ASSESSORS' HANDBOOK
SECTION 534

# RURAL BUILDING COSTS

JANUARY 2015


CALIFORNIA STATE BOARD OF EQUALIZATION

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# FOREWORD

The 2015 revision of Assessors' Handbook Section 534 (AH 534), *Rural Building Costs*, updates costs contained in previous editions. These costs become effective as of January 1, 2015. The 2014 revision of AH 534 is available only on the BOE website. The entire text, photographs, and drawings of AH 534 are posted to the BOE website at www.boe.ca.gov/proptaxes/ah534.htm.

The costs in this 2015 revision are based on recently sampled market data, Producer Price Index data, and cost information from knowledgeable sources in the rural cost field. There has been some movement in the basic building costs, as indicated by the latest Producer Price Index. Many of the costs in that index have increased slightly over the last several years, and, therefore, most chapters have been updated for this revision.

Statutory and regulatory considerations, general instructions, and pertinent information concerning the use of this handbook are contained in the *Costing Information* chapter. Comments appropriate to an improvement type are found in some of the introductory pages of the respective chapters of the handbook devoted to a particular improvement type.

Diligent efforts have been made to supply accurate and reliable information. AH 534 should serve as a guide, but it is important for the appraiser to research and analyze permit costs and fees of jurisdictions in the region and to make appropriate adjustments where necessary, due primarily to the wide variance in these costs, both within and among the counties. An appraiser must research the market to determine which costs are most applicable for the appraisal assignment when considering the data provided in AH 534 along with local cost data.

This revision was prepared by County-Assessed Properties Division staff under the direction of the Property Tax Department.

/s/ Dean R. Kinnee

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# RURAL BUILDING COSTS

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# AH 534.00: COSTING INFORMATION

## STATUTORY AND REGULATORY BASIS

Assessors' Handbook Section 534 (AH 534) was designed and developed for use by the 58 California counties as an aid to assessors in fulfilling their statutory and regulatory requirement in the assessment of all taxable property in the county.[1]

The work in AH 534 is guided by Property Tax Rule 6[2] and Revenue and Taxation Code section 401.5. Rule 6 provides in part:

> (a) The reproduction or replacement cost approach to value is used in conjunction with other value approaches and is preferred when neither reliable sales data (including sales of fractional interests) nor reliable income data are available and when the income from the property is not so regulated as to make such cost irrelevant. It is particularly appropriate for construction work in progress and for other property that has experienced relatively little physical deterioration, is not misplaced, is neither over- nor underimproved, and is not affected by other forms of depreciation or obsolescence.
>
> (b) The reproduction cost of a reproducible property may be estimated either by (1) adjusting the property's original cost for price level changes and for abnormalities, if any, or (2) applying current prices to the property's labor and material components, ***with appropriate additions for entrepreneurial services***, interest on borrowed or owner-supplied funds, and other costs typically incurred in bringing the property to a finished state (or to a lesser state if unfinished on the lien date). Estimates made under (2) above may be made by using square-foot, cubic foot, or other unit costs; a summation of the in-place costs of all components; a quantity survey of all material, labor, and other cost elements; or a combination of these methods. [Emphasis added.]

Section 401.5 reads as follows:

> The board shall issue to assessors data relating to costs of property, or, with respect to commercial and industrial property, shall, after a public hearing, review and approve commercially available data, and shall issue to assessors other information as in the judgment of the board will promote uniformity in appraisal practices and in assessed values throughout the state**. *An assessor shall adapt data received pursuant to this section to local conditions and may consider that data together with other factors as required by law in the assessment of property for tax purposes.*** [Emphasis added.]

[1] Revenue and Taxation Code section 405.
[2] Title 18, Public Revenues, California Code of Regulations, section 6.

## BASIS OF COST

Costs to construct improvements such as barns, greenhouses, steel buildings, etc., in this handbook are based on the cost to build on a level and cleared site in California as of the date in the lower right-hand corner of each page. The costs are contingent on the following assumptions:

- A clear site
- Normal soil conditions
- Adequate site drainage
- No off-site improvement cost

The costs in this handbook include normal expenses incurred in placing the improvement or component in the hands of the ultimate consumer, including the following:

1. Excavation for foundations, piers, and other structural foundation components, considering a level site
2. Materials
3. Labor
4. Architectural fees
5. Engineering fees
6. Supervision
7. Permits for improvements, land use, environmental impact, etc.
8. Normal utility hook-ups, if any
9. Contractor's overhead and profit
10. Contingencies
11. Carrying charges during construction
    - Taxes
    - Interest
    - Insurance
12. Legal expenses

All data are in the form of in-place costs for improvements and additives that may differ between various structures.

***The costs in this handbook do not include entrepreneurial profit except where noted***. It is, therefore, necessary for the appraiser to add an appropriate market adjustment for entrepreneurial profit where appropriate for real property improvements.

# GLOSSARY OF TERMS

| Term | Definition |
|---|---|
| **A-Frame Cages** | Cages stacked in an "A" formation which house chickens for the purpose of egg production. |
| **Battery Cages** | Vertically stacked cages which house chickens for the purpose of egg production. |
| **Bent** | A framework that is perpendicular to the length of a building. |
| **Breeder** | A chicken that produces eggs for the purpose of producing day-old chicks. |
| **Breeder house** | A structure which houses breeder chickens. |
| **Broiler** | A chicken farmed for retail food products. |
| **Broiler house** | A structure which houses broiler chickens. |
| **Chime Joists** | Wooden support members that are placed under the bottom of a redwood storage tank. |
| **Cistern** | An artificial reservoir or tank, often underground, which stores rain water collected from a roof. |
| **Cordon** | Shoots or canes originating from the crown of a grapevine that are trained along wire on trellis systems. |
| **Crown** | Termination of grapevine trunk where cordons emerge. |
| **Cwt** | A unit of weight measurement which is equal to 100 pounds. |
| **Free-stall Barn** | A structure that contains individual stalls cows may enter, lie down, or leave without restriction. |
| **Gable roof** | A ridged roof that slopes up from only two walls. A gable is the triangular portion of the end of a building from the eaves to the ridge. |
| **Gas Brooder** | A small, gas-fueled circular heater used to keep young chickens warm. |

# GLOSSARY OF TERMS

**Gear Head** Housing enclosing gears used to provide positive power transmission to a pump.

**Girts** A secondary horizontal framing member located between studs or columns. They are designed to stiffen the framing system and often provide support for siding or sheathing.

**Grapevine Trunk** The main structural member that supports all upper growth of the grapevine that is supported by and is directly attached to the roots. The trunk develops from a single shoot that is selected from several that grow from the grape cutting in the first season of growth. This selected shoot is then trained up the stake to form the trunk.

**Hopper** An elevated bin with a cone-shaped bottom. A gate at the bottom, when opened, allows the stored material to be emptied due to the sloping sides of the cone.

**J-R Clip** A type of clip used on T-Posts to attach wires to trellis systems that are commonly used for vertical trellis systems.

