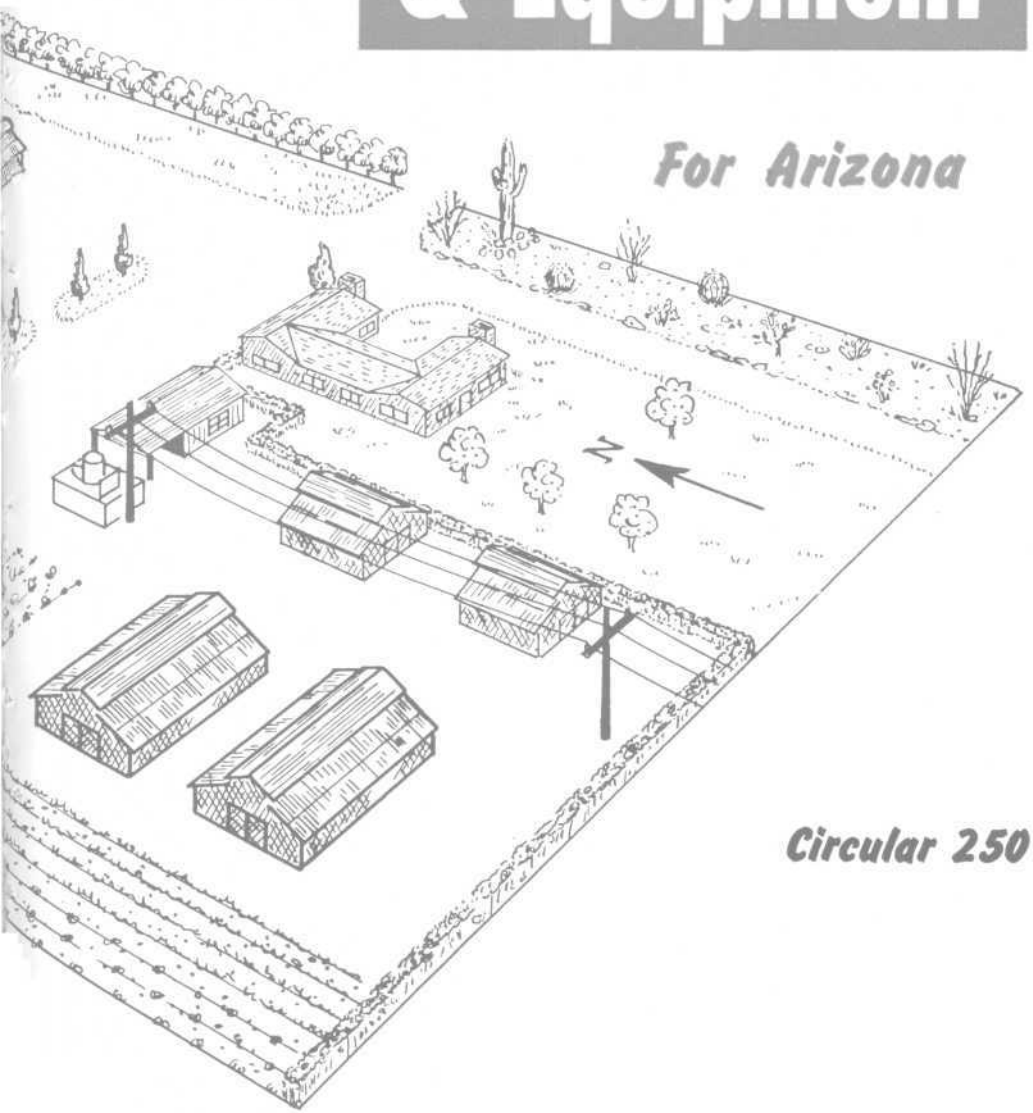
Poultry Housing & Equipment

For Arizona



Circular 250

Agricultural Extension Service,
University of Arizona, Tucson

(For Detailed Table of Contents See Page 21)

University of Arizona
College of Agriculture
Agricultural Extension Service
Chas. U. Pickrell, Director

Cooperative extension work in agriculture and home economics, the University of Arizona College of Agriculture and the United States Department of Agriculture cooperating. Distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914.

5M—July 1957—Circular 250

Poultry Housing and Equipment

For Arizona

By W. T. Welchert
Extension Agricultural Engineer,
University of Arizona, Tucson

This circular gives recommendations for poultry housing and equipment that can be used in Arizona. The main emphasis is on the laying house and laying-house equipment.

On the inside pages of the back cover, you will find design recommendations and suggestions for the laying house and other structures. For poultry management recommendations, see your County Agricultural Agent.

Laying House and Equipment

A well designed laying house compromises all labor-saving and management techniques with the maximum economic utilization of the equipment and structure to produce a dozen eggs at the lowest cost.

Research and field tests show what equipment is needed to get maximum performance from 100 hens. Labor requirements for each job are determined by time-motion

studies which, in turn, dictate the location of the equipment and the order of design importance.

Work Load

Egg handling has the largest labor requirement on the poultry farm followed by feeding, watering, culling, and cleaning. Therefore, it follows that the simplification of egg handling (a daily chore) should be given consideration in the structural design before ease of cleaning (a once or twice-a-year job).

Bird Characteristics

Characteristics of a bird influence structural and equipment design. The hen is defenseless against rodents, susceptible to many diseases, and distressed by sudden changes.

Isolation of brooding and rearing birds from layers is required. Sanitation is extremely important. Pathologists report that dust contributes to respiratory diseases, and recommend a 25 percent litter-moisture content. Equilibrium moisture content for litter in southern Arizona is estimated at approximately 10 percent. On the other hand, pathologists say virus diseases are spread via excessive moisture. Therefore, localized wet spots are highly undesirable besides contributing to dirty eggs.

Chickens peck at anything including each other, so do not use fiber boards. Chickens have a natural habit of nesting and roosting. The higher they can roost the better they like it. To prevent crowding, place roosts level.

The hen has to elevate her head to allow water and feed to flow by gravity to the stomach. Head room is necessary over feed and water. Standing erect, the head is 14 to 16 inches above the ground, with the feet approximately 8 inches behind the head in a parallel-horizontal plane. Because the chicken is a two-legged animal, the body shifts so that the head transcribes an arc to just in front of the feet when picking up an object from the ground. So feed and water level should be at the level of the bird's back and the perch positioned accordingly.

The hen exhausts great quantities of heat, about 60 BTU's per hen per hour (1,000 birds equal to an average furnace). Also, a hen exhausts about ⅓ of a pound of moisture per day. These facts are important in the design of a closed structure. Ventilation is needed to remove excess moisture and maintain heat balance for bird comfort.

Ventilation at a rate adequate to remove excess moisture is sufficient to control an objectionable accumulation of odors and carbon dioxide produced. Chickens have no sweat glands; high critical temperatures make artificial sweat desirable in the form of foggers.

