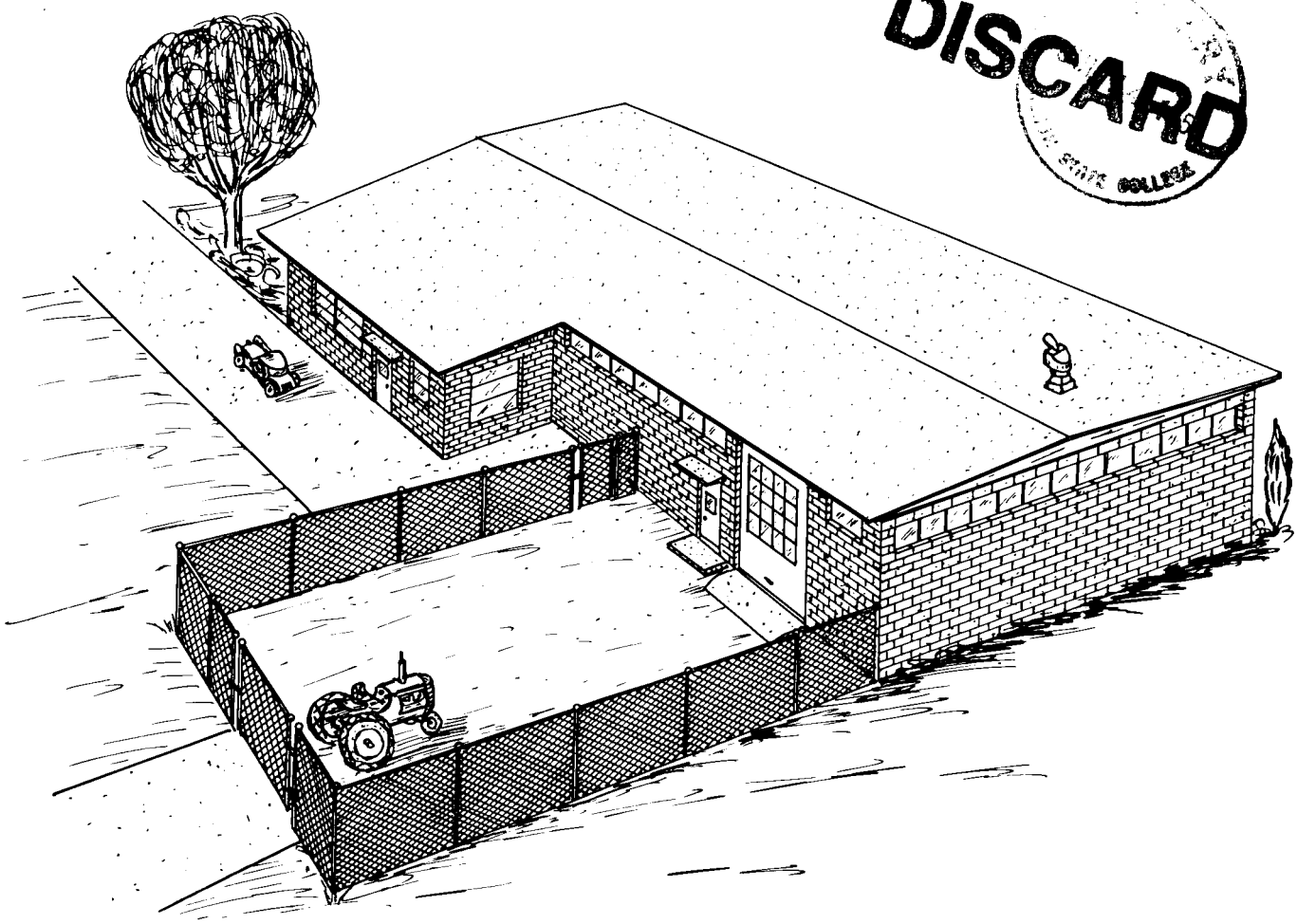
Planning

VOCATIONAL AGRICULTURAL FACILITIES



Prepared by

DIVISION OF VOCATIONAL EDUCATION

STATE DEPARTMENT OF EDUCATION AND OREGON STATE COLLEGE

1959

Preface

The purpose of this publication is to provide information to assist and guide school administrations, architects, and others in planning and developing adequate facilities as economically as possible.

The material herein was developed by members of the State Department of Education, Division of Vocational Education, and staff members of Agricultural Education and the Agricultural Engineering Departments of Oregon State College. Publications from other states were reviewed for suggestions and ideas and a number of superintendents and local school people were consulted.

Introduction

Costly alterations, additions, and limited educational efficiency can often be avoided by adequate attention to details and the planning of new buildings. Ordinarily when new facilities are planned or when extensive remodeling is contemplated the State Division of Vocational Education should be consulted. On all new construction the standard for public secondary schools in Oregon provides that "preliminary sketches, working drawings, and specifications for new construction and major alterations on all school buildings shall be presented to the School House Planning Section of the State Department of Education for review and approval of the educational adequacy of the plan before they are submitted for bids." For further details on this, attention is called to the publication "Standards for Public Secondary Schools in Oregon" which may be secured from the State Department of Education. Assistance in all stages of the planning and help with the location of equipment may be had by contacting the State Division of Vocational Education.

General Considerations

Buildings for a vocational agriculture facility may be constructed as a part of the main school plant or as a separate unit. A vocational agriculture facility should include a classroom, office, shop, storage, and an outside work area located together.

Vocational agriculture facilities are often used by adults and high school students when the main school plant is not open. Access to the agriculture facility and provision for heating should be planned to provide for this use of the building. Conveniently located toilet facilities should also be available for both men and women.

The electrical service entrance lines and fuses should have a current carrying capacity of 400 amperes at 208 or 240 volts.

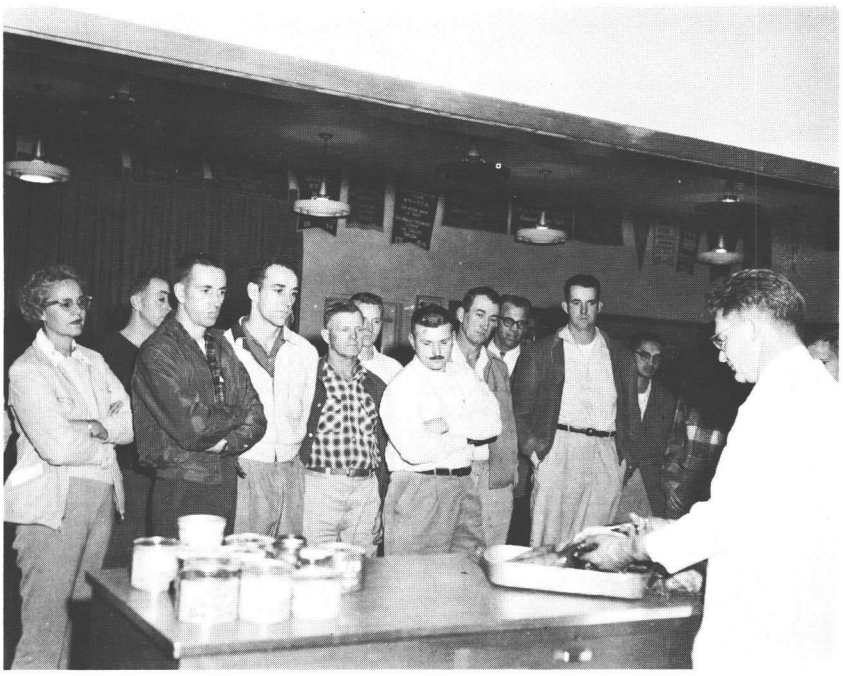


Figure 1. A laboratory demonstration during an adult course in Livestock Health Problems for farmers, taught by R. C. Story, D.V.M. (Molalla), at Canby Union High School, Canby, Oregon.

Recommendations for the Classroom, Laboratory, and Library

The classroom, laboratory, and library are usually provided as one unit. As the vocational agriculture classroom is often used for adult meetings and Future Farmer meetings it is advisable to make the classroom larger than would be required for regular day classes.

A cabinet in the classroom equipped with a sink and hot and cold water serves the laboratory needs. The counter top should be of acid resisting material with a metal trimmed edge. This unit should be wired for electricity. Ordinarily this cabinet is an island-type arrangement located to provide a demonstration counter for the instructor. See picture and note floor plans.

The Library area in the classroom should be equipped with cabinets for books, special drawers for bulletins, a magazine rack, chart storage, and special drawers for project record books. See Library Unit Plans 1 and 2.

The classroom should be equipped with a teacher's desk, a four-drawer filing cabinet, standard chalkboard, and a bulletin board.

Tables and chairs are recommended to permit a conference method of teaching. A table 2 feet by 7 feet with a formica top and metal trimmed edge is recommended. See figure 1, page 3.

The classroom and shop should be visable from the agriculture instructor's office. Bottom height of windows between the classroom and shop, or between the office and shop, should be 48″ above the floor.

Recommendations for the Farm Mechanics Shop

Floor Dimensions:
Minimum 40′ to 50′ wide by 80′ to 100′ long

Floor Materials:
Smooth concrete, leveled except in the drain area

Walls:
12′ to 14′ high
No pilasters on inside wall

Wall Space:
Place windows to allow 8′ of wall space between the bottom of the window and the floor *or*
Arrange window to allow 5′ to 8′ wall space for cabinets and spacing of tall equipment
Four or more spaces on each side wall

Service Door:
12′ to 14′ high and 12′ to 14′ wide wood construction, spring balanced overhead type
Glazed from 4′ above floor to near top of door to provide additional light

Location of Service Door:
Near center if in end of shop
Locate 14′ to 16′ from corner for side opening

Figure 2. Note U-type arrangement of tables used for the conference method of teaching.

Entrance Door:

Provide one entrance door 3′-0″ x 7′-0″ near large door

Roof:

Harmonize with architecture of other buildings
Clear span

Ceiling:

Sealed to improve light, lessen heat loss, decrease noise level

Lighting:

Natural:

Bottom height of windows should be 54″ or more

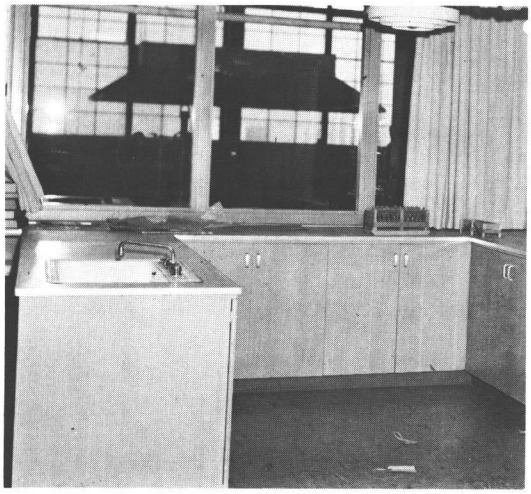


Figure 3. Island-type laboratory with sink, water, formica counter top with metal trimmed edge.

Figure 4. Book storage and magazine rack. See Library Unit Plan No. 1 for detail.

Figure 5. Farm project record book drawers. One recommended for each student. See Library Unit Plan No. 1.

Figure 6. Bulletin drawers. 30-36 drawers recommended. See Library Unit Plan No. 1.

above floor. Arrange windows to allow 5′ to 8′ spacing between groups *or*
Place all windows above 8′ level
Window sills should be sloping

Artificial:
Sufficient to provide 50 to 100 foot candles of diffused light at bench top height
Additional lights provided over each power machine
Overhead lights should be arranged to provide light directly over benches along walls

Heating:
Adequate to maintain 60° F
Not to occupy floor space

Electrical Service:
Power panel located in the shop but near the classroom
All power devices and convenience outlets controlled from power panel
Power panel provided with complete service disconnect switch
One convenient outlet 37″ above floor at each bench less than 10′ long
Other than over benches, one convenience outlet located 37″ above the floor every 10′ around the shop
Service through rigid conduit in the floor for machines located away from the walls
Conduit for machines planned but not installed, cut and capped flush with the floor
Wall space unobstructed by conduit or outlets
Six or more 208 or 240 volt single-phase outlets for 180 amperes AC welder, #6 wire protected at 50 amperes
Four or more of these outlets to be installed in welding area, outlets installed 24″ above floor and not less than 5′ apart

Figure 7. Stainless steel wash basin located in shop.