**Layer House** A structure which houses chickens for the purpose of egg production.

**Loam** A rich soil composed of clay, sand, and organic matter. Generally any rich, dark soil.

**Mangers** A box or trough that holds animal feed.

**Mudsills** The lowest sill of a structure. As a foundation, timber placed directly on the ground or foundation.

**Nipple System** A system that uses mechanical nipples to provide fresh drinking water to chickens.

**Pencil Rod** Metal stake of approximately 3/8" used to train new grapevines.

**Pole Building** A structure whose main frame and foundation are treated posts or piles sunk into the ground with prefabricated trusses.

**Polycarbonate** A class of resins that are used to produce tough, transparent items such as roof material and siding of greenhouses.

# GLOSSARY OF TERMS

**Polyethylene** A type of plastic with a wide array of applications. One common use is to insulate greenhouses.

**Purlin** Horizontal structural members that support the common rafters in roofs.

**Quonset Building** A prefabricated metal building with a curved roof that extends to the ground forming the sides of the building. Common uses are for storage of agricultural equipment or products such as baled hay.

**Ripping** The term used in agriculture to indicate plowing or breaking up of soil. The result is a reduction in compacted soil.

**Sash** The frame in which window lights are set.

**Silage** A type of foodstuff for livestock prepared from green crops (for example, grass). The crops are stored in a pit or silo. The bacteria on the plants carry out fermentation resulting in the preservation of the plant material from further decay and loss of nutritional value.

**Solid Set Irrigation** Irrigation system where the pipe may be left in place during the irrigation season.

**Spurs** Pruned section (usually to two buds) of growth that originates from cordons that are last season's growth that will produce the following season's fruit and growth. Some spurs (non-fruiting) are also maintained to replace the cordons.

**T-1-11** A registered trademark name for a common plywood siding. The 4' by 8' sheets have a distinctive rough texture on the exterior side with vertical grooves spaced regularly across the face.

**Vertical Line Post** Used in vertical shoot positioning trellis systems. The built-in wire slots make it a good choice for mechanized harvesting.

**Unloading Auger** A screw-like device that rotates, resulting in the horizontal movement of stored material out of a storage bin.

**Wind Machines** Powered fans used to provide frost protection for crops. They are used when temperatures approach freezing and sufficient temperature inversion in the frost area makes warmer air available to either mix with or displace colder lower lying air.

# AH 534.10: BASIC FARM BUILDINGS

Basic farm buildings and outbuildings vary depending on use and type of farm operation. This chapter covers many of the structures that may be used in agricultural farming and also contains specifications and costs of various buildings which include the following:

- Prefabricated horse barns/riding arenas
- Steel frame riding arena
- General purpose barns
- Hay storage barns
- Feed barns
- Pole buildings
- Shops
- Machinery and equipment sheds
- Prefabricated wood storage sheds
- Small sheds

Photographs showing examples of the buildings discussed are located at the end of this chapter.

# BASIC FARM BUILDINGS

## PREFABRICATED HORSE BARNS

Prefabricated barns have many benefits that make them desirable for horse accommodation. They are very strong and easier to build because they have fewer pieces to assemble than wood structures. They are more cost-effective than their wood counterparts, in part because they have most of the detail work already completed. The material used in prefabricated horse barns is generally not subject to problems such as warping, twisting, cracking, rotting, or deterioration. Prefabricated horse barns are also more resistant to damage from vermin and termites and are non-flammable, making them very safe. Property and fire insurance costs tend to be lower for prefabricated barns than for wood structures.

**SPECIFICATIONS**

| | |
|---|---|
| Structure | 6" steel purlins on 6' centers; enamel exterior |
| Foundation | Concrete piers |
| Floor | Dirt |
| Door | Sliding stall (inside track) |
| Roof | 2" x 12" pitch; skylight in each stall |
| Roofing | White 26 gauge steel hi-rib |
| Walls | Laminated wall panels; grilled fronts; top 4'; 5" colored gutter trim |

**IN-LINE SHED ROW BARN**

| Stall Size | First Stall | Each Additional Stall |
|---|---|---|
| 12' x 12' | $4,120 | $3,700 |
| 12' x 16' | 4,740 | 4,120 |

Shed roof overhang per square foot: 8' — **$5.15**
12' — **$5.75**

***(Photographs shown on AH 534.10, pages 14 and 15)***

# BASIC FARM BUILDINGS

## PREFABRICATED HORSE BARNS

### GABLE ROOF BARN—STANDARD BREEZEWAY

| Stall Size | First Two Stalls | Each Additional Two |
|---|---|---|
| 12' x 12' with 12' breezeway | $10,800 | $9,100 |
| 12' x 12' with 16' breezeway | 11,200 | 9,150 |
| 12' x 16' with 12' breezeway | 11,950 | 10,400 |
| 12' x 16' with 16' breezeway | 12,350 | 11,000 |

### GABLE ROOF BARN—RAISED BREEZEWAY

| Stall Size | First Two Stalls | Each Additional Two |
|---|---|---|
| 12' x 12' with 12' breezeway | $11,350 | $9,800 |
| 12' x 12' with 16' breezeway | 12,150 | 10,500 |
| 12' x 16' with 12' breezeway | 12,950 | 11,550 |
| 12' x 16' with 16' breezeway | 13,100 | 12,350 |

Roof extension per square foot—**$6.00**
12-foot breezeway doors—**$800** each
16-foot breezeway doors—**$920** each

***(Photographs shown on AH 534.10, pages 14-15)***

### ADDITIVES

| Item | Cost |
|---|---|
| Concrete floor | $4.80 - $5.20 per square foot |
| Full footing | $13.50 per linear foot |
| Portable 5' x 12' – 4 rail corral panels | $8.25 - $11.35 per linear foot |
| Portable 5' x 12' – 5 rail corral panels | $9.25 - $12.35 per linear foot |
| Portable 6' rail corral panels with metal roof | $5.75 - $6.90 per square foot |

## STEEL FRAME RIDING ARENA

| | |
|---|---|
| Frame | Good quality steel frame, 14' to 16' eave height |
| Roof | Gable roof with 26-gauge panels |
| Walls | None |
| Floor | Sand |
| Plumbing | Minimum water outlets |
| Electrical | None—or add **$.62** to **$1.03** per square foot |
| Cost | **$10.30** to **$11.60** per square foot |
| Add for vinyl fencing | **$8.25** to **$12.35** per linear foot |

***(Photographs shown on AH 534.10, page 16)***

# BASIC FARM BUILDINGS

## GENERAL PURPOSE BARNS

General purpose barns are usually the center of a farming operation. They can be used to house animals, provide refuge for animals in poor weather, store food and equipment, or provide indoor working areas. Areas within a barn can be constructed with stalls, grooming areas, tack rooms, or storage rooms for supplies. Other possible uses include areas for birthing, sheering, milking, or equipment maintenance.