Temperature extremes below 17° F. and above 100° F., depending upon the length of exposure time, are recognized as critical production temperatures in Arizona. Lethal temperatures are somewhat lower and slightly higher for an extended exposure period.

In the chicken, light activates the anterior lobe of the pituitary gland. The result is increased body activity and feed consumption. Hence, artificial lights are used to stimulate production.

CLIMATIC DATA

Station	Elevation (No Feet)	Expected High Extreme	Expected Low Extreme	Record High
Yuma	200	115°	31°	123°
Phoenix	1100	113°	25°	118°
Tucson	2550	108°	23°	112°
Safford	2900	107°	17°	114°
Prescott	5400	98°	4°	105°
Flagstaff	7000	89°	—5°	93°

Station	Avg. Wind MPH	Max. Wind MPH	Pre. Wind* Direction	Avg. Annual Precipitation
Yuma	5.9	56	SW	3 "
Phoenix	5.0	65	E	7½"
Tucson	6.2	59	NW	11 "
Safford	....	....	SE	9 "
Prescott	8.4	72	SW	18½"
Flagstaff	8.1	56	SW	20 "

(From Exp Sta. Bul. 279)

** Prevailing wind in local areas may vary because of air drainage over the surrounding mountains. For example, in South Phoenix, the prevailing wind is east, while in the North Phoenix area it is west.*

Climatic Extremes

Temperature extremes, wind extremes and direction, sun angle and direction, snow, rain and relative humidity determine the structural requirements, the orientation, the shape, slope and overhang of the roof, and the ventilation and insulation requirements of a poultry house.

Method of Housing

The following is a comparison of cost and income studies between caged and conventional floor-housed layers. This study covered a ten-year period (1941 through 1950) and was conducted in southern California by L. D. Sanborn, Farm Advisor, Los Angeles County, California.

Caged and Floor-Housed Data

TABLE I

10-Year Average	Caged	Floor
1. Eggs per hen	197.9	180.7
2. Percent culled	94.2	73.3
3. Percent mortality	20.7	20.8
4. Net cost per dozen eggs	44.2	40.9
5. Feed-egg ratio	8.0	8.2

TABLE II

10-Year Average	Caged	Floor
1. Investment	8.07	4.87
2. Hours labor	3.6	2.6
3. Labor cost	2.29	1.68
4. Total cost	9.01	7.18
5. Total income	9.52	7.82
6. Net income	$0.51	$0.68

Provide drainage in all directions from the poultry house.

Drainage

Avoid locating poultry houses in any area where a potential flash-flood condition exists. Provide drainage in all directions from the structure. Provide a complete tile drainage from water systems to drainage ditch or sewage system.

To permit flood irrigation of land around the house, use a concrete floor on top of at least a 6-inch gravel fill.

Orientation

Unless good shade trees and grass are available, an east-west orientation of the building is desirable for maximum summer cooling because of a more favorable shade pattern.

Ventilation

Continuous ridge ventilators are used in Arizona to allow the heat build-up under the roof to escape. With chicken wire and semi-open slatted structures common to Arizona, ventilation is always adequate.

A continuous low wind movement up to 250 feet per minute (3 MPH) is desirable. However, in the cooler areas of over 3,000 feet elevation, movement of air will need to be slowed down during certain winter months with muslin, burlap, plastics, or tar paper.

In the higher elevations over 5,000 feet, where closed structures are necessary, a more complex ventilation system must be employed. It is recommended that window openings be constructed that can be opened or closed to provide complete ventilation or reduce the amount required during colder weather. Ridge ventilators should also be baffled. In some cases, mechanical ventilation and insulation may be required.

In semi-open structures, ventilation is adequate so that condensation is seldom a problem underneath metal ceilings. In cooler areas, with a closed structure,

condensation can become a serious problem with uninsulated metal roofing. Building paper under the roofing will help some, but is not always adequate insulation.

Floor Space

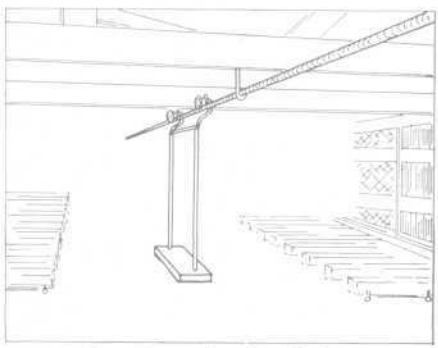
Most commercial producers limit the size of the poultry flock to 500 hens per pen. Two and one-half to 3 square feet of floor space per bird is recommended. Less than 2½ square feet is dangerous.

Feeding Equipment

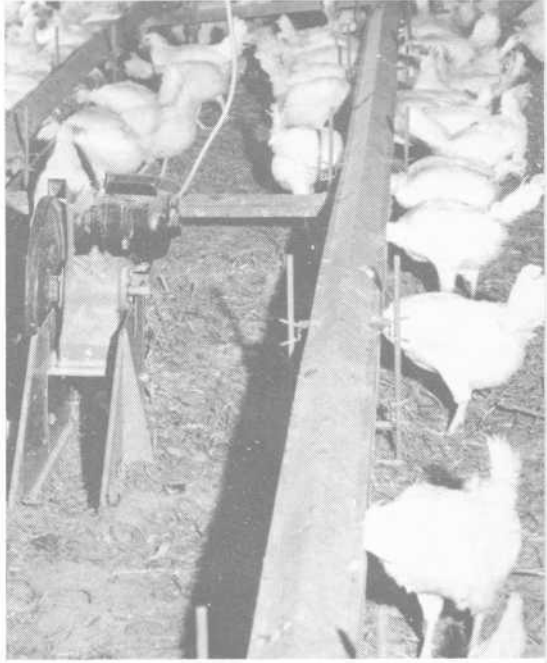
Mechanical feeders in large operations offer a definite saving in labor over hand feeding systems.

An overhead track and carrier for carrying several buckets of feed at one trip from a central service room greatly reduce time and labor. The overhead carrier also may be used for egg baskets, litter, tools, etc. Arranging feeders, nests, etc., systematically on both sides of the carrier line speeds daily chores.

Feed space requirements for mechanical and hand feeding vary. Hand feeders have a greater peak space requirement than mechanical feeders which tend to spread out the feeding period more uniformly.



An overhead carrier is a labor saver.

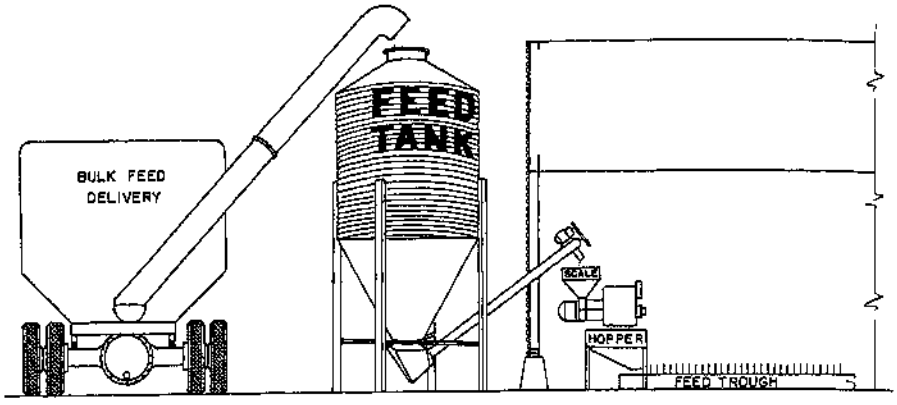


Mechanical feeders can be used in large operations.