Two additional outlets to be installed in convenient areas of the shop
Three-phase power circuits should be provided for all motors over ½ hp.

Arc Welding Tables:
Shielded grill top welding tables on casters for welding area
See figure 11, page 8.
Note Equipment Plan No. 4

Acetylene Welding Tables:
Portable welding tables—may be grill top same as arc tables with fire brick on each end
See figure 12, page 8.

Ventilation:
Forced air ventilation using a centrifugal fan and a manifold exhaust system that picks up the smoke at its source
See Equipment Plan No. 6

Woodworking Benches:
2′ wide, 4′ to 8′ long supported on welded metal brackets fastened to walls with bolts embedded in the masonry
Mount 2′-8″ to 2′-10″ from floor
Materials:
¾″ plywood covered with random length flooring, oak or maple
Space metal brackets 12″ from each end to allow space for the woodworking vise
Vise mounted flush with top and end of bench
2′ spaces between benches
See Equipment Plan No. 1

Metalworking Benches and General Purpose Benches:
2′ wide, 4′ to 8′ long spaced 2′ or more apart
Materials:
Brackets same as for woodworking benches
Wood top ¾″ plywood
Cover plywood with ⅛″ sheet metal except front edge, cover front edge with ¾″ x ¾″ x ⅛″ angle iron
See Equipment Plan No. 1

Portable Benches:
2′ wide, 4′ to 6′ long
Frame 1¼″ x 3/16″ angle iron
Legs angle iron or 1″ pipe
Top material ¾″ plywood, covered with ⅛″ sheet metal except for outside edges, cover edges with 1″ x 1″ x ⅛″ angle iron

Folding Tool Panels:
Height 4′
10″ depth including front and back
Open width 5′ to 8′, not to extend past windows
Bottom of tool panel mounted 42″ above floor
See Equipment Plan No. 1

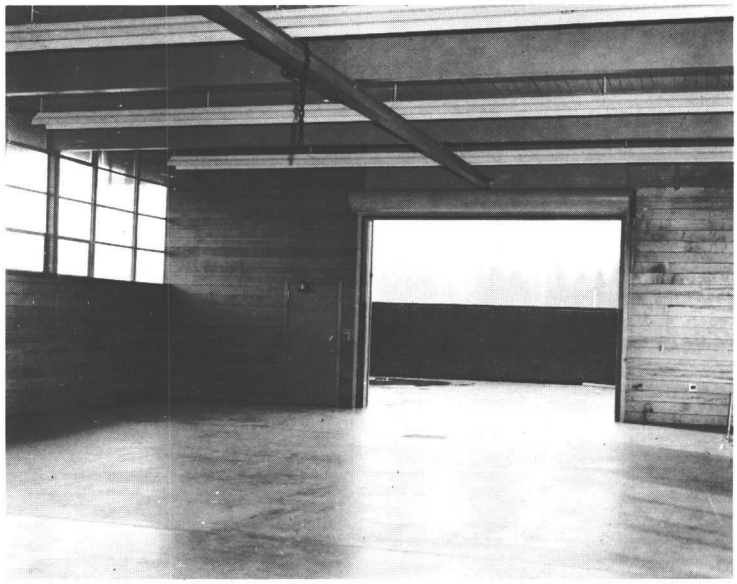


Figure 8. Note **space below windows for placement of work benches, tool cabinets, and equipment.**

Figure 9. Note **small entrance door beside larger overhead service door.**

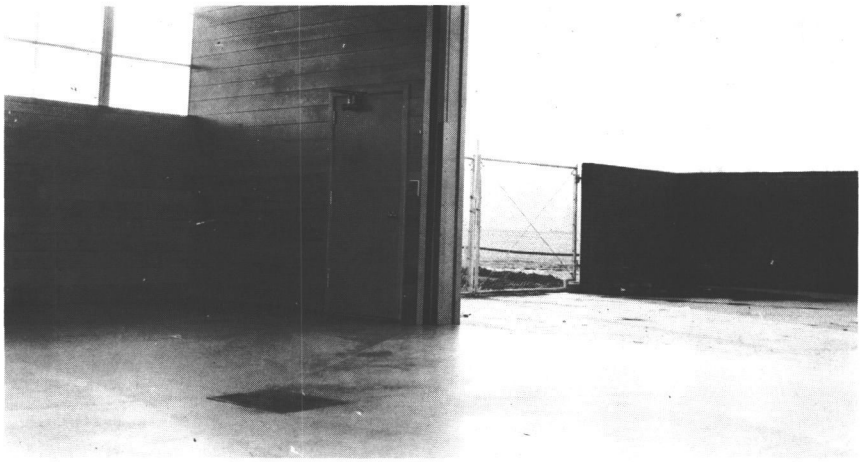


Figure 10. Note **fenced outside work and storage area adjacent to service door.**

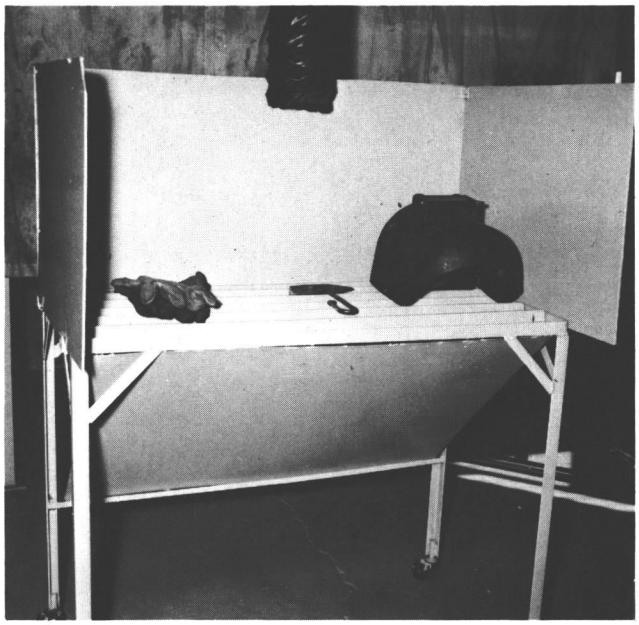


Figure 11. Portable grill top arc welding table. See Equipment Plan No. 4.

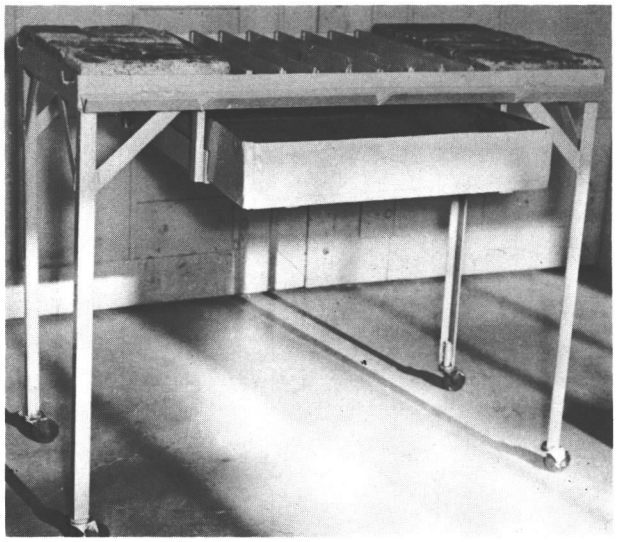


Figure 12. Portable acetylene welding and cutting table. Adaptation of Equipment Plan No. 4. Note slag pan.

Lumber Storage:
Side delivery, horizontal
See Equipment Plan No. 2

Metal Storage:
Vertical storage rack 5′ or more in width, 11′ or more high
See Equipment Plan No. 3

Air Compressor:
Not to occupy floor space, mount overhead or on wall
1 hp. motor, 30 gallon tank
See figure 15, page 9.

Wash Sink:
Located in shop near lockers
Large enough so 4 or more can wash at one time
Provision for soap, towels, and towel disposal
See figure 7, page 6.

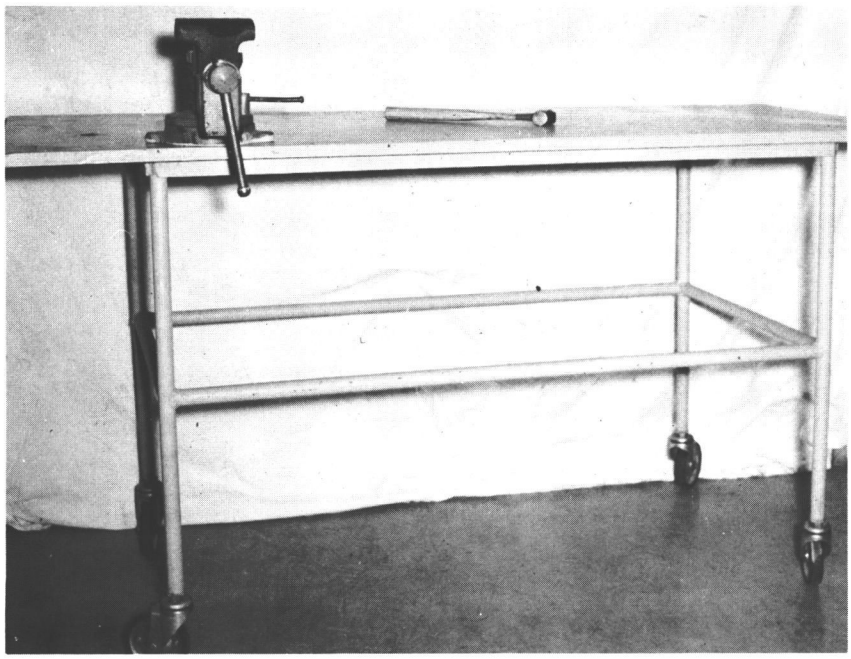


Figure 13. Portable work bench 2′ x 6′ x 34″.

Hoist:
½ ton or larger mounted on A frame
Placed on heavy duty casters

Lockers:
Triple deck type, 1′ x 1′ x 2′
Not more than two boys per locker

Small grinders or drills:
Wall mounted
See figure 16

Radial Saw:
Wall mounted
See figure 17

Shop Storage

Shop Storage Room:
Space for supplies
Space 8′ x 10′-16′ usually sufficient

Outside Work and Storage Area:
1000-2000 sq. ft.
Storage of machinery and construction projects
Surfaced court adjoining large door
Should be fenced
May need to have roof over some area if chapter-owned equipment is to be stored here

Safety

Safety Areas:
Indicated by 2″ white lines around power machines
Non-slip surfacing applied to area where operator stands

Flammable Liquids:
Not to be stored in shop

Paint Storage:
All paint stored in metal cabinet

Fire Extinguishers:
Dry chemical type for oil fed fires
CO_2 for electrical fires
One extinguisher of each type mounted on red panel at each end of the shop

First Aid Cabinet:
On wall near classroom door

Grounding Power Tools:
Wire provided from frame of motor on each permanently installed power tool to a low resistance ground
All portable power tools provided with three wire grounding plugs and receptacles providing grounding plug

Lights:
Additional lights over wall benches, power saws, grinders, welding tables, drills, jointers, etc., located to prevent worker from working in his own shadow

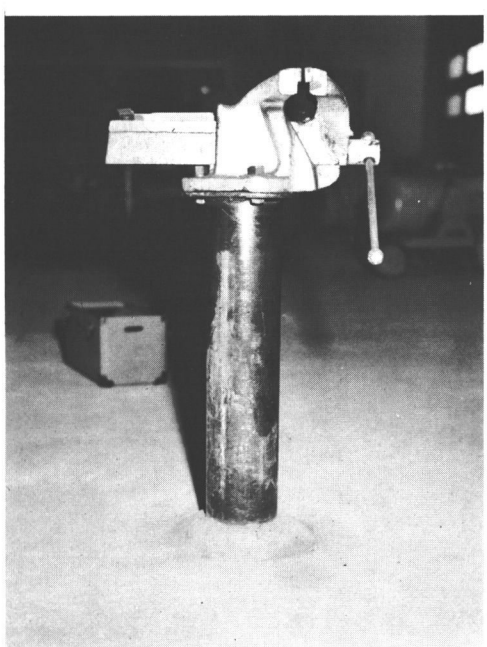


Figure 14. Heavy duty machinist vice anchored to pipe embedded in concrete floor.