### BUILDING SPECIFICATIONS

| Components | Fair Quality | Class 2<br>Average Quality | Class 3<br>Good Quality |
|---|---|---|---|
| Foundation | Redwood or cedar mudsills | Concrete or masonry piers | Continuous concrete |
| Floor | Dirt | Dirt/some concrete | Concrete |
| Wall Structure | Light wood frame, 10' eave height | Average wood frame, 10' eave height | Good wood frame, 10' eave height |
| Roof Construction | Medium to high pitch—2" x 4" rafters, 24" to 36" on center, or light wood trusses | Medium to high pitch—average wood trusses | Medium to high pitch—good wood trusses |
| Roof Cover | Light aluminum | Standard gauge corrugated iron or aluminum | 26-gauge steel |
| Electrical | None | Two outlets per 1,000 square feet | Four outlets per 1,000 square feet |
| Plumbing | None | One cold water outlet | Two cold water outlets |

***(Photographs shown on AH 534.10, pages 17, 18, and 19)***

### SQUARE-FOOT COSTS

| | Square-Foot Area | | | | | |
|---|---|---|---|---|---|---|
| **Class** | **1,000** | **3,000** | **5,000** | **7,000** | **9,000** | **11,000** |
| **1** | 16.50 | 12.75 | 11.80 | 11.35 | 10.90 | 10.70 |
| **2** | 21.95 | 17.85 | 16.65 | 16.00 | 15.65 | 15.10 |
| **3** | 33.15 | 27.20 | 25.10 | 24.20 | 23.70 | 23.70 |

# BASIC FARM BUILDINGS

## HAY STORAGE BARNS

Outbuildings for most farms with animals typically include a hay barn. It is important to have a separate building for hay because hay may spontaneously combust endangering livestock. A separate grain room or supplemental feeding area is also important within the hay barn.

**BUILDING SPECIFICATIONS**

| Components | Class 1<br>Fair Quality | Class 2<br>Average Quality | Class 3<br>Good Quality |
|---|---|---|---|
| Foundation | Redwood or cedar mudsills | Concrete or masonry piers | Continuous concrete |
| Floor | Dirt | Dirt | Concrete |
| Wall Structure | Light wood frame, 20' eave height | Average wood frame, 20' eave height | Good wood frame, 20' eave height |
| Exterior Wall Cover | Light aluminum or low cost boards | Standard gauge corrugated iron or aluminum | Good wood siding, painted or 26-gauge steel |
| Roof Construction | Medium to high pitch—2" x 4" rafters, 24" to 36" on center, or light wood trusses | Medium to high pitch—average wood trusses | Medium to high pitch—good wood trusses |
| Roof Cover | Light aluminum | Standard gauge corrugated iron or aluminum | 26-gauge steel |
| Electrical | None | Two outlets per 1,000 square feet | Four outlets per 1,000 square feet |
| Plumbing | None | One cold water outlet | Two cold water outlets |
| Shape | Nearly square, length between one and two times width | Nearly square, length between one and two times width | Nearly square, length between one and two times width |

***(Photographs shown on AH 534.10, page 20)***

**SQUARE-FOOT COSTS**

| | Square-Foot Area | | | | | |
|---|---|---|---|---|---|---|
| **Class** | **1,000** | **3,000** | **5,000** | **7,000** | **9,000** | **11,000** |
| **1** | 12.80 | 10.75 | 9.80 | 9.00 | 8.70 | 8.25 |
| **2** | 14.85 | 12.20 | 11.10 | 10.40 | 9.90 | 9.55 |
| **3** | 24.20 | 20.10 | 18.55 | 17.00 | 16.20 | 15.55 |

**Adjustments:** Pole Buildings – Deduct 10 percent from above costs
No Electricity/No Water – Deduct **$.75** to **$1.00** per square foot

# BASIC FARM BUILDINGS

## FEED BARNS

Feed barns are designed for livestock shelter and feeding. They are typically open on all sides but may be enclosed on the ends. A center aisle is used to transport feed to the feeders which are usually located on both sides of the center aisle. The barns can be built using either wood posts or steel frames with a pitched roof of steel or aluminum.

### BUILDING SPECIFICATIONS

| Components | Class 1<br>Fair Quality | Class 2<br>Average Quality | Class 3<br>Good Quality |
|---|---|---|---|
| Foundation | Redwood or cedar mudsills | Concrete or masonry piers | Continuous concrete |
| Floor | Dirt | Concrete in center section | Concrete |
| Wall Structure | Light wood frame, 8' eave height at drip line | Average wood frame, 8' eave height at drip line | Good wood frame, 8' eave height at drip line |
| Exterior Wall Cover | Open sides and ends | Open sides, standard gauge corrugated iron, aluminum, or average wood siding on ends | Open sides, good siding painted on ends |
| Roof Construction | Medium to high pitch— light wood trusses | Medium to low pitch—average wood trusses | Medium to low pitch—good wood trusses |
| Roof Cover | Light aluminum | Standard gauge corrugated iron or aluminum | 26-gauge steel |
| Electrical | None | Two outlets per 1,000 square feet | Four outlets per 1,000 square feet |
| Plumbing | None | One cold water outlet | Two cold water outlets |

***(Photographs shown on AH 534.10, page 21)***

### SQUARE-FOOT COSTS

| | Square-Foot Area | | | | | |
|---|---|---|---|---|---|---|
| **Class** | **1,000** | **3,000** | **5,000** | **7,000** | **9,000** | **11,000** |
| 1 | 8.65 | 7.80 | 7.40 | 7.25 | 7.20 | 7.05 |
| 2 | 13.70 | 12.55 | 12.15 | 11.95 | 11.85 | 11.75 |
| 3 | 16.50 | 14.85 | 14.85 | 14.50 | 14.35 | 14.30 |

# BASIC FARM BUILDINGS

## POLE BUILDINGS

A pole building is basically a series of upright poles supporting a roof. These buildings are generally rectangular with a gabled roof. The poles make up the outside perimeter of the barn, and often have no outside walls. Storage of goods like hay or livestock is the main purpose of these structures. The major advantages of pole barns over other agricultural storage building options are their low cost and easy accessibility for storage.

**BUILDING SPECIFICATIONS**

| | |
|---|---|
| Structure | Poles: 15' to 20' on center; wood or steel |
| Floor | Dirt |
| Roof | Light trusses; low to medium pitch; wood or steel |
| Roofing | Galvanized steel or colored steel with gutter |
| Walls | None, wall height: 18' - 21' to plate |

***(Photographs shown on AH 534.10, page 22)***

**SQUARE-FOOT COSTS** **ALL SIDES OPEN** **GOOD QUALITY**

| | Side Length | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **End Width** | **30** | **50** | **80** | **100** | **120** | **140** | **150** | **160** | **180** | **200** |
| **20** | 7.85 | 7.65 | 7.50 | 7.35 | 7.25 | 7.10 | 7.05 | 6.95 | 6.90 | 6.85 |
| **30** | 7.50 | 7.35 | 7.20 | 7.05 | 6.90 | 6.85 | 6.80 | 6.70 | 6.65 | 6.60 |
| **40** | 7.21 | 7.10 | 6.90 | 6.80 | 6.75 | 6.55 | 6.50 | 6.45 | 6.40 | 6.35 |
| **50** | 6.90 | 6.80 | 6.65 | 6.55 | 6.50 | 6.30 | 6.25 | 6.20 | 6.10 | 6.05 |
| **60** | 6.65 | 6.55 | 6.40 | 6.30 | 6.25 | 6.05 | 5.95 | 5.90 | 5.85 | 5.80 |
| **70** | 6.40 | 6.30 | 6.15 | 6.00 | 5.95 | 5.75 | 5.70 | 5.65 | 5.60 | 5.55 |
| **80** | 6.15 | 6.05 | 5.90 | 5.75 | 5.70 | 5.55 | 5.50 | 5.45 | 5.40 | 5.35 |

Deduct 15 percent for light duty, fair quality construction.

| | |
|---|---|
| Skylights (3' x 10') | **$84 - $105** each |
| Vents (14", Rotary) | **$205** each |
| Poles, In-Place | **$173 to $237** each |
| Covered wall area add | **$3.95** per square foot of wall surface |
| Reinforced Concrete Floors: | |
| 4" | **$5.15** per square foot |
| 6" | **$5.75** per square foot |

# BASIC FARM BUILDINGS

## SHOPS

Shops provide a center for repair and maintenance of machines and equipment. They are a place for orderly tool storage, supply and spare part storage, and shelter when work cannot be done outside. Workshops are usually present on most farms. Size and design should complement the type of farm and the work to be done.

