sense, and it would have exposed more people to

the hopefully pleasant experience of my plant. But the obvious site, as was discussed in "Site Potential" is very secluded and isolated from the activity of St. Regis. By introducing pedestrian-bike paths and a community park to the site I hope to make that seclusion only a visual sort of thing. Being exclusive is a major problem of industry today; by having an open plant, encouraging tours, setting up educational exhibits, and any number of other activities, the plant should become an integral and welcome part of the community.

The final visual solution, the "building", came together after some amount of consideration. The path was not direct and involved some gymnastics that felt altogether uncomfortable at times. I hope that this stumbling, thinking, and re-thinking is considered when judging the final solution. It has brought together a lot of loose ends for me. Thought is what architecture is.

At the building site it becomes apparent that the major mode of response will be the trees. They are everywhere, and are most noted as a force to be responded to in the short, steep valley to the east. This force, the clearing orientation, etc. generally formed the building. Relationships within that form were decided in the framework of industrial efficiency. The building could still be just about anything. My first response was to meet the valley force with another force, but to do so seemed puny and insignificant. I thrashed around with various other solutions that all were trying hard to say something "architectural" but had very little to say about the environment containing the. I was also tending to be unfair to the industrial process being contained. The final solution came about through a questioning of these major directions, and a shift in emphasis.

The structure became pre-stressed and cast concrete frame and roof system with an applied skin to form the walls. Concrete was chosen because of its efficiency and economy.⁴⁶ A plywood insulated skin was applied to this framework for several reasons. First, it's efficient and fast, it is a softer material and more easily modified than metal or masonry, and it speaks in the vocabulary that most new mills being put up today are speaking in. I don't believe this is the time or place to be using fancy or expensive structures and shapes, and this is part of being 'responsible' to people and the way they think.

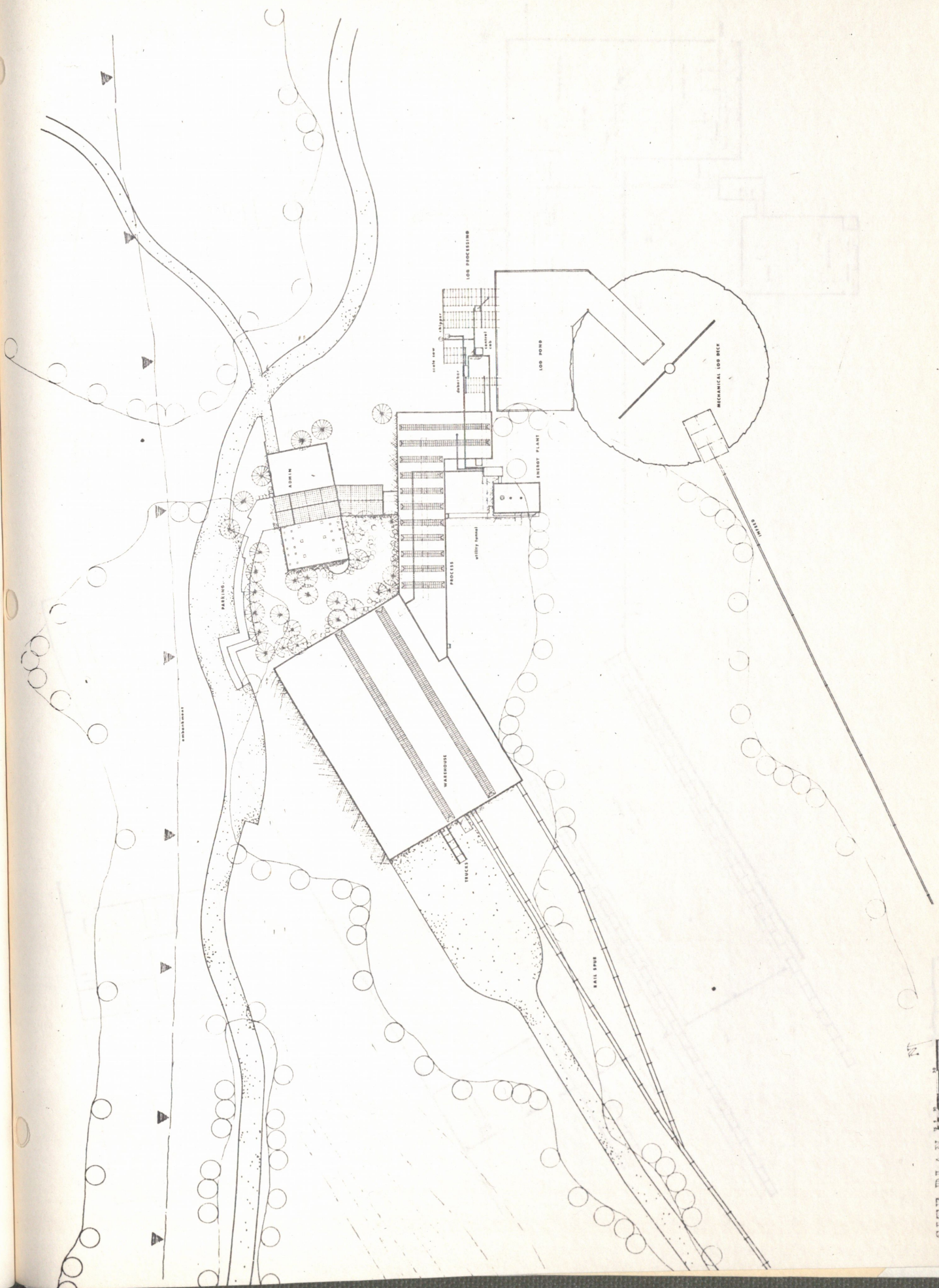
Lighting and ventilation were the next major points as far as the building was concerned. Years of industrial design by others has shown that strips of windows both high and low combined with clerestories or skylights in rows provides the best overall natural lighting.⁴⁷ Simple mechanical operation of these windows and skylights for ventilation works well when there are no dangerous fumes or odors. These principles I used as a guide on window placement and fenestration and came up with a simple and straight forward handling of lighting and ventilation.