Minimum space requirements for mechanical feeders are 30 linear feet per 100 birds with 40 linear feet being most desirable. For hand feeders, the minimum is 40 linear feet per 100 birds with 50 linear feet being most desirable.

Place feed level with the bird's back. If feeder perches are used, all should be placed at the same height — preferably 18 to 24 inches above the litter.

Elimination of all bag storage and handling in favor of bulk feed storage and handling, benefits the poultryman as follows: (1) Reduction in feed costs, since sacks are unnecessary and labor for processing reduced; (2) Saving in labor: let machinery do the lifting; (3) Fewer disease hazards from re-used sacks; (4) Less loss



Bulk feed storage bins may be built into the structure or they may be separate units.

from rodents; (5) Easy application to mechanical feeding; (6) Faster delivery time.

Bulk feed storage bins may be built into the structure or may be separate units. Commercial feed bin and auger units usually can be purchased more economically than homemade units. A combination of augers, elevators, weighing scales and some ingenuity can produce a nearly automatic feeding system.

One thousand hens will consume approximately 2,200 pounds of feed per week. Allow 60 cu. ft. of bin space per ton for mash and 50 cu. ft. per ton for pellets or scratch.

For gravity flow, use a minimum wall slope of 50 degrees. To prevent feed from bridging use a discharge of at least an 8-inch square opening.

Watering Equipment

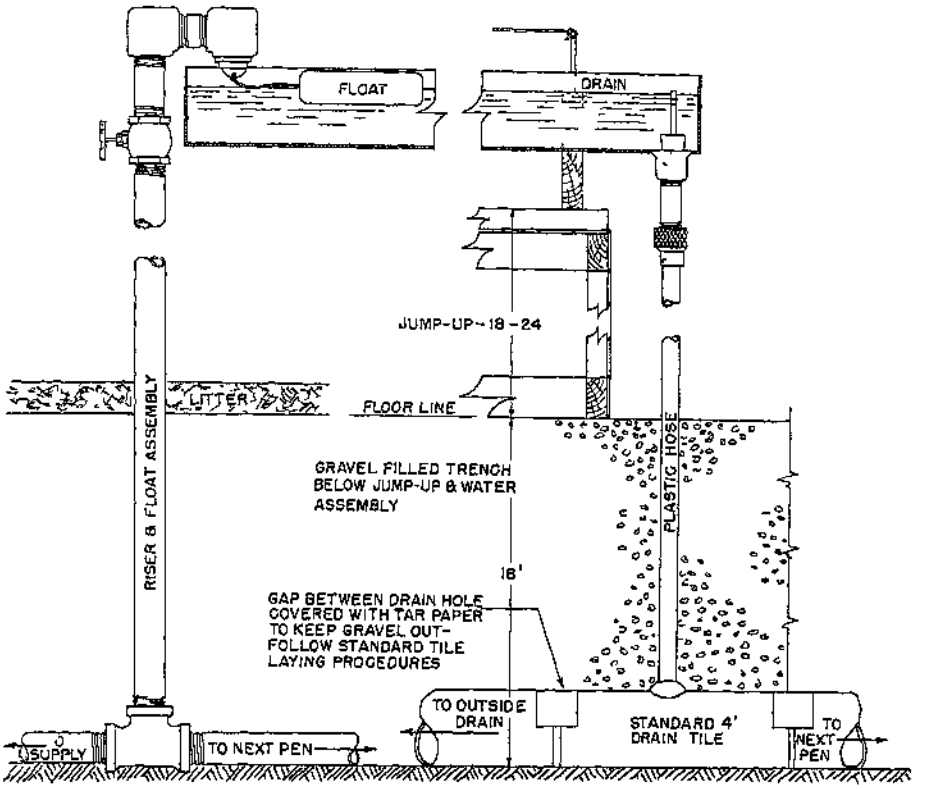
A properly designed water system includes an adequate water supply, automatically controlled flow, adequate water space, adequate freeboard to insure against spillage, ease of cleaning, adaptability to medication, and an adequate drainage system. It should provide a minimum of 12 linear feet per 100 birds and be within 15 feet of all feeders.

Long troughs most nearly fulfill water space and location requirements. Trough waterers must be placed level and have a cross section adequate to carry a water depth of 2½ inches with a two-inch freeboard above the water line to prevent overflow.

Hens Need Water!

The amount of water hens drink helps determine the number of eggs they lay. One hundred hens require from 6 to 8 gallons of water per day. The water supply necessary depends upon the water system used.

An automatic waterer is either of continuous flow and/or controlled flow type. Continuous flow is desirable to provide clean, cool and fresh water at all times. Controlled flow is desirable to conserve water and for application of medications. A combination system can



You can build a combination continuous-flow and controlled-flow automatic waterer.

be built with an adjustable float and an adjustable drain system.

Any water system used needs a complete pipe and tile drainage system from trough to drainage ditch or sewer line, and an additional drainage capacity to prevent wet litter due to bird spillage. Water troughs should be placed on a 1 x 2-inch mesh welded wire platform 30 to 36 inches wide and 18 to 24 inches higher than the litter line over a tile drain. Water stands are closed to prevent litter from being scratched into the drain area. Drain tile installation requirements are the same as for ordinary sewerage field drain lines.

Lay Pipes Underground

Water pipes should be laid underground for frost protection, to keep them out of the way, and to keep water cool in the summer. The pipes may be galvanized steel, copper or plastic. All have some disadvantage.

Copper pipes are corroded by ammonia fumes and therefore should not be exposed to air in a poultry house. Galvanized steel pipes will corrode when laid in cinder fill. Certain types of waters and soils attack metal pipes. Where these conditions exist plastic pipes have a decided advantage.

The high expansion rate of plas-

tic pipes due to temperature change demands a zig-zag installation of the pipe in the trench. Use about 102 feet of pipe in a 100-foot trench.

Cost of materials for galvanized or plastic pipe is nearly the same but installation cost of plastic is substantially reduced. Plastic pipes are subject to possible rodent damage and may not be used for hot water lines.

Water pipe size depends upon the length of supply line and the peak water demand. On most farm installations, the main water supply line from the pump to major use outlet farthest away requires a 1½-inch pipe. For example, the line from the pump to the farthest poultry house.