**BUILDING SPECIFICATIONS**

| Components | Class 1<br>Fair Quality | Class 2<br>Average Quality | Class 3<br>Good Quality |
|---|---|---|---|
| Foundation | Light concrete | Light concrete | Standard concrete |
| Floor | 3" concrete | 4" concrete | 4" reinforced concrete |
| Wall Structure | Light wood frame, 15' eave height | Average wood frame, 15' eave height | Good wood frame, insulated, 15' eave height |
| Exterior Wall Cover | Light aluminum or low cost boards | Standard gauge corrugated iron, aluminum, or average wood siding | Good wood siding painted or 26-guage steel |
| Roof Construction | Low to medium pitch— 2" x 4" rafters, 24" to 36" on center, or light wood trusses | Low to medium pitch— average wood trusses | Medium pitch— good wood trusses, insulated roof |
| Roof Cover | Light aluminum corrugated | Standard gauge corrugated iron or aluminum | 26-gauge steel, with skylights |
| Electrical | Two outlets per 1,000 square feet | Two outlets per 1,000 square feet | Excellent lighting and ample outlets |
| Plumbing | None | One cold water outlet | Two cold water outlets |
| Doors | One light sliding or swinging door per 2,000 square feet | One average sliding or swinging door per 2,000 square feet | One drive-thru door per 1,000 square feet plus one walk-thru door |
| Windows | None | None or few low cost | 5 percent of floor area |
| Shape | Nearly square, length between one to three times width | Nearly square, length between one to three times width | Nearly square, length between one to three times width |

***(Photographs shown on AH 534.10, page 23)***

# BASIC FARM BUILDINGS

## SHOPS

### SQUARE-FOOT COSTS

| | Square-Foot Area | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Class** | **1,000** | **1,500** | **2,000** | **2,500** | **3,000** | **4,000** | **5,000** | **6,000** | **8,000** | **10,000** |
| **1** | 19.15 | 17.50 | 16.45 | 15.60 | 14.90 | 14.60 | 14.10 | 13.40 | 13.35 | 13.00 |
| **2** | 23.90 | 21.85 | 20.60 | 19.90 | 19.15 | 18.30 | 17.50 | 17.20 | 16.80 | 16.40 |
| **3** | 27.65 | 27.00 | 26.15 | 25.00 | 23.95 | 23.25 | 22.50 | 21.70 | 21.00 | 20.20 |

# BASIC FARM BUILDINGS

## MACHINERY AND EQUIPMENT SHEDS

It is important to have a building to store machinery, tools, and farm vehicles such as tractors and their attachments for protection from the elements. Smaller pieces of equipment also need a place to be stored during poor weather. In some instances, these buildings are enclosed to prevent theft and vandalism, but most are open to provide easy access.

**BUILDING SPECIFICATIONS**

| Components | Class 1<br>Fair Quality | Class 2<br>Average Quality | Class 3<br>Good Quality |
|---|---|---|---|
| Foundation | Redwood or cedar mudsills | Concrete or masonry piers | Continuous concrete |
| Floor | Dirt | Concrete | Concrete |
| Wall Structure | Light wood frame, 10' to 12' eave height | Average wood frame, 10' to 12' eave height | Good wood frame, 10' to 12' eave height |
| Exterior Wall Cover | Light aluminum or low cost boards | Standard gauge corrugated iron or aluminum | Good wood siding, painted or 26-gauge steel |
| Roof Construction | Low to medium pitch—shed type, light wood framing | Low to medium pitch—gable or shed type, average wood framing | Low to medium pitch—gable or shed type, good wood framing |
| Roof Cover | Light aluminum | Standard gauge corrugated iron or aluminum | 26-gauge steel, with skylights |
| Electrical | None | Two outlets per 1,000 square feet | Four outlets per 1,000 square feet |
| Shape | Usually elongated, width between 20 and 40 feet, any length | Usually elongated, width between 20 and 40 feet, any length | Usually elongated, width between 20 and 40 feet, any length |

***(Photographs shown on AH 534.10, page 24)***

# BASIC FARM BUILDINGS

## MACHINERY AND EQUIPMENT SHEDS

### SQUARE-FOOT COSTS—TYPE I, ALL SIDES CLOSED

| | Square-Foot Area | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Class** | **500** | **1,000** | **1,500** | **2,000** | **2,500** | **3,000** | **3,500** | **4,000** | **4,500** | **5,000** | **6,000** |
| **1** | 11.55 | 10.40 | 9.70 | 9.35 | 9.20 | 9.05 | 9.00 | 8.95 | 8.85 | 8.75 | 8.60 |
| **2** | 17.05 | 14.90 | 14.05 | 13.80 | 13.50 | 13.40 | 13.25 | 13.05 | 12.95 | 12.85 | 12.50 |
| **3** | 22.05 | 19.90 | 18.50 | 18.20 | 17.75 | 17.65 | 17.45 | 17.30 | 17.20 | 17.10 | 16.80 |

### SQUARE-FOOT COSTS—TYPE II, ONE SIDE OPEN

| | Square-Foot Area | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Class** | **500** | **1,000** | **1,500** | **2,000** | **2,500** | **3,000** | **3,500** | **4,000** | **4,500** | **5,000** | **6,000** |
| **1** | 10.20 | 8.55 | 8.05 | 7.80 | 7.65 | 7.50 | 7.40 | 7.35 | 7.30 | 7.25 | 7.20 |
| **2** | 15.60 | 13.40 | 12.35 | 11.95 | 11.60 | 11.50 | 11.40 | 11.35 | 11.20 | 11.05 | 11.00 |
| **3** | 20.35 | 19.05 | 18.40 | 17.65 | 17.15 | 16.90 | 16.75 | 16.60 | 16.55 | 16.40 | 16.35 |

Pole Buildings – Deduct 15 to 20 percent from above costs.

# BASIC FARM BUILDINGS

## PREFABRICATED WOOD STORAGE SHEDS

Prefabricated wood storage sheds are normally purchased at lumber yards and home improvement centers. They are commonly used to house small machinery and equipment.