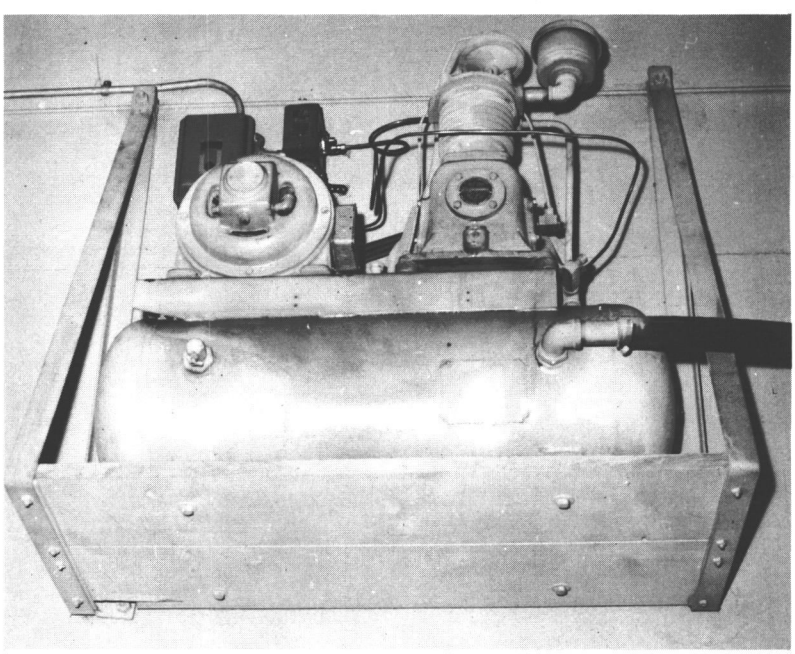


Figure 15. Air compressor, wall mounted overhead.

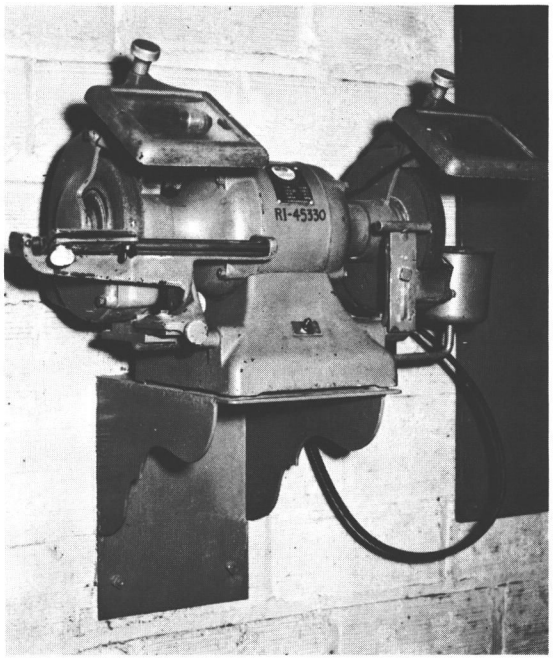


Figure 16. Light duty grinder, wall mounted.

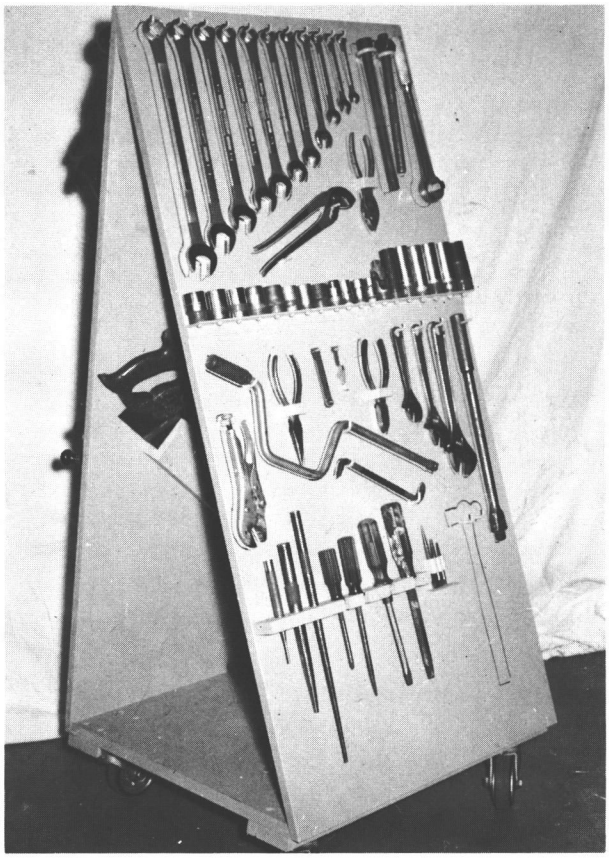


Figure 18. Portable tool rack made of ¾" plywood, 2' x 2' x 4'.

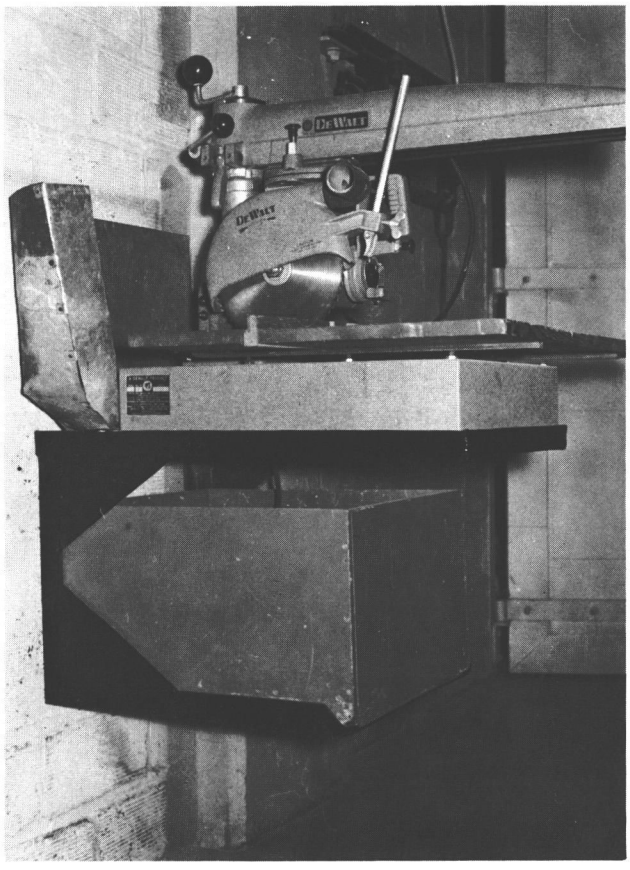


Figure 17. Radial arm saw, wall mounted.

Figure 19. Note hangers for welding leads.

Examples of Scientific Color Systems Developed by Leading Paint Manufacturers

Area	Color Dynamics (Pittsburgh)	Color Conditioning (DuPont)
Ceiling	White tinted with Sea Foam Green	Flat White
Walls and window casings	Seafoam Green (use same color down to floor. Do not use a dado)	Daylight Green with a dado of light green from the bottom of the window to the floor
Doors, door casings, tool cabinets (inside and outside)	Vista Green	Light Green
Bodies and non-critical parts of machines, bodies of machinists vises, bench brackets	Vista Green	Light Green
Edges of tables of power tools outside of movable guards on machines, top of riping fence on saw, edges and tops of work benches, jaws of machinists vises	Focal Beige	Spotlight Buff
Paintable portion of handles of machines, handles of vises	Focal Yellow	Spotlight Buff
Silhouettes of tools	Focal Beige	Spotlight Buff
Floor	Dixie Gray	Light Stone
Inside of saw guard, underside of rim of eye shield on grinder, inside of doors on switch and fuse boxes, inside of shields over moving parts	Focal Orange	Alert Orange
Outside of switch and fuse boxes, switch and receptacle plates	Focal Blue	Precaution Blue
Wall panel for hanging fire extinguishers and fire fighting equipment	Focal Red	Fire Protection Red
First aid cabinet	Focal Green with white cross on door	White with Safety Green cross on door
Stumbling, falling, strike-against hazards	Alternate 2″ stripes of black and Zone Marking Yellow	Alternate 2″ stripes of black and High Visibility Yellow

Suggested List of Equipment for Oregon Vocational Agricultural Shops

Description	No.
Air Compressor, 1½-2 hp. motor	1
Anvils:	
Blacksmith's with steel face and horn 200#	1
Guard and sickle	1
Bars:	
Crow and tamping combination	1
Pinch	1
Wrecking	1
Battery lifter, strap type	1
Bender, pipe or conduit ¾"	1
Bevel, sliding T	4
Bits:	
Wood auger ¼" to 1" by 16ths, set	1
Countersink, rosehead	2
Expansive ⅞" to 3"	1
Brace screwdriver	2
Hi speed steel drill 1/16" to ½" by 64ths, set	1
Hi speed steel drill bits 9/16", to 1" by 16ths with ½" shank, each	1
Wire drills size 0-60, set	1
Wood boring for use in ½" portable drill sizes ¼" to 1" by 16ths, set	1
Carbide tipped, sizes ¼, ⅜, ⅝, ¾, each	1
Brace, ratchet bit, 10" sweep	2
Brush, wire wheel 6"	1
Brush, wire hand	6
Brush, paint brushes, 1", 2", 3½", each	2
Calipers, outside 6"	1
Cans:	
Oilers	4
Solvent storage	2
Cell Tester	1
Chisels:	
Wood, ¼", ½", ¾", 1", set	1
Cold, ⅜", ½", ¾", each	2
Clamp fixtures for use on ¾" pipe, set	4
Clamps, "C," 4", 6", 8", pairs each	2
Clamps, wood, 12" x 14"	4
Clippers, bolt 30" length	1
Clippers, bolt 18" length	1
Coppers, electric, special heavy duty	2
Creeper, auto	1
Cutters:	
Pipe, cuts ¼" to 2"	1
Glass	2
Tubing	1

Description	No.
Die Sets:	
Tap and die set NC ¼" to ¾" by 16ths, set	1
Tap and die set NF ¼" to ¾" by 16ths, set	1
Pipe dies, ratchet handle, ⅛" to 2", set	1
Dividers, wing 6", 10" each	1
Dresser, emery	1
Drills:	
Hand, chuck size 0" to ¼"	1
Electric, portable ¼" chuck	1
Electric, portable ½" chuck	1
Press, ⅝" chuck	1
Drivers:	
Screw, offset 6", plain and Phillips, each	1
Screw, shockproof 4", 6", 8", 12", each	1
Screw, short 1¼", blade	2
Edger, concrete workers, square corner and round corner, each	1
Extractor, screw, set	1
Flaring tool, tube	1
Float, wood, or rubber sponge concrete workers	1
Gauges:	
Vacuum	1
Compression	1
Feeler	1
Tappet adjusting	1
Wire	1
Goggles, grinding, pair	6
Grinders:	
Bench, electric 6"	1
Floor, electric, wheel size 12-14", diameter, 1½" to 2" face	1
Sickle grinder	1
Portable 6" stone	1
Disc grinder	1
Groover, concrete worker's	1
Guns:	
Zerk grease gun (hand type)	1
Paint sprayer	1
Air blow	1
Hammers:	
Ball-peen, 1lb. and 2 lb., each	2
Claw, curved	6
Cross, peen, 2½ lbs.	4
Sledge, 6-8 lb.	1
Hardy, blacksmith to fit anvil	1
Helmet, arc welders	6–8
Hoist, chain capacity ½-1 Ton	1