Check Size

To determine the size of pipe for secondary outlets, proceed as follows:

1. Determine pipe line distance from outlet (s) to the point where it joins main line.

2. Determine gallons - per - hour capacity based on the greatest possible demand for any one use. If there are two or more outlets, figure pipe size to serve the one with the greatest demand. In most cases, this is a hydrant, or hose connection — 200 gallons per hour.

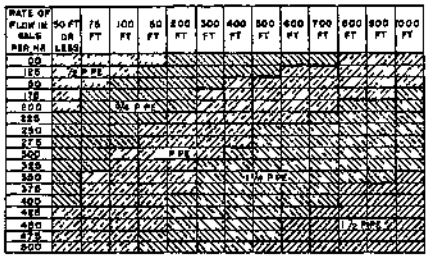
3. Select pipe size from steel or plastic pipe chart.

Example:

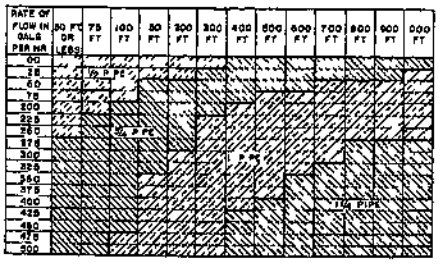
	Pipe Size Required	
	Galv. Steel	**Plastic**
Junction at mainline to poultry house hydrant—100 ft., 200 gal. per hour	¾ in.	¾ in.
Junction from hydrant to waterers — 200 ft., 125 gals. per hour	¾ in.	¾ in.
Junction from hydrant to foggers —240 ft., 60 gal. per hour	½ in.	½ in.

Nests

Since egg handling is the poultryman's largest single chore, considerable attention should be given to reducing the labor requirement for the entire egg-handling process. This can best be done by reducing the number of steps taken to gather eggs and reducing the number of handling and carrying operations.

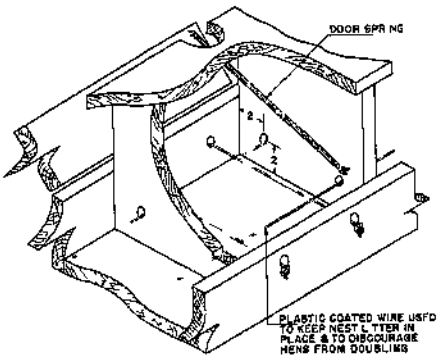


STEEL PIPE chart (based on maximum drop of 5 lbs. per sq. in. and 17-year-old pipe)

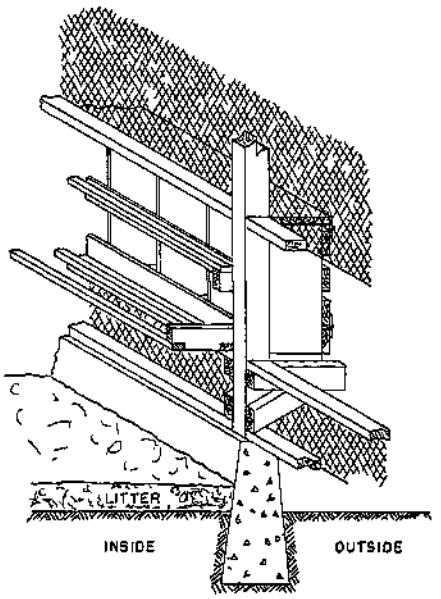


PLASTIC PIPE chart (based on maximum pressure drop of 5 lbs. per sq. in.)

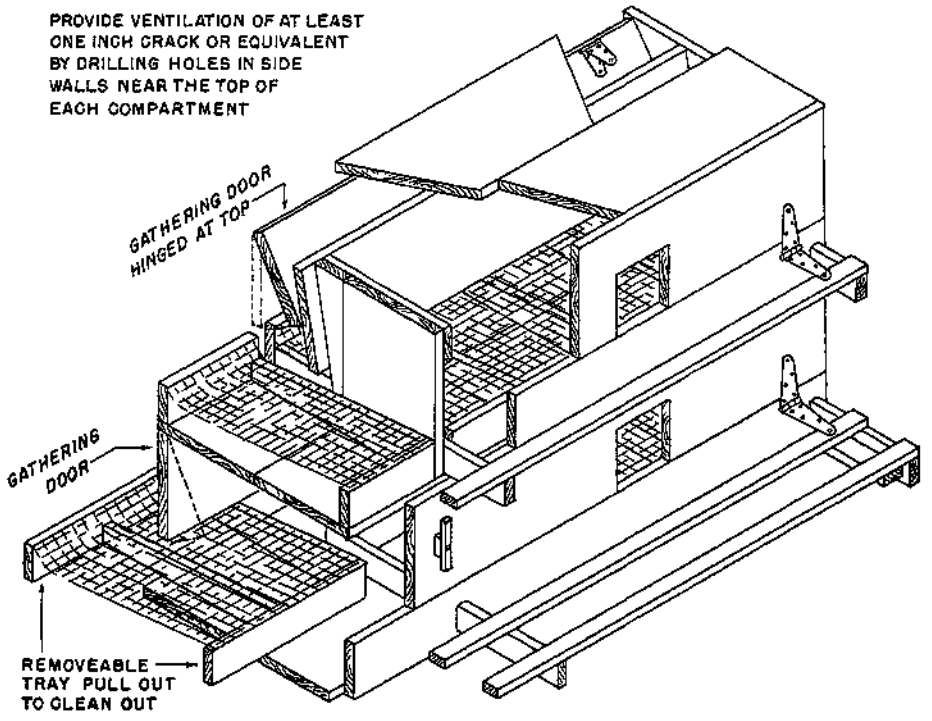
Nests may be mounted on the inside or outside of the poultry house.



Individual Nest.



Community Nest.



The construction location and number of nests affect egg breakage, cleaninless, and labor required to gather and clean the eggs. Uniform distribution of laying hens in the nests is a major problem affected by both location and construction. The distribution pattern also determines the number of nests desirable.

All nests must provide convenient entry and be alike to keep hens from crowding into certain ones. One individual nest is needed for every 5 or 6 hens, or one 6-foot section of double tier community nests per 100 hens.

Besides the desirable characteristics of economy, a dark location, ease of cleaning and of gathering of eggs, adequate ventilation must be provided especially in southern Arizona. There should be at least a 1-inch crack, or equivalent, at the top for escape of heated air. Additional holes may be drilled in the walls or top.

Two types of nests are in general use — individual or community. Satisfactory roll-away floors for community nests can be made. (See Plan A-133D, page 19.)

The trend seems to be back to smaller individual nests. (See Plan A-133B.)

Perches in front of the nest covered with 1″ x 2″ welded wire or 1″ mesh hardware cloth will help keep the nests clean. Gypsum trays on the perch also have been used. Some poultrymen keep hens from roosting in the nests at night by hinging the perch to fold up against the nest openings.

Roosts

Roosts aid in reducing the spread of disease and in producing clean eggs. From the standpoint of egg production, they are not necessary.

Because of the hen's natural roosting instinct, it is desirable to place all roosts on the same level to prevent crowding.