**BUILDING SPECIFICATIONS**

| | |
|---|---|
| Foundation | 4" x 4" pressure treated skids |
| Floor | Plywood or particleboard on 2" x 6" floor joists |
| Walls Structure | 2" x 4" framing on 24" centers, 7' to 8' eave height |
| Exterior Wall Cover | Plywood or T-1-11 with one 4' x 6' door |
| Roof | Gable low to medium pitch, 2" x 4" rafters |
| Roof Cover | Metal or composition shingles |

***(Photographs shown on AH 534.10, page 25)***

**SQUARE-FOOT COSTS**

| Square Feet | Price Per Square Foot |
|---|---|
| 50 to 74 | $28.35 |
| 75 to 99 | $24.80 |
| 100 to 139 | $22.60 |
| 140 to 199 | $21.35 |
| 200 and up | $18.50 - $20.80 |

**ADDITIVES**

| | | |
|---|---|---|
| Windows | 2' x 2' | **$140 each** |
| | 3' x 2' | **$170 each** |
| Doors—Double 6' Wide | | **$155** |
| Skylight—2' x 2' | | **$170** |
| Turbine Vent | | **$90** |
| Shelves—16" wide | | **$4.40** per linear foot |
| Shelves—24" wide | | **$5.40** per linear foot |
| Workbench—24" wide | | **$6.45** per linear foot |
| Steel roll-up door | | **$77** per foot (width) |
| Loft | | **$3.10** per square foot |
| Extra Concrete | | **$5.65 - $6.80** per square foot |

# BASIC FARM BUILDINGS

## SMALL SHEDS

### BUILDING SPECIFICATIONS

| Components | Class 1<br>Fair Quality | Class 2<br>Average Quality | Class 3<br>Good Quality |
|---|---|---|---|
| Foundation | Redwood or cedar mudsills | Concrete or masonry piers | Continuous concrete |
| Floor | Dirt | Boards | Concrete |
| Wall Structure | Light wood frame, 8' eave height | Average wood frame, 8' eave height | Good wood frame, 8' eave height |
| Exterior Wall Cover | Light aluminum or low cost boards | Standard gauge corrugated iron or aluminum, or average framing | Good wood siding, painted, or steel |
| Roof Construction | Low to medium pitch—shed type, light wood framing | Low to medium pitch—gable or shed type, average wood framing | Low to medium pitch—gable or shed type, good wood framing |
| Roof Cover | Light aluminum | Standard gauge corrugated iron or aluminum | Good steel cover; composition shingles |
| Electrical | None | None | None |
| Shape | Usually elongated, width between 6 and 12 feet, any length | Usually elongated, width between 6 and 12 feet, any length | Usually elongated, width between 6 and 12 feet, any length |

### SQUARE-FOOT COSTS—TYPE I, ALL SIDES CLOSED

| | Square-Foot Area | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Class** | **50** | **60** | **80** | **100** | **120** | **150** | **200** | **250** | **300** | **400** | **500** |
| 1 | 20.00 | 18.15 | 16.15 | 13.80 | 13.30 | 12.35 | 11.95 | 11.50 | 10.85 | 10.50 | 10.05 |
| 2 | 28.10 | 25.35 | 22.90 | 21.10 | 20.10 | 19.05 | 18.25 | 17.20 | 16.15 | 15.70 | 15.35 |
| 3 | 34.55 | 31.05 | 29.60 | 27.70 | 25.75 | 23.70 | 22.40 | 21.55 | 20.50 | 20.10 | 19.60 |

### SQUARE-FOOT COSTS—TYPE II, ONE SIDE OPEN

| | Square-Foot Area | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Class** | **50** | **60** | **80** | **100** | **120** | **150** | **200** | **250** | **300** | **400** | **500** |
| 1 | 14.00 | 12.65 | 11.35 | 9.70 | 9.30 | 8.65 | 8.35 | 8.05 | 7.60 | 7.35 | 7.00 |
| 2 | 19.75 | 17.70 | 16.00 | 14.75 | 14.00 | 13.40 | 12.75 | 12.05 | 11.35 | 11.00 | 10.70 |
| 3 | 24.20 | 21.75 | 20.70 | 19.35 | 18.05 | 16.65 | 15.65 | 15.05 | 14.30 | 14.00 | 13.70 |