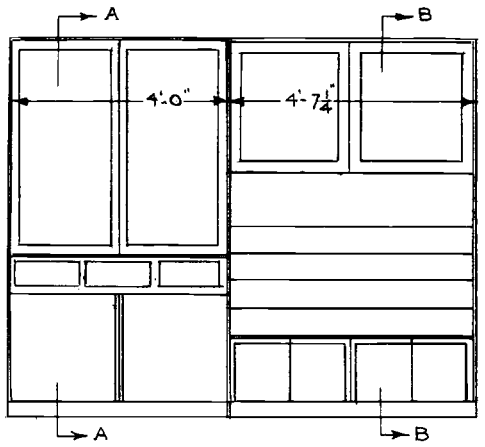
Description	No.
Impact tool	1
Indicator, speed	1
Jack, automotive floor type 1½ to 3 tons	1
Jack, hydraulic capacity 3-5 tons	1
Knives, putty	6
Ladle, melting bowl, diameter 3-3½"	1
Lamp, automotive trouble light, 25' cords	2
Levels:	
Carpenters	1
Masons	1
Farm level with leveling rod	1
Mallet, rawhide	2
Nippers, end cutting	1
Oilstones, combination	4
Planes:	
Block, adjustable 6" steel frame	4
Jack, 14"	4
Pliers:	
Combination 6" or 8"	6
Diagonal cutting 6" or 8"	2
Lineman's 8"	2
Long nose, 6"	2
Locking, vice grip type, 6", 8", 10", each	2
Groove joint pliers	1
Plumb bob	1
Pullers:	
Gear, heavy duty	1
Gear, small 0-3"	1
Punches:	
Aligning, point size 3/16", ¼", ⅜", each	1
Center	2
Pin, machinists, 3/32", 3/16", 7/32", 9/32", each	1
Sheet metal punch sizes 3/32", to ¼", by 32nds	1
Starter punches	2
Rivet buster	1
Rules, caliper	2
Sander, portable electric orbital action	1
Saws:	
Compass, 12"	1
Crosscut, 8 or 10 point, 26"	4
Hack, adjustable frame	4
Tilting arbor or radial arm, 12" complete with motor	1
Skill 6"	1
Metal cutting electric band or hack saw	1
Electric hand saw	1

Description	No.
Sets:	
Nail, assorted sizes	1
Rivet, 3 sizes, each	1
Shovels, one round point long handle, one square point short hnadle, scoop 14, each	1
Snips:	
Aviation 10"	1
Tin 12"	1
Soil sampling equipment, set	1
Squares:	
Combination	4
Carpenters, 16" x 22"	4
Steel 8" x 12"	2
Tables:	
Arc welding, grill top with shields attached 18" x 36"	4–8
Acetylene, grill top with fire brick	2
Tapes:	
Steel, 100'	1
Steel, 8-10'	6
Torch:	
Oxy-acetylene with cutting attachment, one set for every 15-20 boys enrolled in vocational agriculture	1
Trowel:	
Brick mason, and plaster, each	1
Vises:	
Drill press, 6" opening	1
Machinist, 4" jaw	4–6
Machinist, 4½-6" jaw, heavy duty	1
Pipe, ⅛" to 3½"	1
Leg, blacksmith	1
Woodworking rapid action, 7"	4–6
Welder:	
Arc 180 amp AC or DC welder for every 8-10 boys enrolled in vocational agriculture	
Carbon arc units, one for each two arc welders	
Wrenches:	
Adjustable open end 6", 8", 10", 12", 18", each	2
Combination open end box end set 5/16-1½ by 16ths	1
Socket set ½" drive 12 pt., 7/16 to 1" by 16ths, set to include ratchet handle, hinged offset handle, etc.	
Sockets, 6 point deep sockets ½" drive, ½" to 1½" by 16ths, set	1
Tappet end wrenches, set	1
Pipe wrenches, 12", 18", each	1
Allen wrench set	1
Ignition wrench set	1
Midget socket wrench set ¼" to ½", set	1

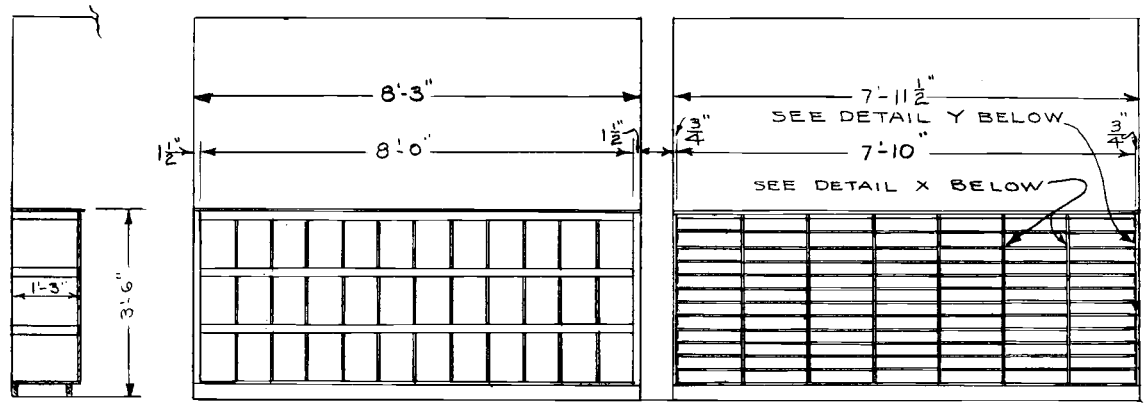
Suggested List of Equipment for Oregon Vocational Agricultural Departments

Description
Tables, 2′ x 7′, formica top, metal trimmed edge
Chairs, metal, non-folding
Filing cabinet, standard 4 drawer
Desk, standard teachers desk
Telephone
Bulletin board, 6′ or more
Chalkboard, 12′ or more
Slide projector, combination slide and filmstrip
Hot plate

Description
Livestock equipment:
Dehorning equipment
Castrating equipment
Syringe, 50 cc
Show ring equipment
Electric clippers, equipped with sheep shearing attachment
Crops equipment:
5 dozen seed storage bottles
6 tripod magnifiers
Pruning equipment