Provide 7 to 8 inches of roosting space with a minimum of 12 inches between rails. A somewhat wider spacing of 13 to 15 inches is preferred. Roosting rails should be 1½ to 2 inches wide with rounded corners.

Maximum length of a section should be 7 to 8 feet for easy culling and cleaning. A 5 to 6 foot width section allows easy removal for cleaning.

Use 1 by 2-inch welded wire to place on top and the sides of the roosts to keep birds out of the dropping pit area. Smaller mesh wires are more easily clogged with feathers and droppings, and larger mesh wires allow eggs laid on the roost to fall through.

Lighting

To maintain egg production during fall and winter, or on cloudy or foggy days, artificial lights are desirable. A total light period of 13 to 14 hours is sufficient. The preferred method is to turn the lights on by an automatic time clock early in the morning.

There should be one 60 watt light bulb for each 200 square feet of floor area. Adjust lights to illuminate the entire floor and roosting area.

Wiring

All wiring should be installed by qualified personnel and should be checked periodically for safety.

Wiring requirements for auto-

matic feeders, water warming devices, portable elevators, fogging control devices, etc., should be checked with the power supplier.

Provide at least one convenience outlet per pen.

Cooling

Fogging or mist spraying directly on birds is the most economical and practical system of cooling birds. In effect, this system is providing the birds with an artificial sweating system which cools them by evaporation.

Wide angle nozzles with a low capacity of 1 to 2 gallons per hour are best. The nozzle should be equipped with, or have in series, a spring loaded ball check valve that will stop all water flow when the pressure drops below 10 psi (pounds per square inch).

A ½-inch diameter pipe is adequate for the average size poultry house. Use a ¾-inch pipe on large installations. Nozzles may screw into a ⅛-inch hole tapped into the pipe, or they may be put into tees.

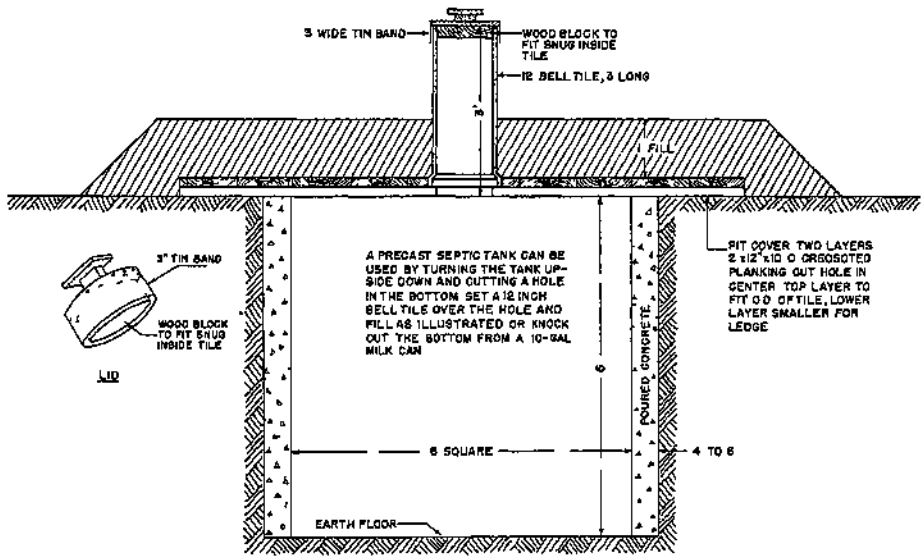
Locate the lines directly over the feeder trough to encourage greater feed intake. Water pressure of at least 25 psi should be maintained.

A strainer with a mesh of about 100 per square inch should always be installed in the supply line.

A thermostat (set at 90 degrees early summer and 95 degrees later in the season) in series with an adjustable interval timer operating an electric solenoid valve will give automatic control. The interval timer can be adjusted to suit the operator. No definite recommendation exists, but the most common practice is one minute on and five minutes off.

Disposal Pit

Birds that die or non-layers that must be killed are a menace to



Plan for a disposal pit.

the health of the flock. Cremating has not been satisfactory.

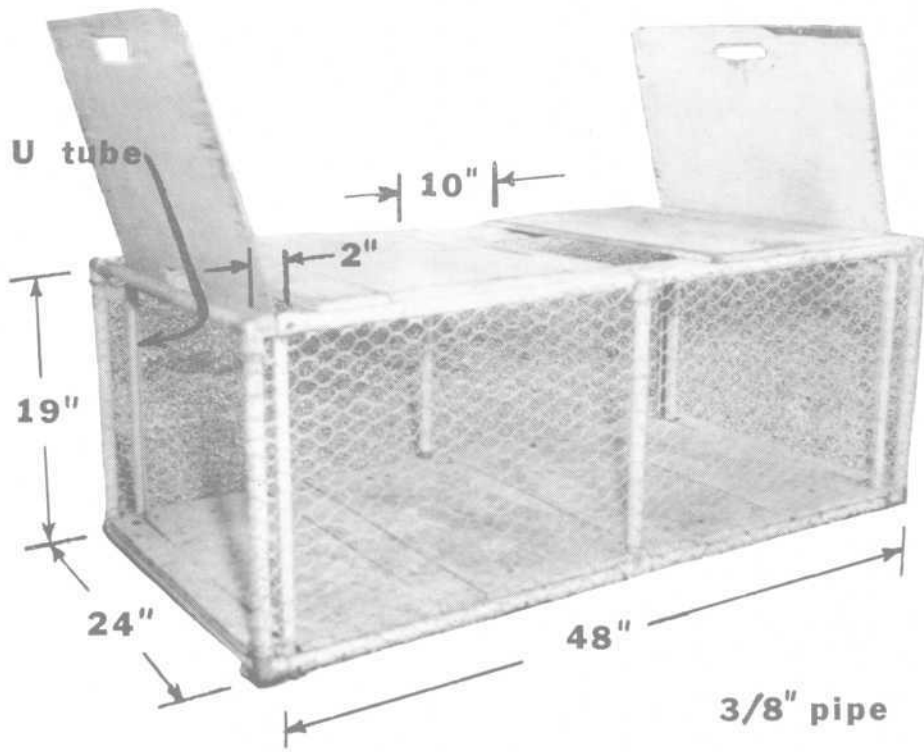
A disposal pit does away with the problem of holding dead birds. The pit should be located where drainage is good, but it should never be placed on sloping ground above a well or poultry yard. Depth is restricted by the highest water table expected.

A pit six feet square and six feet deep is large enough with normal mortality for 2,000 layers. The deeper the pit, the more rapid the decomposition. Dead birds decompose rapidly without the use of chemicals, and the pit will operate better when such chemicals are not used. Two pits are desirable. Size of pits may be reduced or increased to fit flock size.

There are no appreciable odors when the pit is tightly covered.