To fit all of this into the site I have chosen, I went back and re-examined trees. Alone, they are vertical; as a group they are horizontal, many shades of green and have a very nice transparent quality to them. You can see through them to other trees and other vistas if they don't grow too thick. Their trunks and limbs form a lattice work that develops an infinite amount of layers. Up close one notes many varied and subtle hues and shades of color - predominantly green. Why couldn't my plant become somewhat humble and respond naturally to the forest it was supposed to be a part of?

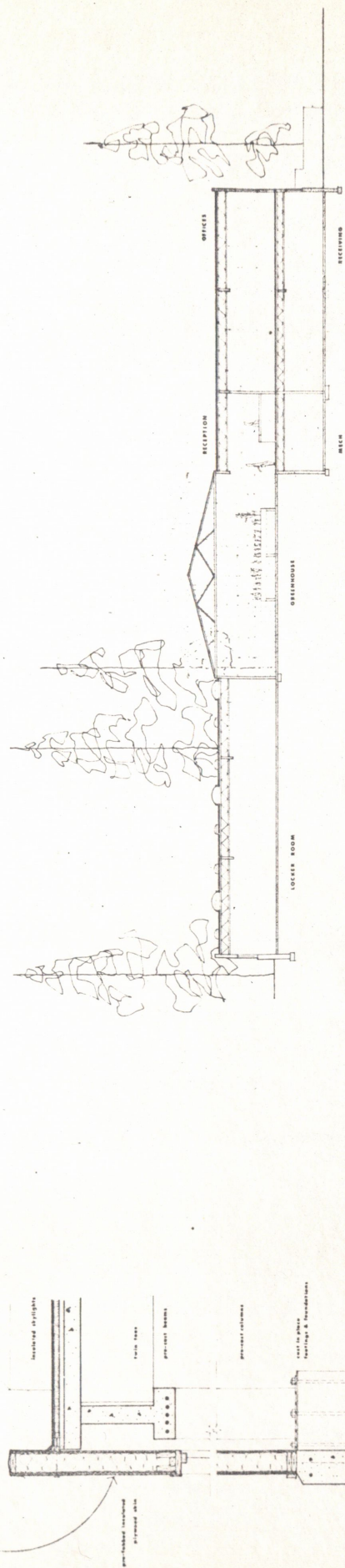
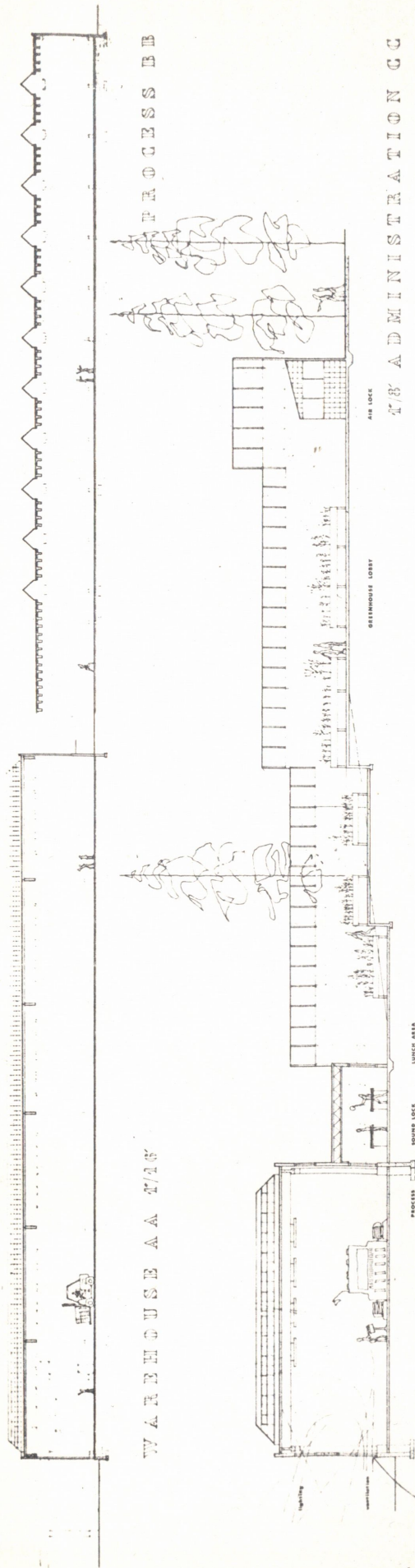
By choosing the right shades of green and applying them in a manner that was sophisticated and yet fairly simple I believe the plant was finally settled comfortably into the site. I've tried to develop the surface of the plant into a transparent lattice that is compatible with the particular site and with my place in time as a designer in 1975. The building won't exactly melt right into the landscape, but people experiencing it should be able to understand and appreciate the intent and purpose.