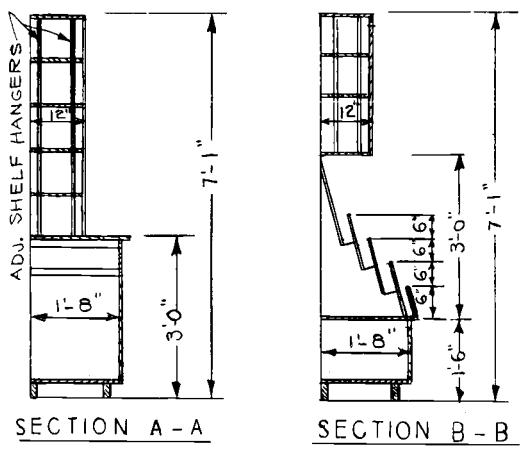


ELEVATION



BULLETIN CABINET ELEVATION

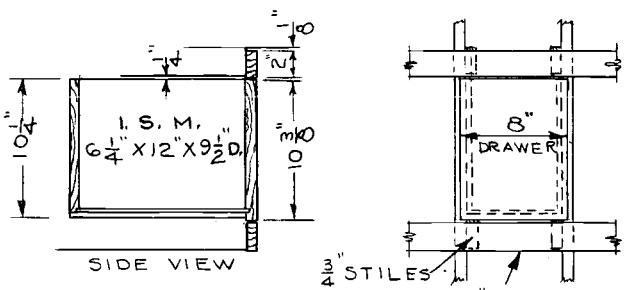
PROJECT CABINET



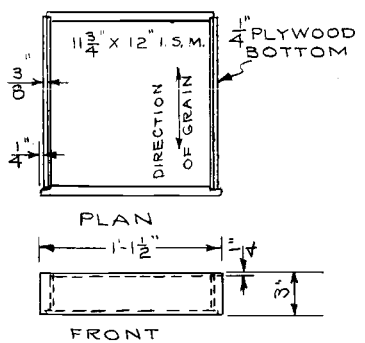
SECTION A-A

SECTION B-B

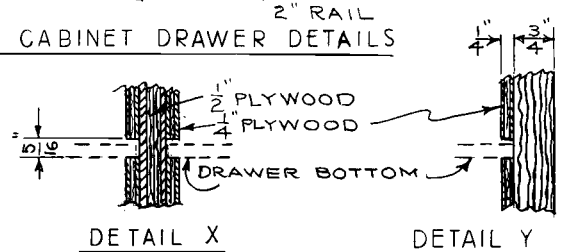
BOOK AND MAGAZINES CABINETS



BULLETIN CABINET DRAWER DETAILS



PROJECT CABINET DRAWER DETAILS



DETAIL X

DETAIL Y

LIBRARY UNIT PLAN I

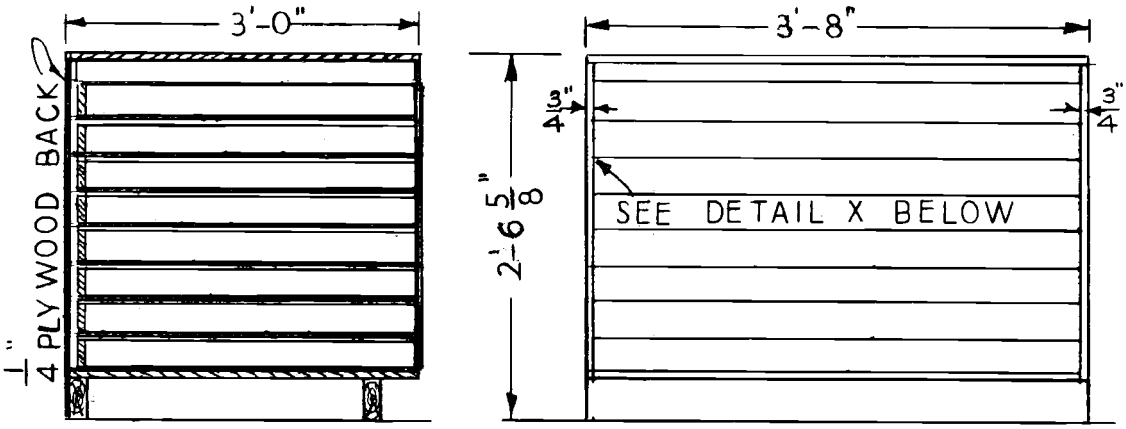


CHART STORAGE CABINET

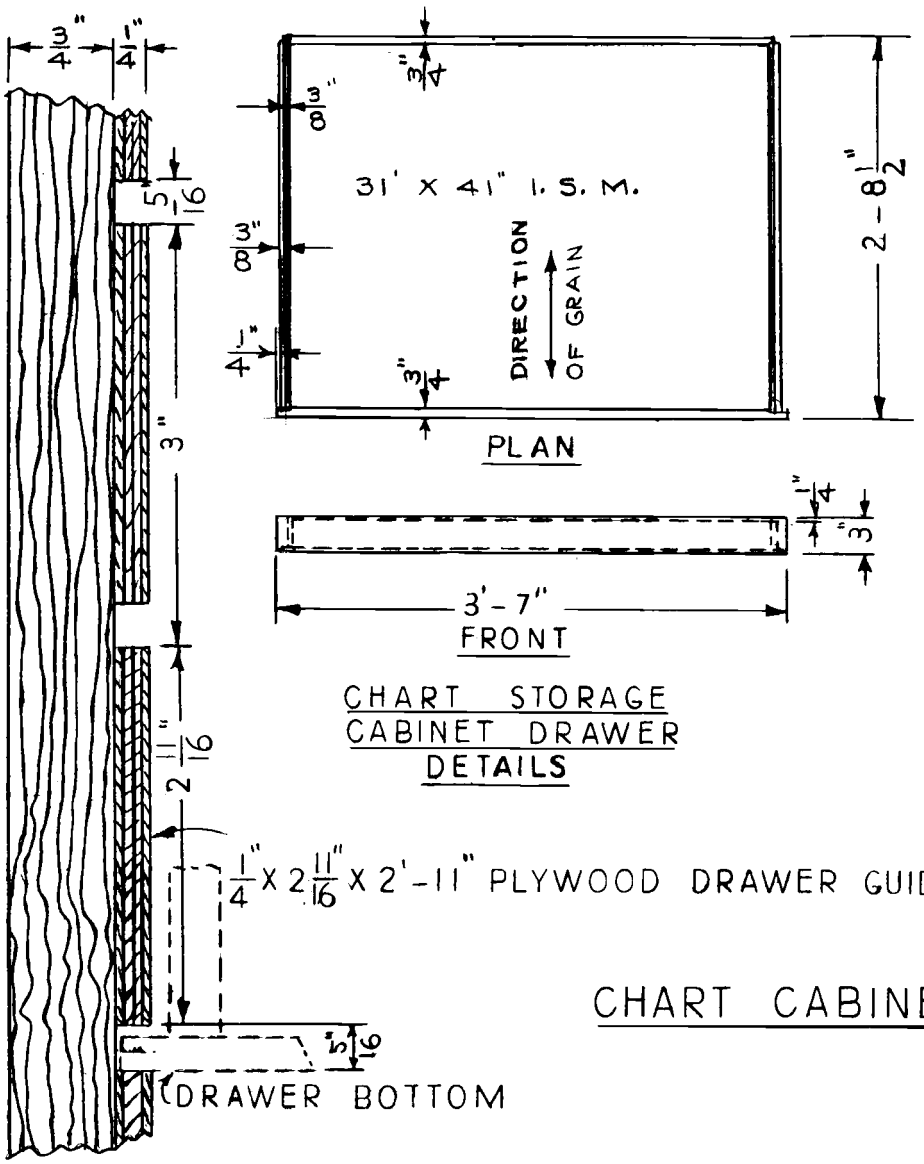
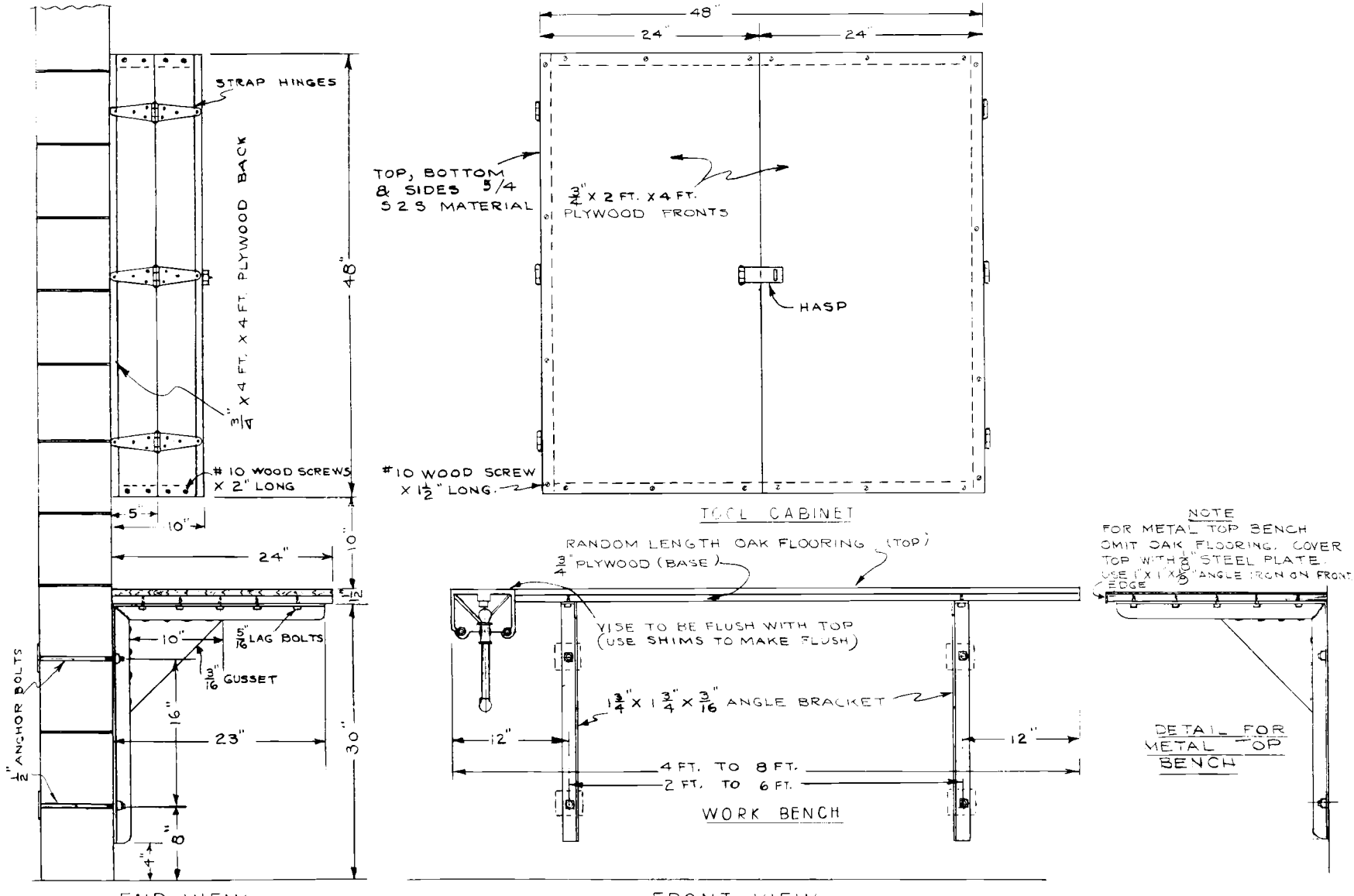
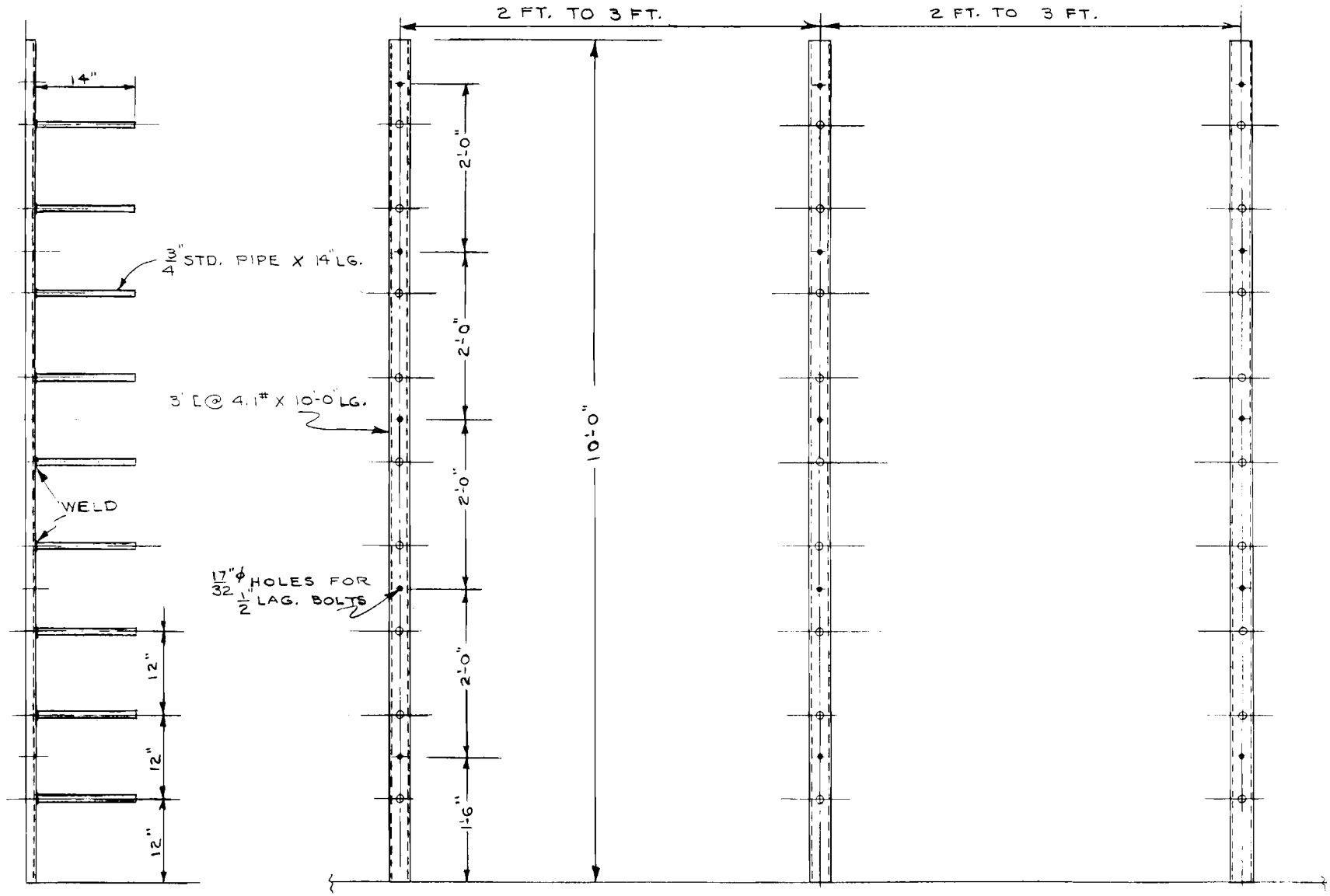


CHART CABINET

LIBRARY UNIT PLAN 2

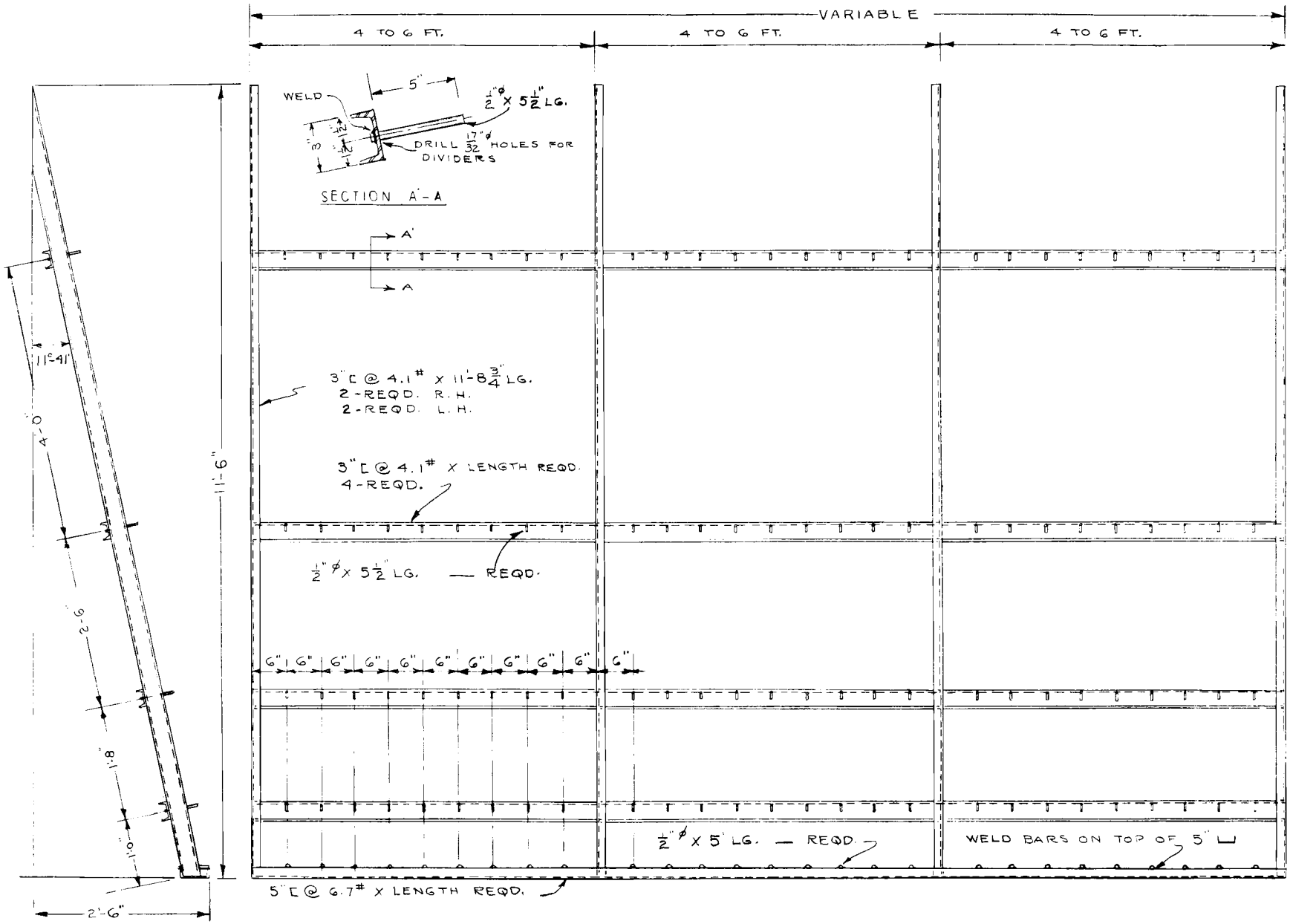

STRAP HINGES
48"
3/4" X 4 FT. X 4 FT. PLYWOOD BACK
10 WOOD SCREWS X 2" LONG
5"
10"
10"
24"
1 1/2"
10"
5/16" LAG BOLTS
13/16" GUSSET
16"
23"
30"
1/2" ANCHOR BOLTS
8"
4"
END VIEW
(VISE NOT SHOWN)
EQUIP. PLAN NO. 1
48"
24"
24"
TOP, BOTTOM & SIDES 5/4 S2S MATERIAL
3/4" X 2 FT. X 4 FT. PLYWOOD FRONTS
HASP
10 WOOD SCREW X 1 1/2" LONG.
TOOL CABINET
RANDOM LENGTH OAK FLOORING (TOP)
3/4" PLYWOOD (BASE)
VISE TO BE FLUSH WITH TOP (USE SHIMS TO MAKE FLUSH)
1 3/4" X 1 3/4" X 3/16" ANGLE BRACKET
12"
12"
4 FT. TO 8 FT.
2 FT. TO 6 FT.
WORK BENCH
FRONT VIEW
NOTE
FOR METAL TOP BENCH OMIT OAK FLOORING. COVER TOP WITH 16 GA. STEEL PLATE. USE 1" X 1" X 3/16" ANGLE IRON ON FRONT EDGE
DETAIL FOR METAL TOP BENCH