Catching Crate

Catching and marketing crates are necessary for careful handling of hens. Equipped with small feeders and water troughs, the same catching crate may double as a broody coop, or it may be used as a marketing crate. Hang it from the ceiling with short lengths



Crates may be made twice the size shown in this drawing. Floor of crate may be welded wire mesh, or hardware cloth.

of chain when using as a broody coop. A guard above the coop will keep other hens from roosting.

In transferring birds, a series of catching crates placed in line at the doorway, with all doors up except the last one, will eliminate a lot of handling. A small tractor power lift can be used to move the crates.

Structural Components

The only building requirements essential for the majority of Arizona poultry are shade, confinement, and dry litter.

If pole construction is used, be sure to use pressure treated posts and set them 3 to 4 feet in the ground.

Foundation

For foundation design, provide for 4 inches of litter and allow for at least 4 more inches of built-up litter.

Continuous foundation or piers may be used. Where frost is not a problem foundations need be only 8 to 10 inches below ground. Otherwise, the rule is to extend the foundation below the frost line.

The foundation, or pier, must have sufficient bearing area to support the building weight and to resist the lifting force of wind without shifting. A 6-inch top and 10-inch bottom is adequate for poultry structures in most soils. Piers should have a larger footing of 12 to 14 inches. Increase these dimensions by 25 percent in less stable soils.

To prevent cracking of the concrete and to insure against uneven settling, it is a good practice to place a reinforcing rod a few inches from the bottom of the foundation. The rod need not be heavy — ⅜-inch is satisfactory.

The use of bolts or steel straps to connect the posts or framing to the foundation is recommended.

Floors

Earth floors have the advantage of economy. If there is a leaky waterer, the water tends to pool in one area and though that spot is wet, the water does not generally spread.

On the other hand, a concrete floor is expensive and liquid spilled does not infiltrate. But it is easier to clean and can be more positively disinfected.

Where a high water table is present or border irrigation used, a concrete floor is highly desirable. In this case, a 6-inch gravel fill and a moisture barrier are recommended between a 4-inch concrete floor and the ground line.

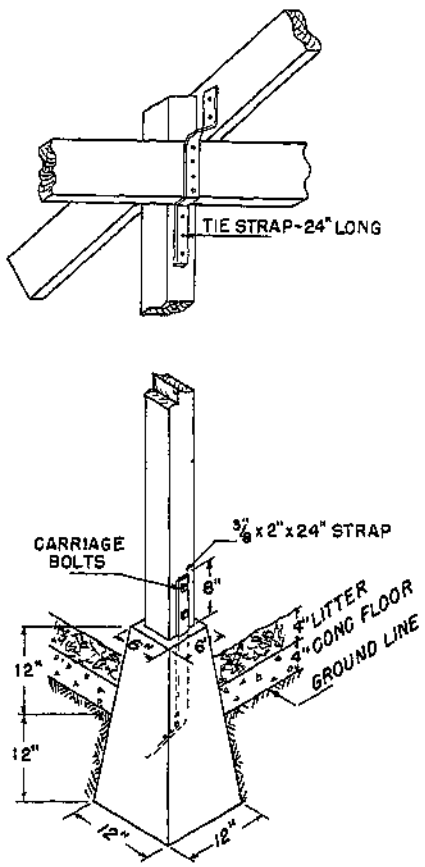
A 1:2:4 concrete mix is adequate. (See USDA Farmers Bulletin No. 1772, "Use of Concrete on the Farm.") Use an expansion joint the total length of the structure for every 10-foot width. An expansion joint should be used where the slab abuts the foundation and other permanent structure.

For drainage and washing off the concrete floor, a slope of one inch in 8 feet is desirable.

Framing

Most structure framing failures are caused by inadequate connections at the foundation and plate. Anchor bolts should be used through sills and steel straps to tie posts to the foundation. Special fasteners or 22-gauge steel strapping should be used to tie the roof to plate or post.

With truss frame construction, use casein glue and nail joints. Casein glue joints are more economical than bolt construction.



Foundation and plate connections.

Roofing Design

For maximum protection against summer temperatures, the ideal roofing material is a smooth white top surface and a rough black bottom surface. The white top surface reflects the radiant heat rays from the building. The black undersurface absorbs those radiant heat rays that bounce from the ground and other surfaces to the ceiling and thus stops most of these rays before they reach the chicken again.

In open structures, roof surface temperatures are not too important if a continous ridge ventilator is used, because the normal air movement through the building will not allow a large heat buildup under the roof. However, the closer the birds are to the ceiling, the more serious roof heat becomes.

With a closed structure, heat buildup under the roof becomes a serious ventilation problem, as well as a problem of condensation during cold nights. Building paper under the metal roof will help reduce condensation but will not eliminate the problem in the higher elevations.

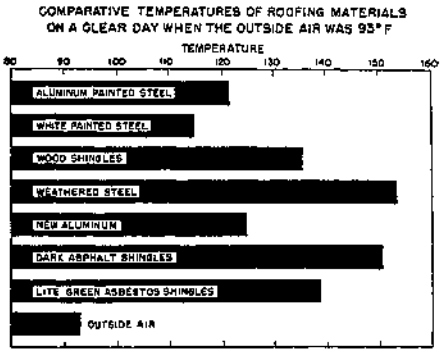
For Shade

A roof overhang of two feet is recommended to increased the effective shade pattern and keep out some of the driving rain.