Up till now my thesis has been concerned with what I'm doing to meet the present problem of a wood products plant. Little mention of 'the future' is contained. Perhaps I have done that on purpose - it doesn't really matter; Pablo Picasso can answer that:

"For me there is neither the past nor the future in art. If a work of art does not live in the present, it does not live. The art of the Egyptians, the Greeks, and of the great painters of yesterday is not art of the past. It is art of today." ⁴⁸



SITE PLAN



TB ADMINISTRATION DD

TYPICAL WALL TE

SECTIONS

Footnotes

Footnote 1: Richard Barrett - Program Manager, Resilience and RFD Program, University of Montana; January 13, 1975. **Footnote**

1. Interview: Dr. Roland Barger - Program manager, Residue and RND Program; Forest Science Lab, University of Montana; January 13, 1975.
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5. Montana Data Book, Montana Department of Planning and Economic Development; Helena, 1970.
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U.S.D.A. Forest Service, FPL Press-Lam Research Team; "F.P.L. Press-lam Process: Fast, Efficient Conversion of Logs into Structural Products", Forest Products Journal, Vol. 22, No. 11; 1972.
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12. Forest Industries Report: Wood Utilization; American Forestry Institute; First Edition, 1975.
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14. Comply Research Project, G.A. Koenigshof; U.S.D.A. Forest Service, 1973.
15. Interviews: J.R. Stevenson - President, Intermountain Lumber Company; January - May, 1975.
16. Op. sit. #14
17. Ibid.
18. Op. sit. #7
19. Op. sit. #3
20. Interviews: Dr. Patrick Jobes, Department of Sociology, Montana State University; January - March, 1975

21. Correspondence: Mineral county clerk and recorder; February 4, 1975.
22. "Anticipated Effects of Major Coal Development on Public Services, Costs, and Revenues in Six Selected Counties", Bureau of Reclamation and Institute of Applied Research; Montana State University; January, 1975.
23. Op. sit. #20
24. Correspondence: Owen Gerrick - Principal, St. Regis High School; February 8, 1975.
25. Interview: Store Owner; St. Regis; February, 1975
26. Op. sit. #22
27. Op. sit. #21
28. Op. sit. #22
29. Op. sit. #24
30. Field Trips: January - May, 1975.
31. Op. sit. #21
32. The Community in America, Roland L. Warren; Rand-McNally and Company, 1963.
33. Op. sit. #25
34. Op. sit. #32
35. Op. sit. #22
36. Interview: Dr. Howard Peavy; Civil Engineering/Engineering Mechanics, Montana State University; March, 1975.
37. Op. sit. #7
38. Op. sit #14
39. Op. sit. #15
40. "Waste Wood Fuel and Power Generation for the Intermountain Co."; Sept. 1968.
41. Field Trip: March, 1975.
42. Op. sit. #15
43. "Potentialities for Using Bark to Generate Steam Power in Western Montana": Forest Products Journal; Vol. 20, No. 2; 1969.
44. Energy and Raw Material Potentials of Wood Residue in the Pacific Coast States; John B. Grantham, U.S.D.A. Forest Service General Technical Report, PNW-18; Pacific Northwest Forest and Range Experiment Station, 1974.

- 44. Ibid.
- 45. Ibid.
- 46. Interviews: Dr. George McClure; Montana State University School of Architecture; January - May, 1975.
- 47. Designing for Industry - The Architecture of Albert Kahn, Grant Hildebrand; The MIT Press, 1974.
- 48. Understanding Picasso, Domenico Porzo; Newseeks Books, New York; 1973.

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