END VIEW

FRONT ELEVATION

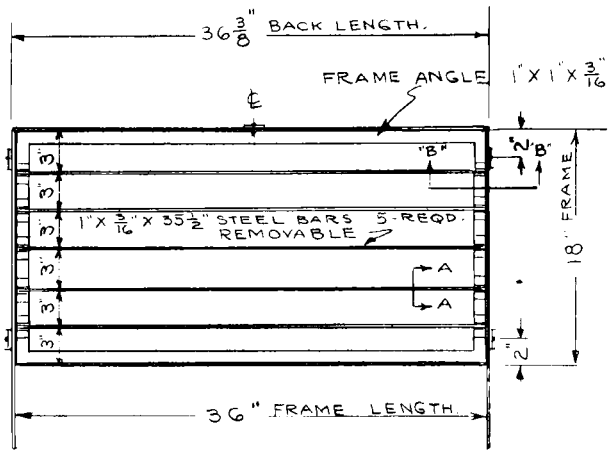
EQUIP. PLAN NO. 2
FOR LUMBER STORAGE



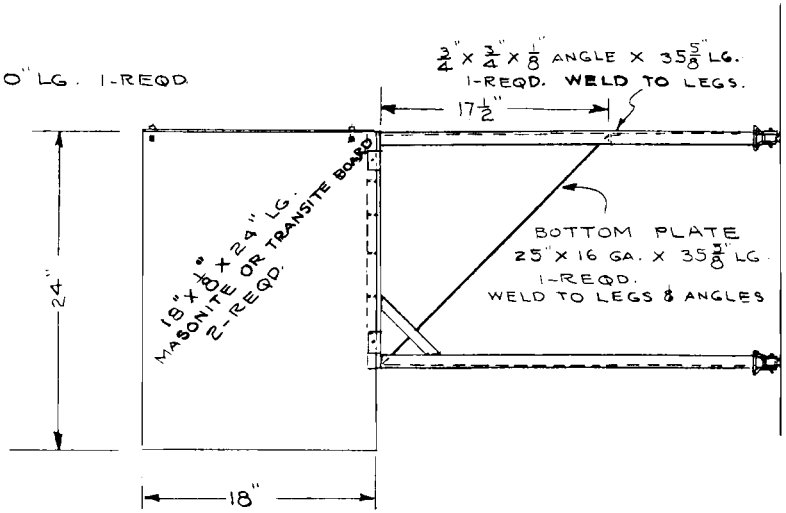
END VIEW

FRONT ELEVATION
WELDED CONSTRUCTION

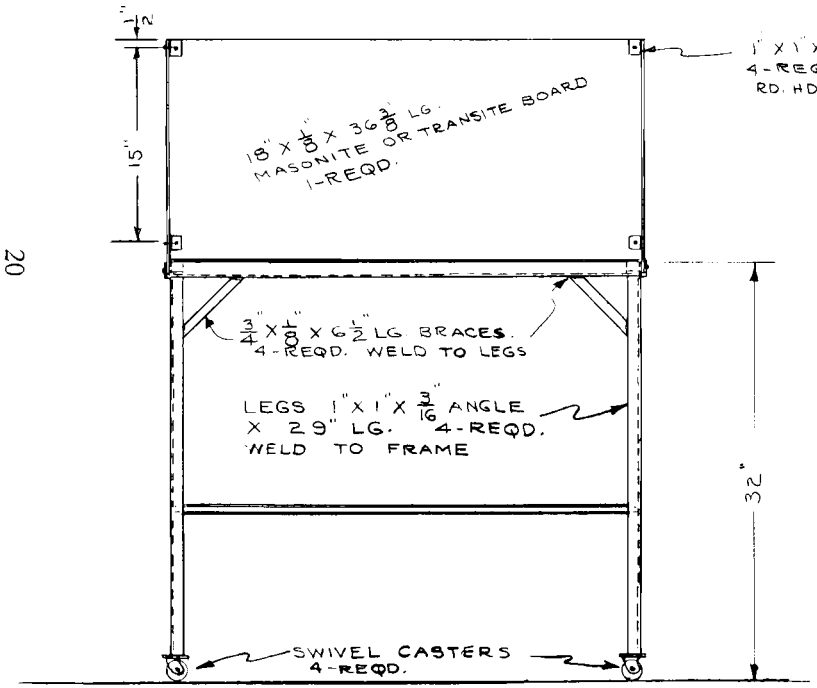
EQUIP. PLAN NO. 3
FOR STEEL STORAGE



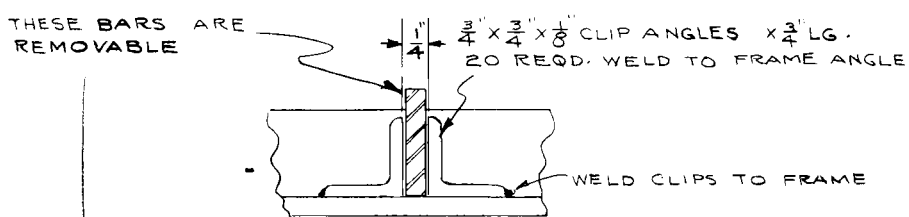
PLAN



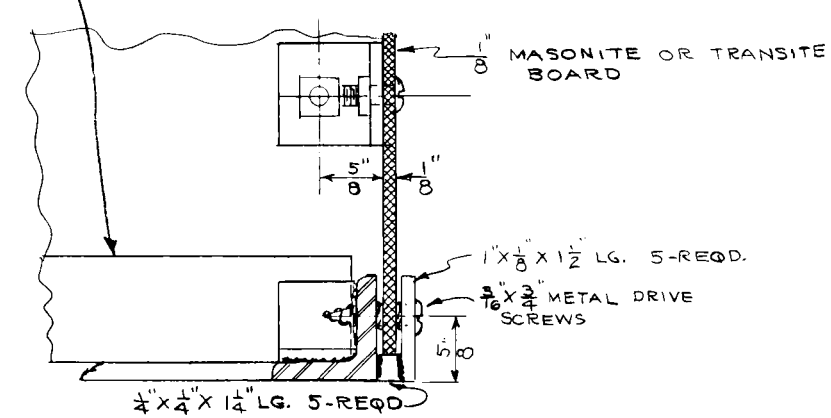
SIDE VIEW



ELEVATION

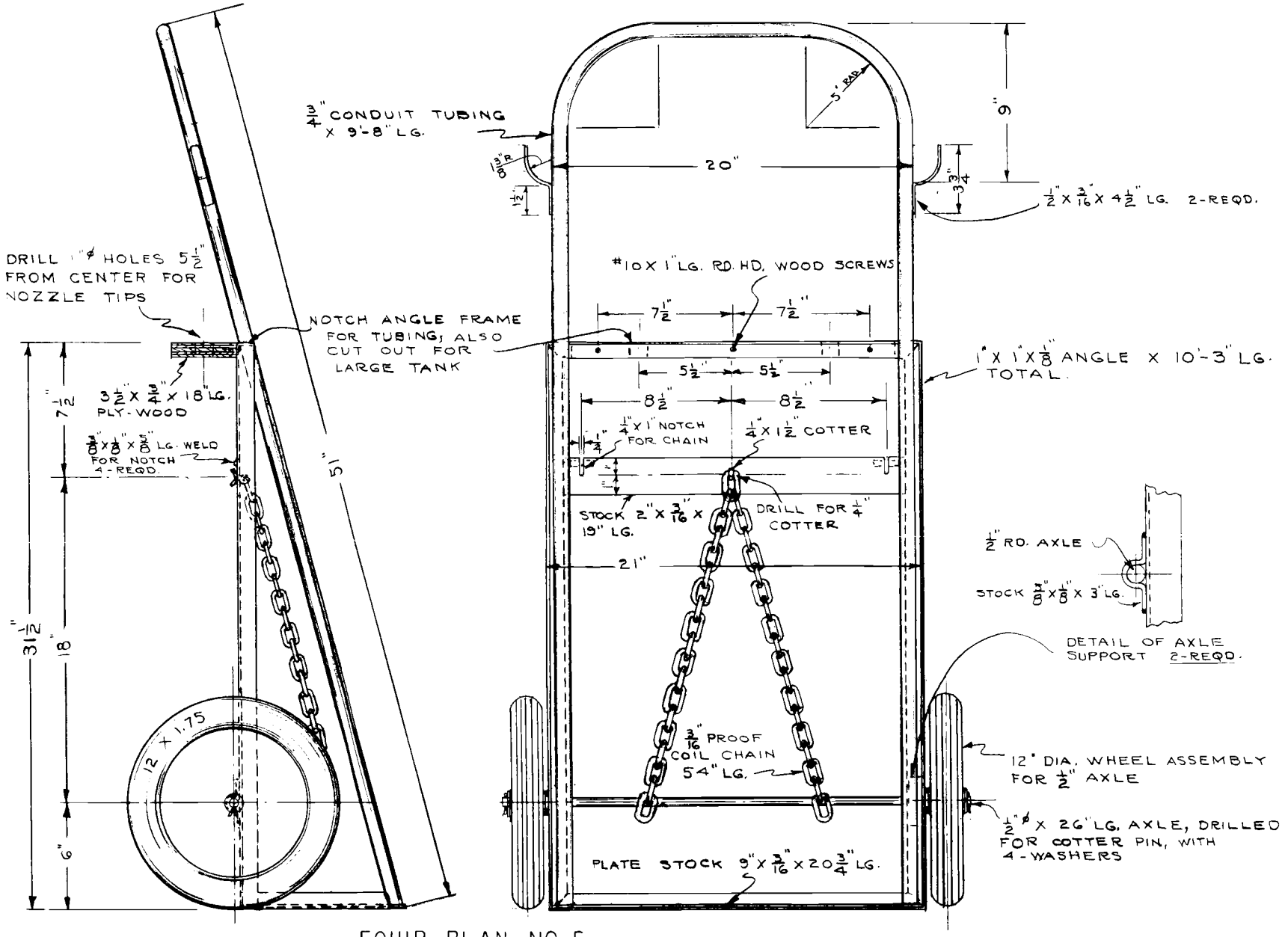


SECTION A-A



SECTION "B-B"