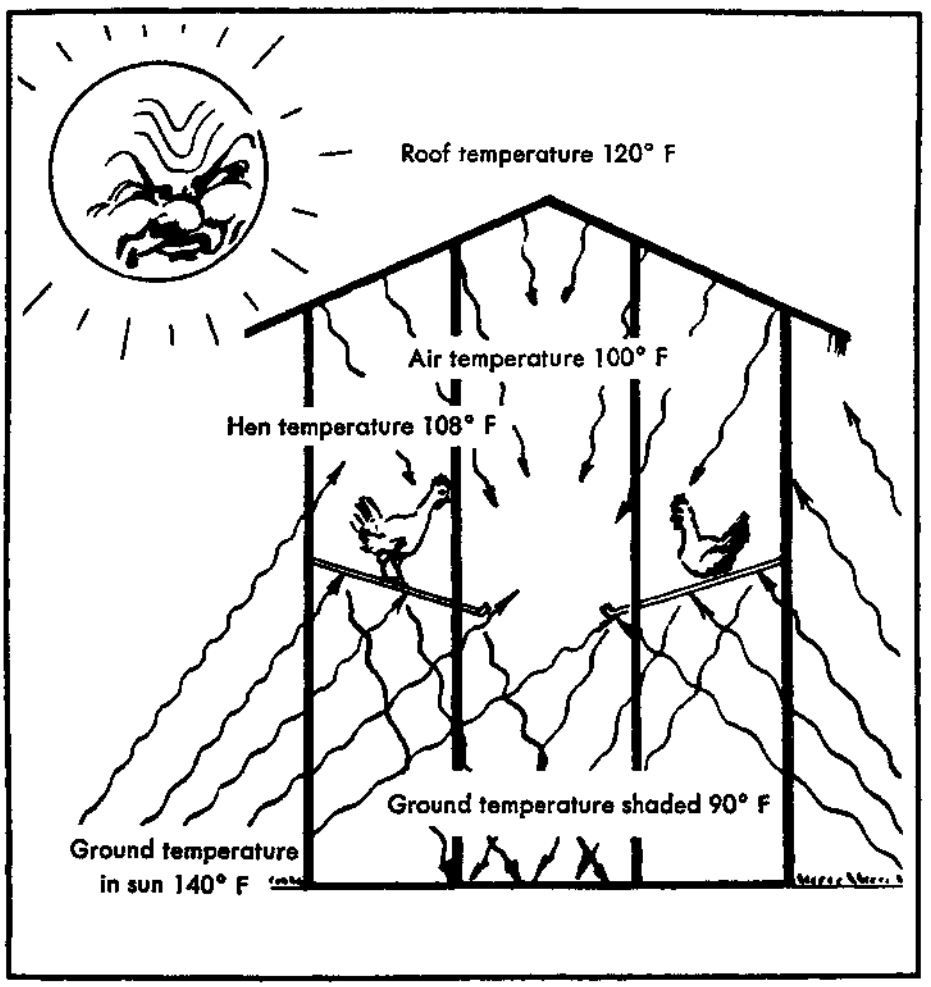
Snow and wind loads in Arizona are relatively low. It is common practice to use corrugated metals on most farm structures with roofing supports strong enough to support construction. A slope of 3 inches per foot of run is adequate for southern Arizona, and 4 inches per foot for northern Arizona. Combined wind and snow load de-

sign pressures for southern Arizona are 12 pounds per square foot. For northern Arizona they are 15 pounds per square foot.

Shed type roofs may be used on narrow structures but should not be used on buildings exceeding 20 feet in width unless exceptionally good wind protection is available. The shed roof acts like an airplane wing when gusts of wind come from the right direction. The difference in economy between a shed



(COURTESY A. C DALE, PURDUE UNIVERSITY)



(DRAWING COURTESY UNIVERSITY OF CALIFORNIA, DIVISION OF AGRICULTURAL SCIENCES)

roof and a gable roof on large structures is not enough to justify the gamble.

Sidewall Cover

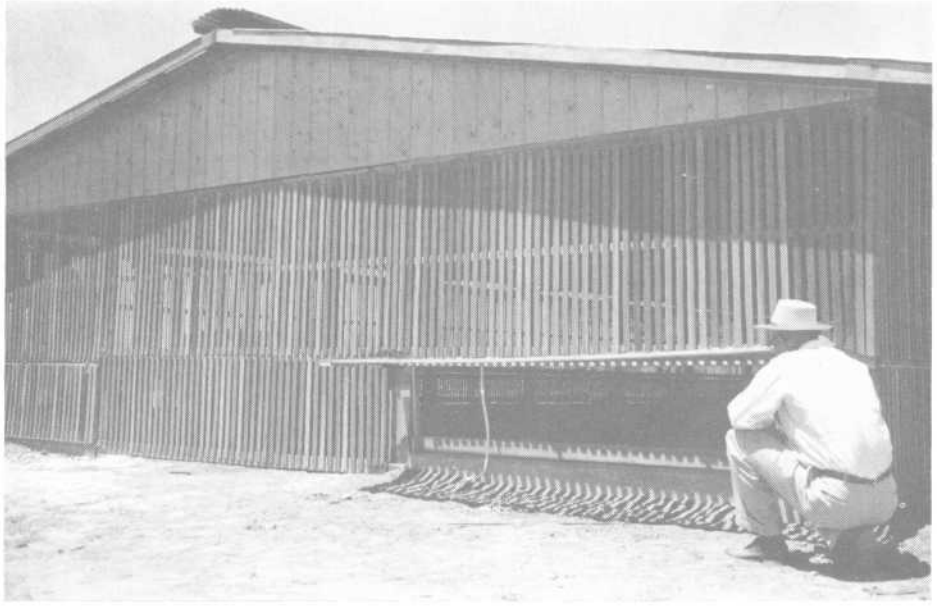
Covering for the ends and sides of the house depends on the section of the state. For the lower elevation, one inch poultry netting is adequate with a wind and sun breaking material used to protect against the afternoon sun on the west side.

Lathing materials are very desirable wall covering. Recommended spacing between strips is ¾ inch. Where mill end waste is available, slatting may be just as economical as chicken netting except for the additional labor of installation. No windows are necessary with semi-open construction.

For the higher elevations, walls may be of block or frame construction. A window space equivalent of 3 to 4% of the floor space should be provided. Mount windows so that they can serve as a regulator for ventilation.

In the winter months, the walls may be partially covered with muslin, burlap, craft papers, or plastics.

All exterior openings should be screened with not larger than one inch poultry netting to keep out all disease carrying wild birds.



Lathing materials are very desirable wall covering.

Plans Available

These plans are available from your County Agricultural Agent's office.

A 133	Desert Floor Laying House
A 133A	Jump-up Water System
A 133B	Individual Nests
A 133C	Nest Mounting for Gathering Eggs Outside
A 133D	Community Nest
A 133E	Fogger System Schematic
A 134	Six-Row Cage Laying House
A 135	Four-Pen Brooder House

Ask your County Agricultural Agent for copies of the following poultry publications of the University of Arizona Extension Service.

Prevent and Control Poultry Diseases and Parasites, Circular 112.

Cooling and Holding Eggs on the Ranch, Circular 191.

Culling Poultry for Profit, Circular 200.

Newcastle Disease, Folder 57.

The author gratefully acknowledges the counseling assistance of Dr. Myron Pasvogel, Head, Poultry Department, University of Arizona; W. R. Van Sant, U of A Extension Poultry Specialist; Burt Heywang, in Charge Southwest Poultry Experimental Station; Otis Lough and Matthew Lonsdale, Maricopa Assistant County Agricultural Agents for the U of A.

Contents

	Page
Laying House and Equipment	3
Work Load	4
Bird Characteristics	4
Climatic Data	5
Climatic Extremes	5
Method of Housing	5
Caged and Floor-Housed Poultry Data	5
Drainage	6
Orientation	6
Ventilation	6
Floor Space	7
Feeding Equipment	7
Watering Equipment	8
Nests	10
Roosts	12
Lighting	12
Wiring	12
Cooling	13
Disposal Pit	13
Catching Crate	14
Structural Components	15
Foundation	15
Floors	15
Framing	16
Roofing Design	16
Sidewall Cover	18
Plans Available	19
Design Recommendations for Commercial Poultry Farm	22
Design Recommendations for Laying House	22
Design Recommendations for Brooder	23
Design Recommendations for Rearing House	23
Design Recommendations for Egg Cooling and Handling Room	23

Design Recommendations for Commercial Poultry Farm

1. **Location** — Look for: good drainage, adequate water supply, good service road, electric power line service, telephone service, natural gas line, near egg market and feed supply, and near schools, church, and shopping center.