# BASIC FARM BUILDINGS

## PREFABRICATED HORSE BARNS

**SHED ROW WITH 8 FOOT ROOF EXTENSION**

**GABLE ROOF WITH RAISED BREEZEWAY**

# BASIC FARM BUILDINGS

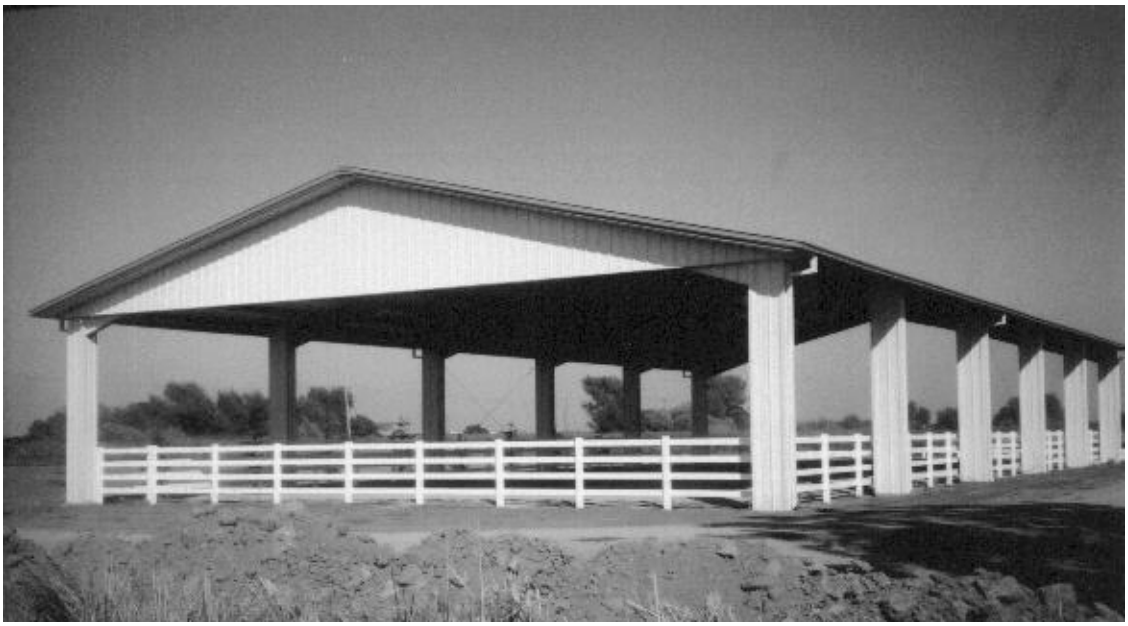
## PREFABRICATED HORSE BARNS

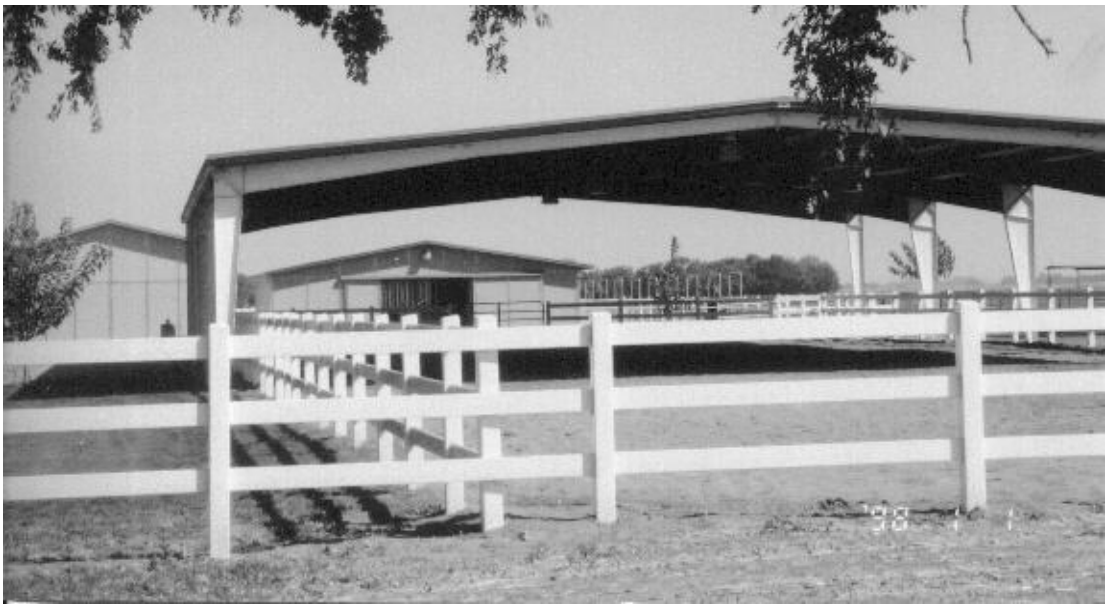
**GABLE ROOF—RAISED BREEZEWAY WITH ROOF EXTENSION**

**12' X 12' STALL**

# BASIC FARM BUILDINGS

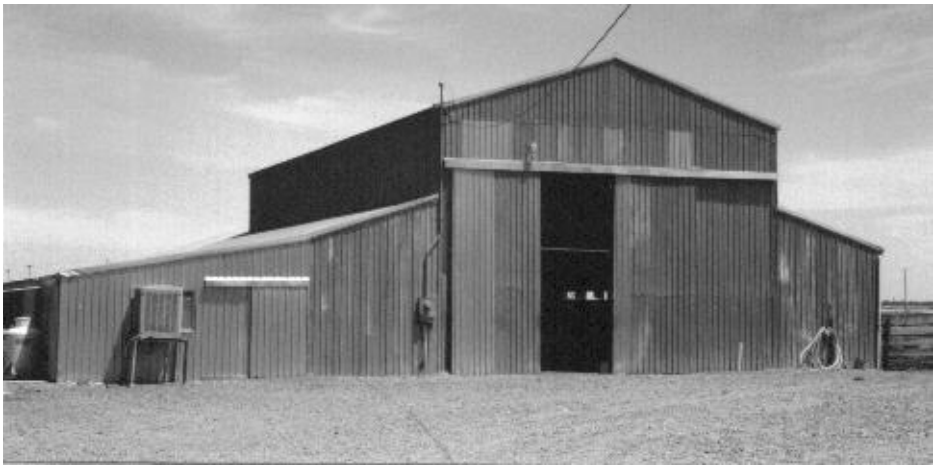
## STEEL FRAME RIDING ARENA





# BASIC FARM BUILDINGS

## GENERAL PURPOSE BARNS

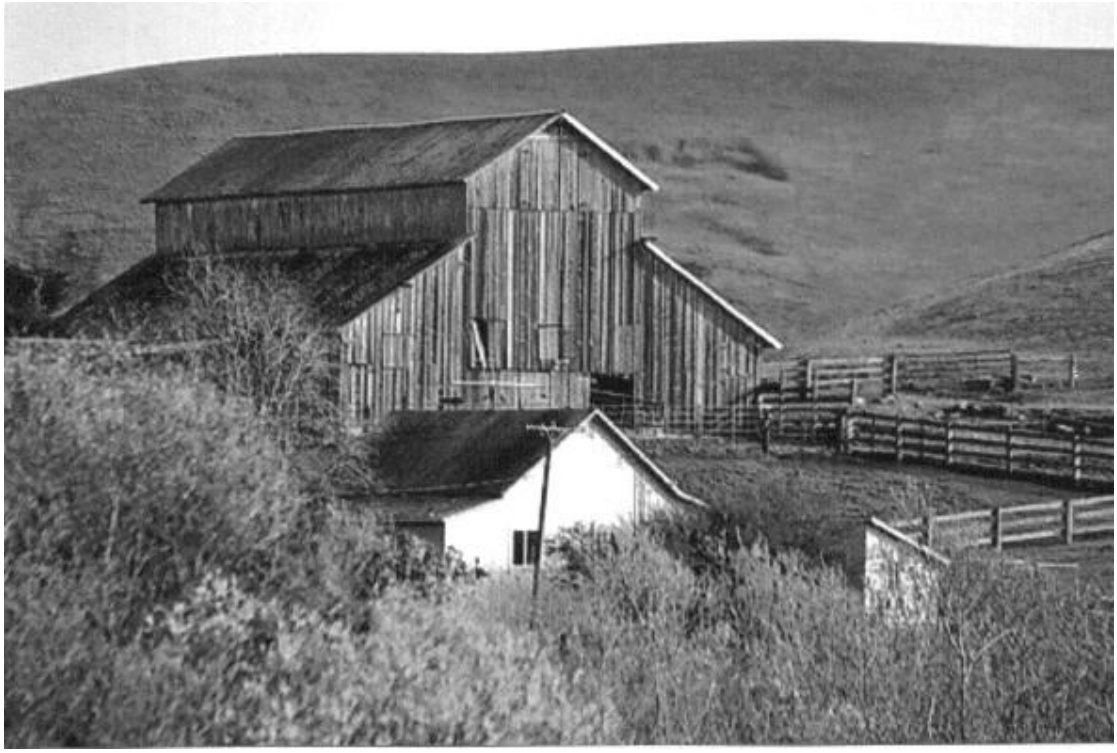


# BASIC FARM BUILDINGS

## GENERAL PURPOSE BARNS

# BASIC FARM BUILDINGS

## GENERAL PURPOSE BARNS

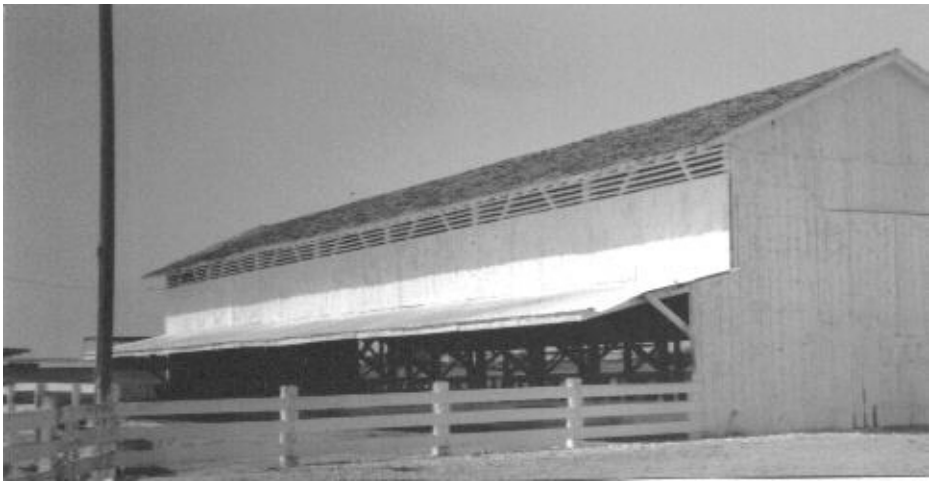


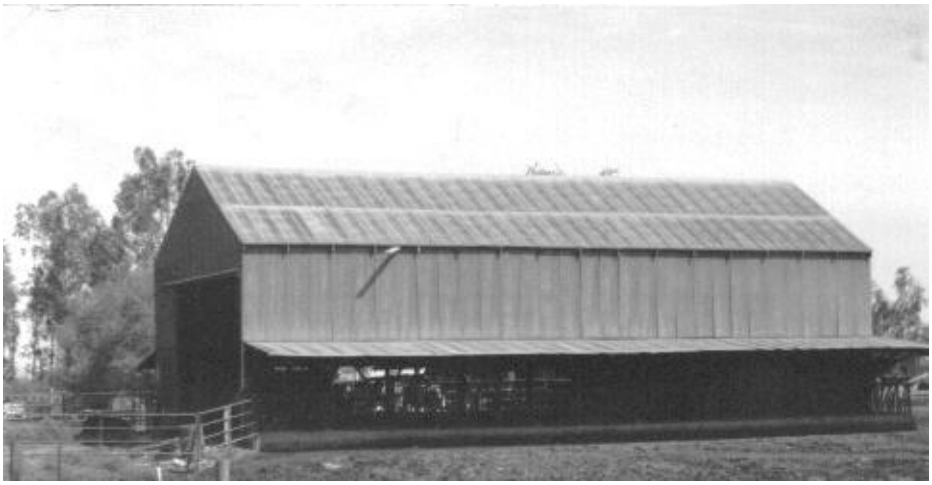
# BASIC FARM BUILDINGS

## HAY STORAGE BARNS

# BASIC FARM BUILDINGS

## FEED BARNS



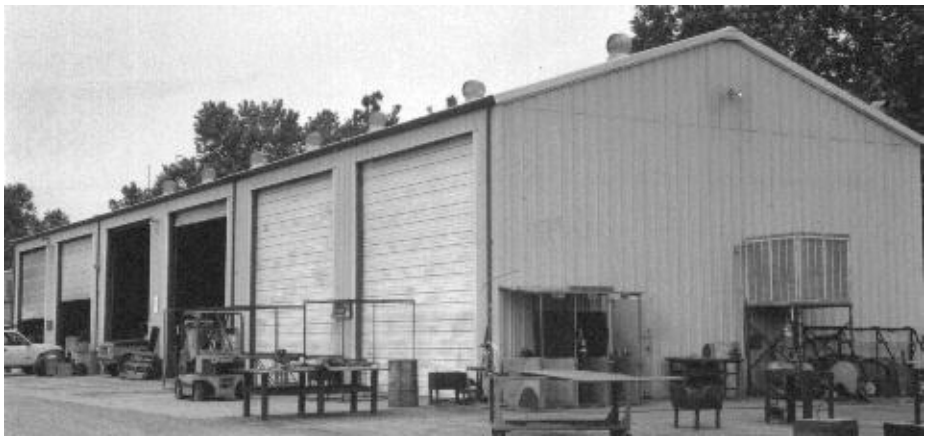


# BASIC FARM BUILDINGS

## POLE BUILDINGS

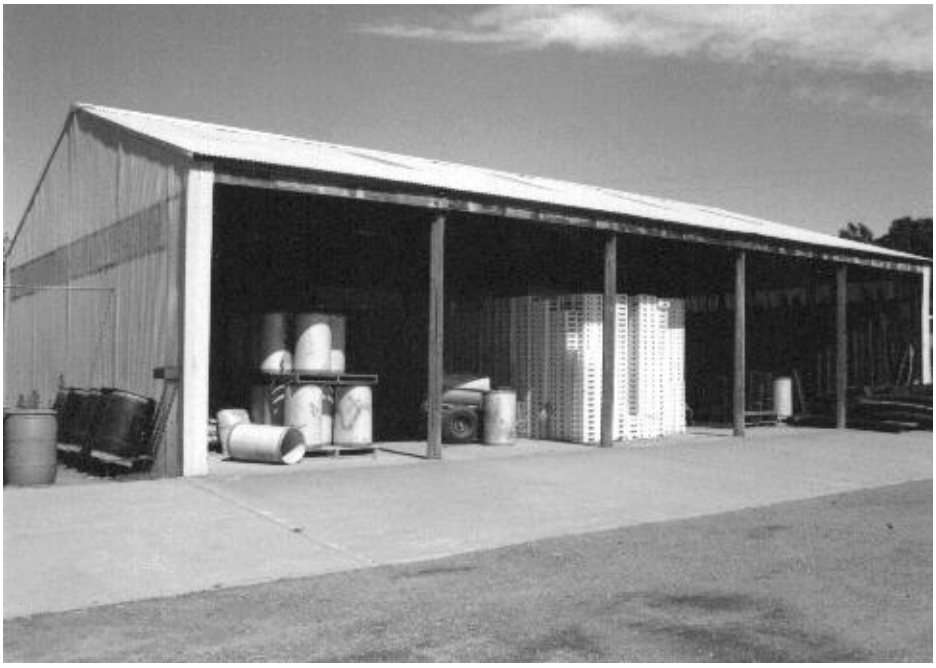
# BASIC FARM BUILDINGS

## SHOPS



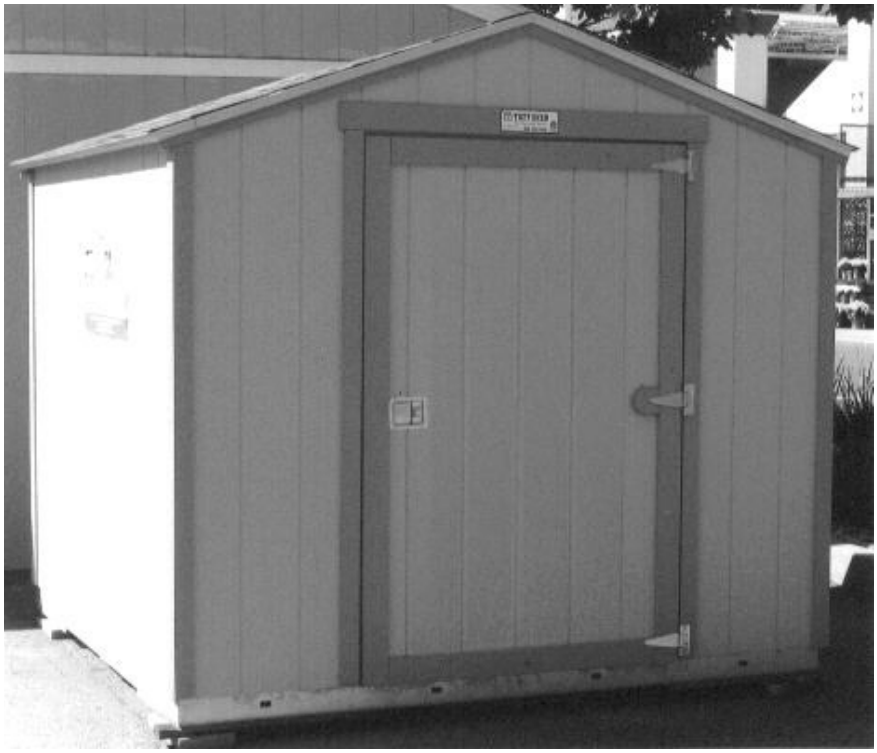
# BASIC FARM BUILDINGS

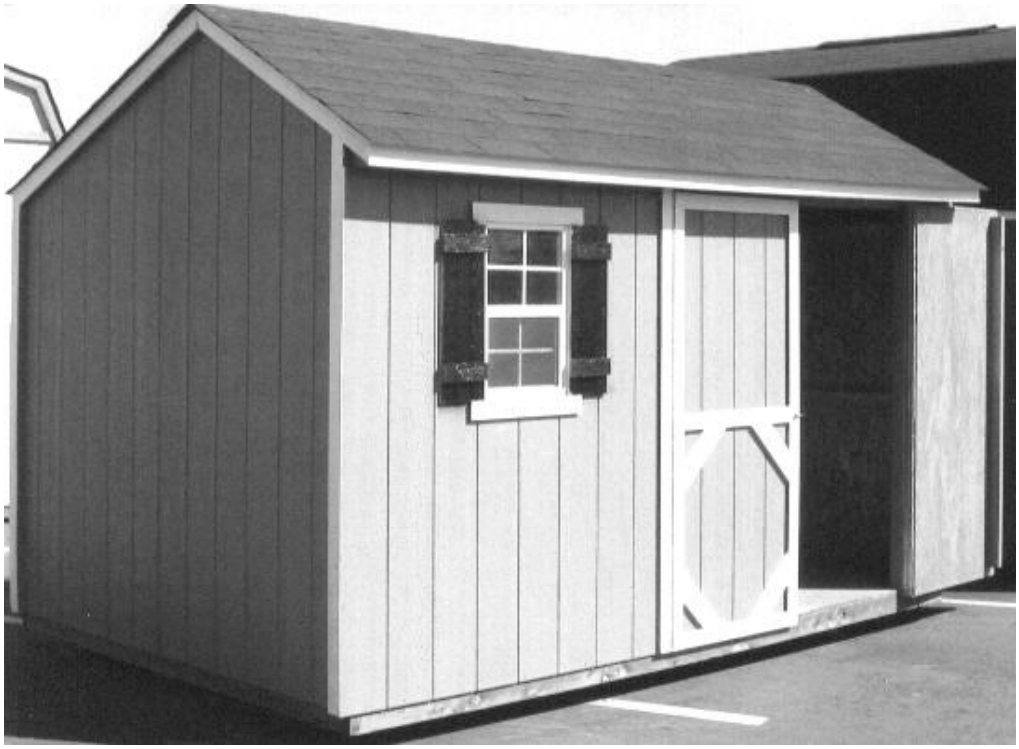
## MACHINERY AND EQUIPMENT SHEDS



# BASIC FARM BUILDINGS

## PREFABRICATED WOOD STORAGE SHEDS





# AH 534.20: DAIRY BARNS

This chapter contains structures and equipment typically used at a dairy. Specifications and costs are provided for the following:

- Commonly used milking parlors
- Modern Herringbone barns
- Parallel barns
- Rotary barns
- Milking parlor
- Holding, wash, and drip area equipment
- Dairy equipment
- Freestall barn
- Hospital barn
- Corrals