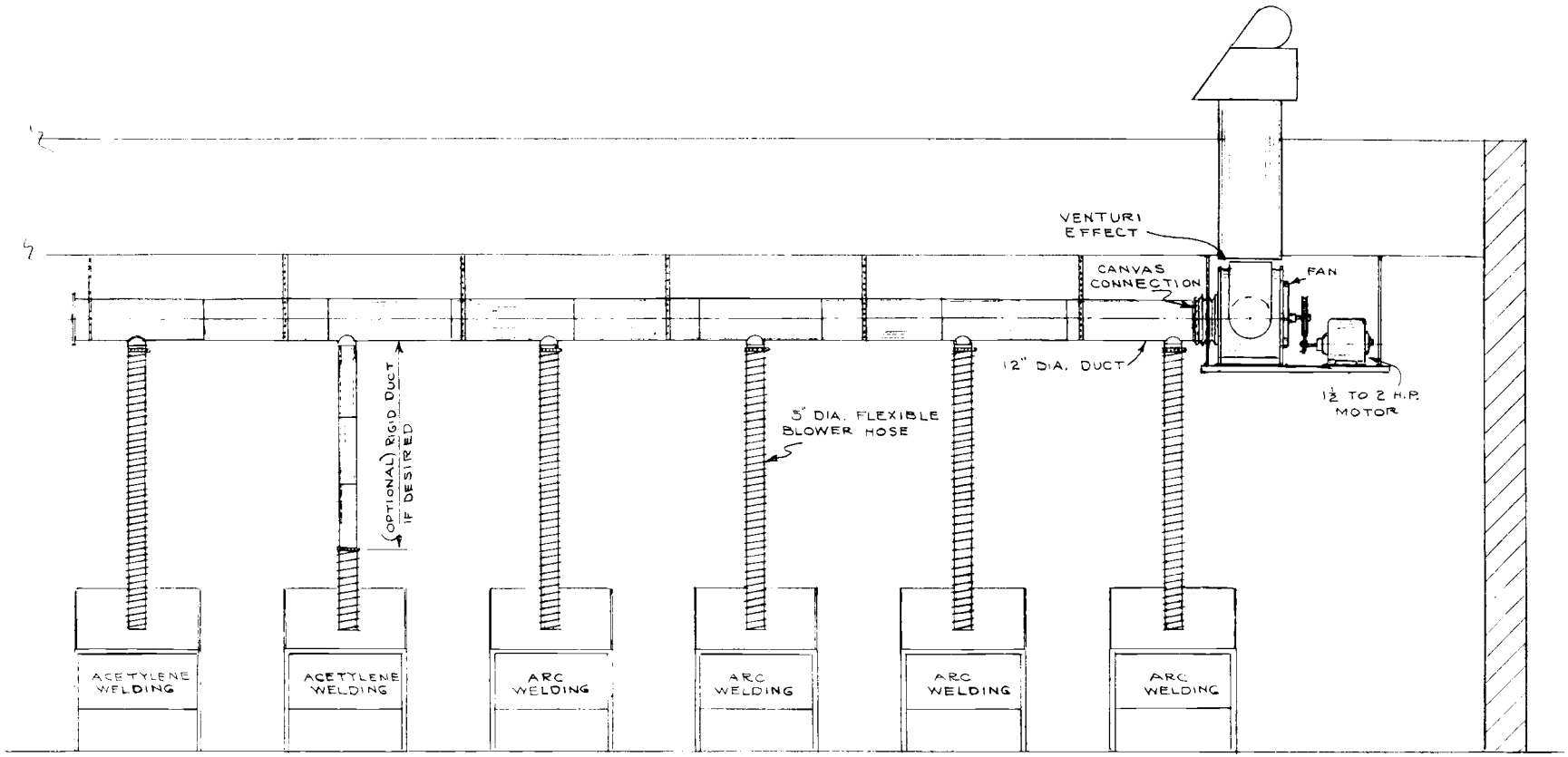
EQUIP. PLAN NO. 4



EQUIP. PLAN NO. 5

SIDE VIEW

FRONT VIEW



ELEVATION

SCALE 0 3 6 9 12" 1:0

SPECIFICATIONS

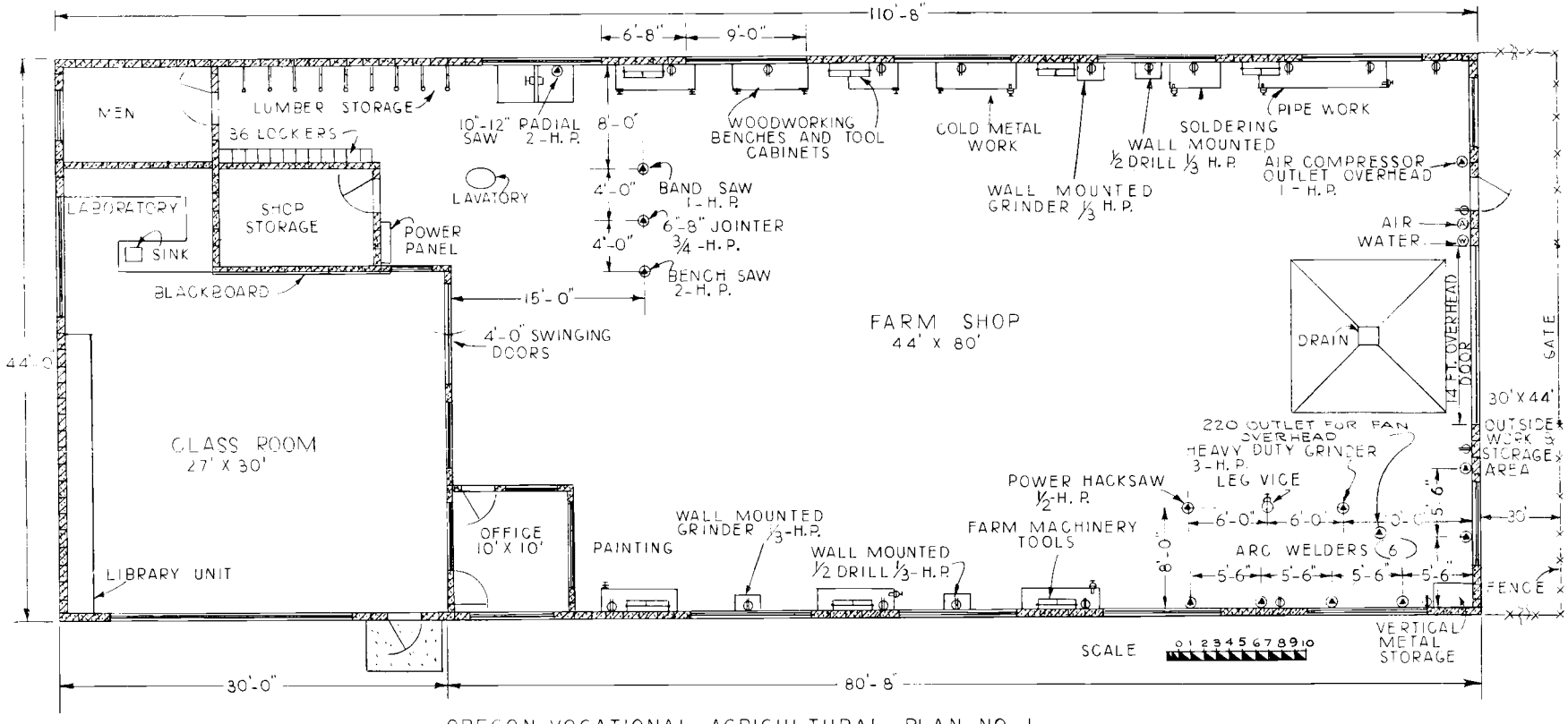
FAN : CENTRIFUGAL TYPE, 12" DIA. MINIMUM ON INLET SIDE.

AIR RATE: 225 C.F.M. PER STATION AT 1.0" H_2O STATIC SUCTION.

FAN SPEED: VARY TO ACHIEVE ABOVE AIR RATE AND STATIC HEAD. APPROX. 1450 R.P.M FOR 12" FAN. NOTE. LARGER FAN AT LESS SPEED SHOULD PRODUCE THE SAME STATIC HEAD WITH LESS NOISE.