2. **Land Area** — A good "rule of thumb" is — one acre per thousand birds. Minimum area recommended is three acres for family poultry farm of three to five thousand birds; seven to eight acres for ten thousand bird flock. These recommendations include area for dwelling, brooding, rearing, laying, egg handling, cooling and storage, service and equipment storage.

3. **Distance Between Buildings**— Recommended brooding and rearing isolation from laying house is 100 feet; pathologists recommend 300 feet. Distance between laying houses, other buildings and property lines, at least 50 feet.

Design Recommendations for Laying House

(Light Breed Layers)

1. **Floor Space** — A minimum of 2½ to 3 square feet of floor space per bird, including roosting area.

2. **Feeder Space** — For mechanical feeders, a minimum of 30 linear feet of hopper space per 100 birds; 40 feet is most desirable. For hand feeding, 40 linear feet per 100 birds; 50 feet is most desirable. (A linear foot is one foot of feeding or watering space. For example, a 30-foot feeder open on both sides has 60 linear feet of feeder space.

All feeders should be within 15 feet of the water in the pens.

3. **Water Space** — a minimum of 12 linear feet of trough space per 100 birds.

4. **Nest Space** — A minimum of 16 to 20 individual nests per 100 birds. For community nesting, a 6-foot section of double-tier nests per 100 birds. Uniform distribution of laying hens in the nests is the major problem.

5. **Roost Space** — A minimum of 7 inches of roost space per bird. Approximately 60 linear feet per 100 birds. Minimum of 12 inches between roosts. Roosts should be placed level to prevent crowding.

6. **Lighting** — For light intensity, provide one 60 watt bulb for every 200 square feet of floor area with an interval time-switch to provide an average of 13 to 14 hour light period per day. For northern Arizona, provide window area of 3 to 4% of floor area.

7. **Bulk Feed Storage** — 2,200 pounds per thousand birds per week. For bin capacity, allow 60

cu. ft. per ton of poultry mash and 50 cu. ft. per ton of pellets or scratch. For gravity flow, use minimum wall slope of 50 degrees with minimum discharge cross section of 64 square inches (an 8-inch square opening).

8. **Cooling** — Use fogger system. One nozzle with a maximum rated capacity of 2 gallons per hour for each 100 birds. Component parts desirable are a line strainer, a thermostat, an interval timer, and an electric solenoid valve.

Design Recommendations for Brooder

1. **Floor Space**—One-half square foot per bird.

2. **Feeder Space** — 200 linear inches of trough space per 100 birds.

3. **Water Space** — 20 to 40 linear inches per 100 birds, or 2 one-gallon waterers.

4. **Roost Space** — 400 linear inches per 100 chicks after 4 to 5 weeks of age.

5. **Lighting** — One 25 watt bulb per 100 square feet. Uniform light distribution desirable.

6. **Brooder** — 7 to 10 square inches of floor space per chick underneath the hover.

Design Recommendations for Rearing House

Same structural and mechanical requirement as found in the laying house except that approximately ⅓ more feeder space may be required for 1½ sq. ft. per bird population, and the number of nests may be reduced to one-half.

1. **Floor Space** — 1½ square feet per bird.

2. **Feeder Space** — 200 linear inches for mechanical feeder and 300 linear inches for hand feeder per 100 birds.

3. **Water Space** — 80 linear inches per 100 birds.

4. **Roost Space** — 600 linear inches per 100 birds.

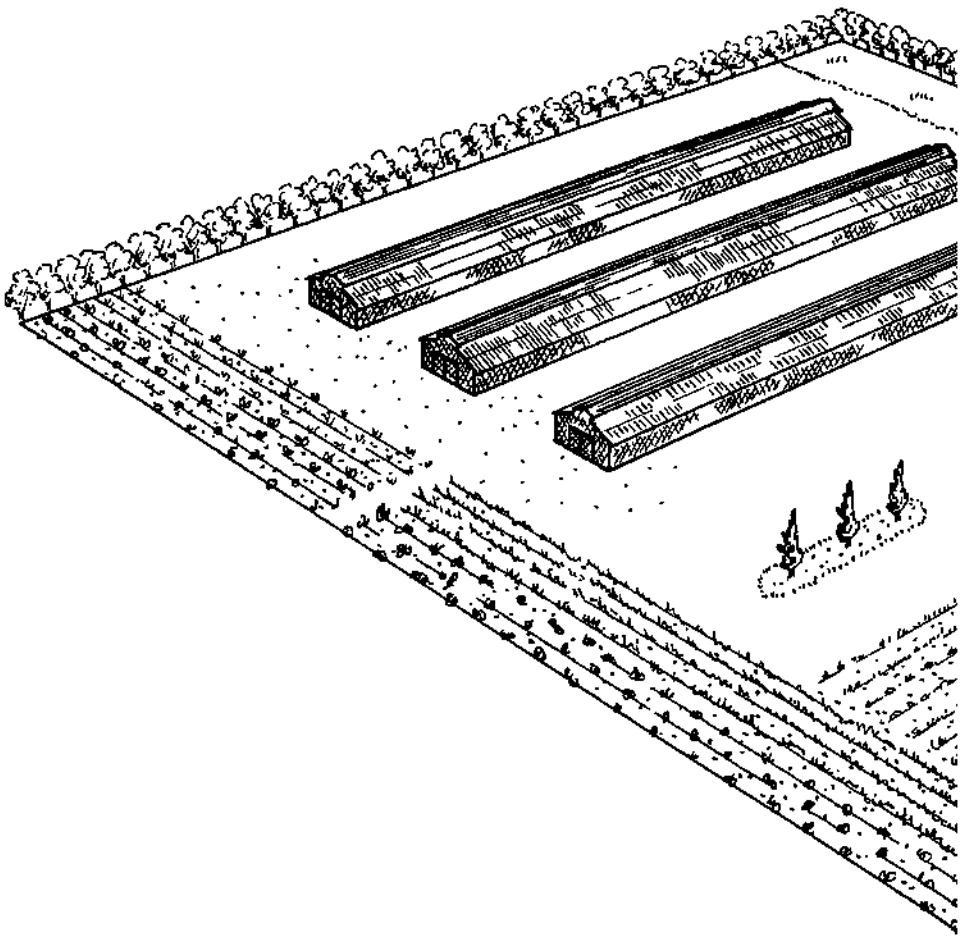
5. **Lighting** — Same as laying house.

Design Recommendations for Egg Cooling and Handling Room

1. For "Egg Cooling," see Extension Circular 191.

2. Floor area for grading, candling, cartoning and storage as follows:

Laying Hens (number)	Workroom Area (square ft.)
2000-5000	200-225
10,000	300-400



* This is a publication of the Agricultural Extension Service, University of Arizona. See your local County Agricultural Agent or County Home Agent for other farm and home information.