- Commodity barns
- Hay barns
- Miscellaneous equipment
- Septic tanks
- Barn fans
- Feedlane stanchions with curb
- Silage pits
- Liquid manure systems
- Painted steel bulk feed tanks on concrete pad/with hopper bottom
- Grade "B" barns
- Stanchion barns
- Walk-through type barns

Photographs or drawings showing examples of the buildings discussed are located at the end of the chapter.

# DAIRY BARNS

## COMMONLY USED MILKING PARLORS

Three of the most common styles of milking barns found in California are referred to as the Herringbone, the Polygon, or the Parallel because of their design. The type most frequently found is the Herringbone or sawtooth design which also has several variations. For instance, the Polygon design is a parlor using multiple sets of Herringbone stalls. The Parallel design is gaining in popularity, especially in larger parlors. All three of these parlors have a central pit for the milker, with the cows elevated on one or all sides. An additional type is the Rotary parlor.

***(Drawings with descriptions shown on AH 534.20, pages 14 - 16)***

## MODERN HERRINGBONE, PARALLEL, OR ROTARY

The high end of the cost range is for Sacramento and Northern California

The major electrical components to run the milking equipment—mains and subpanels, breakers and master start switches—are considered fixtures and are not included in building costs.

**EQUIPMENT ROOM, OFFICE, BREEZEWAY, MILK ROOM, RESTROOM, BATH**

| Components | Average Quality | Good Quality |
|---|---|---|
| Foundation | Reinforced concrete | Reinforced concrete |