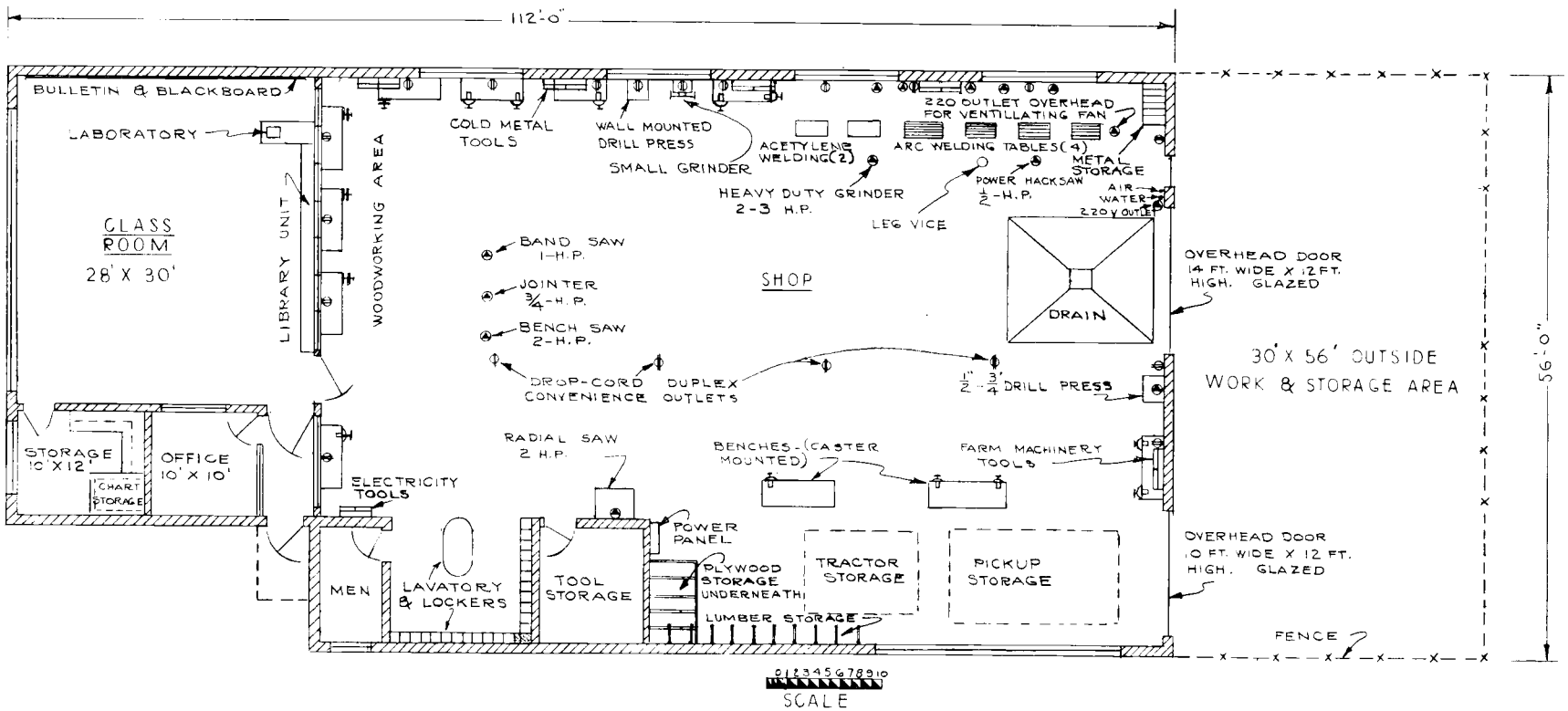
MOTOR : 1½-2 H.P. 3-PHASE IF AVAILABLE, OR 2 H.P. 220 SINGLE PHASE

EQUIP. PLAN NO. 6



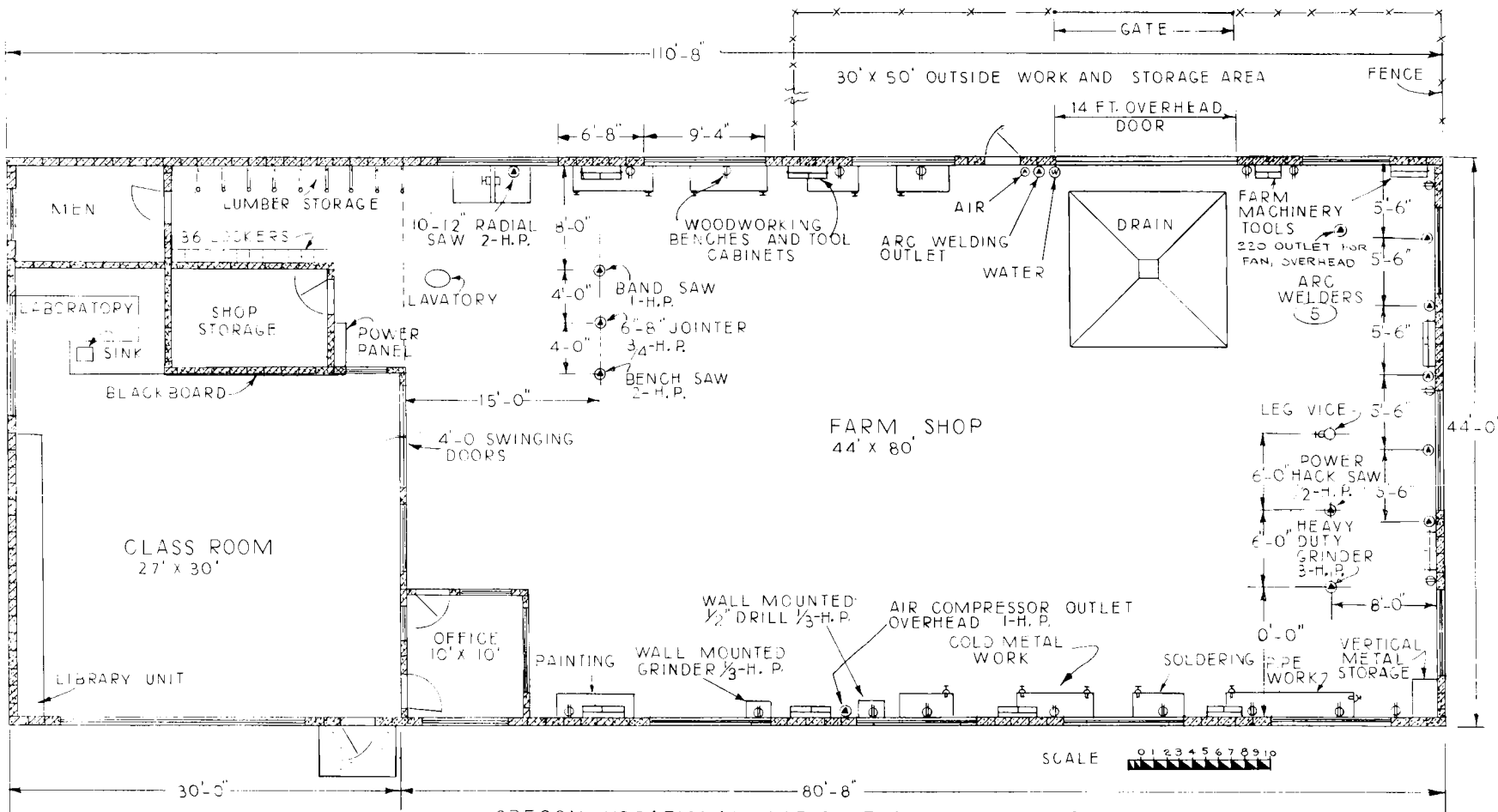
OREGON VOCATIONAL AGRICULTURAL PLAN NO. 1

OREGON STATE DIVISION OF VOCATIONAL EDUCATION AND
OREGON STATE COLLEGE AGRICULTURAL ENGINEERING DEPT. COOPERATING.



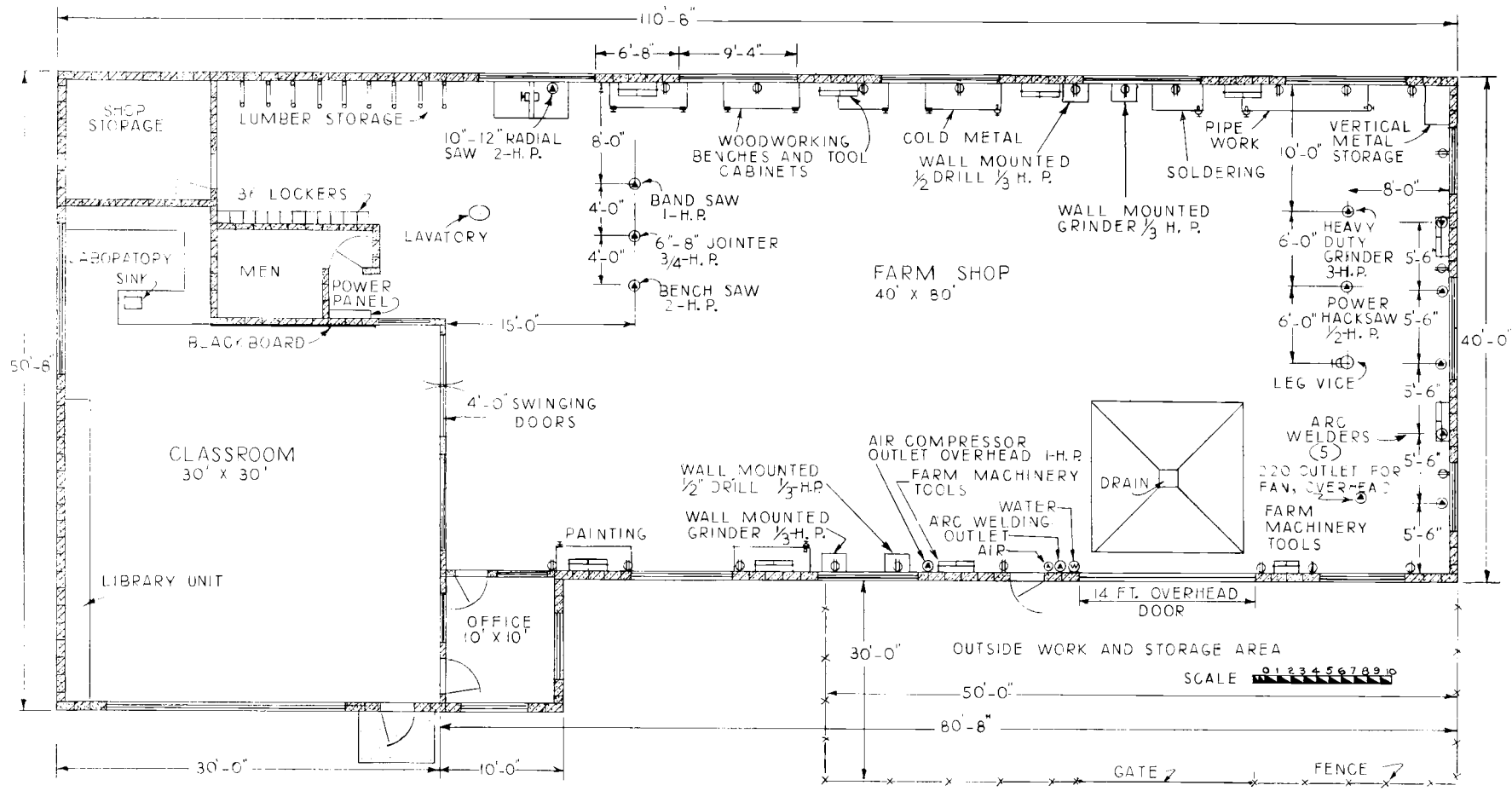
OREGON VOCATIONAL AGRICULTURAL PLAN NO. 2

OREGON STATE DIVISION OF VOCATIONAL EDUCATION AND
OREGON STATE COLLEGE AGRICULTURAL ENGINEERING DEPT. COOPERATING.



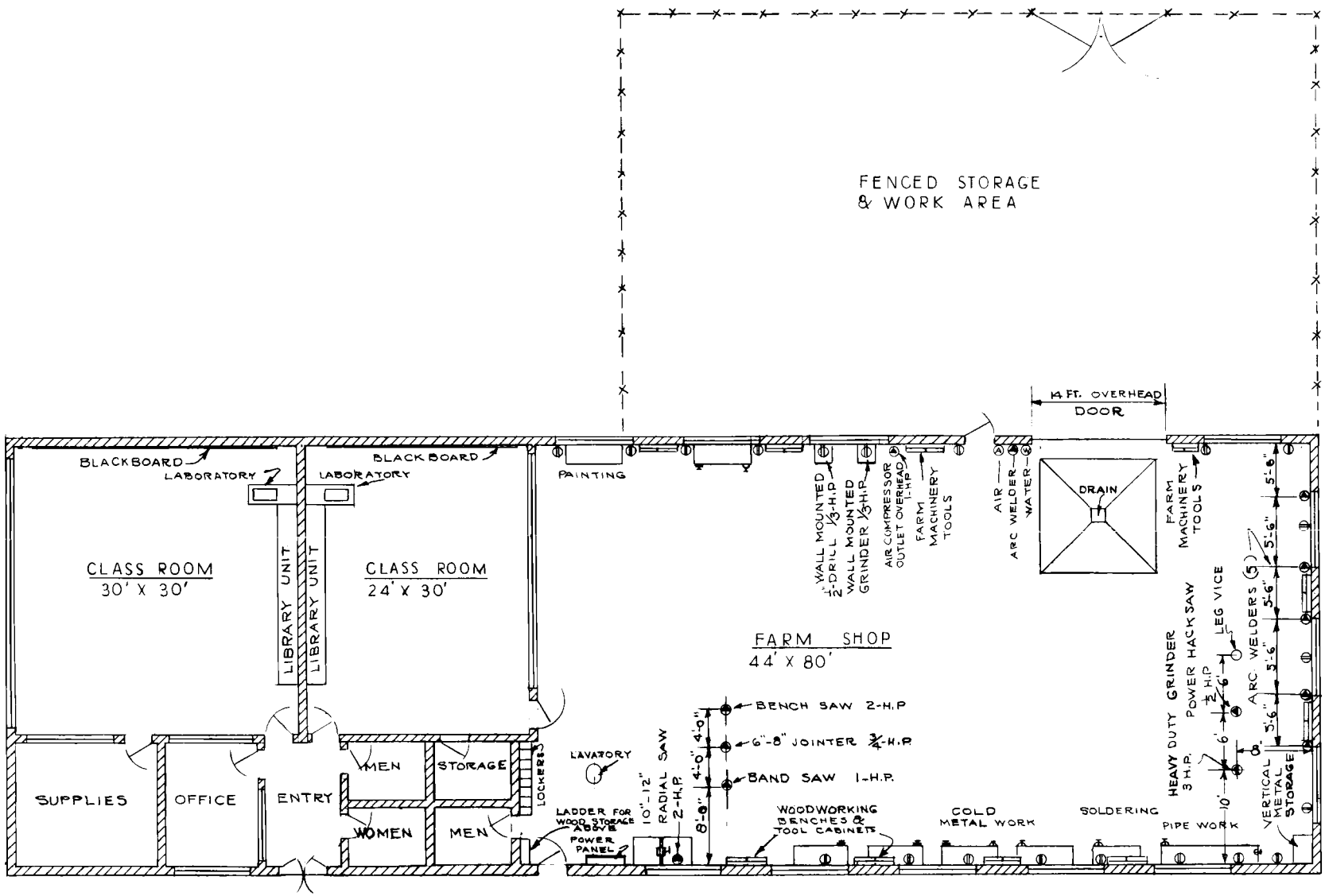
OREGON VOCATIONAL AGRICULTURAL PLAN NO. 3

OREGON STATE DIVISION OF VOCATIONAL EDUCATION AND
OREGON STATE COLLEGE AGRICULTURAL ENGINEERING DEPT. COOPERATING.



OREGON VOCATIONAL AGRICULTURAL PLAN NO. 4

OREGON STATE DIVISION OF VOCATIONAL EDUCATION AND
OREGON STATE COLLEGE AGRICULTURAL ENGINEERING DEPT. COOPERATING.



OREGON VOCATIONAL AGRICULTURAL PLAN NO. 5

OREGON STATE DIVISION OF VOCATIONAL EDUCATION AND
OREGON STATE COLLEGE AGRICULTURAL ENGINEERING DEPT. COOPERATING.