| Floors | Concrete slab | Concrete slab, reinforced |
| Walls | 8" concrete block | Concrete block |
| Exterior | Stucco or concrete block | Stucco and masonry veneer, split face |
| Roof Structure and Roofing | Average wood frame, corrugated iron roofing | Good wood frame, good quality roofing or steel beams and good steel roofing or tile, skylights, gutters |
| Windows | Metal sash, 10 percent of wall area | Metal sash, 10 percent of wall area |
| Interior | Smooth finish plaster—cove base | Tile floors and walls, many areas |
| Electrical | Conduit—average fixtures | Conduit—excellent lighting and ample outlets |
| Plumbing | One stainless steel sink, one water heater, one lavatory, one water closet, usual floor drains | One stainless steel sink, one water heater, ¾ bath, vinyl floor and tape, textured walls, usual floor drains |
| **Square-Foot Cost** | **$59.25 to $68.00** per square foot | **$68.00 to $74.75** per square foot |

***(Drawings and photographs shown on AH 534.20, pages 15 – 20)***

# DAIRY BARNS

## MILKING PARLOR

| | |
|---|---|
| Foundation | 6" reinforced concrete |
| Floors | Concrete slab—well-formed gutters and mangers |
| Walls | 6" or 8" concrete block or reinforced concrete 60" high with 2" x 6"—16" on center framing above, or all concrete block |
| Roof Structure and Roofing | Average wood frame, corrugated iron roofing or steel beams, good steel roofing, skylights |
| Windows | Metal sash or metal louvers |
| Interior | Smooth plaster on entire surface of block walls or some combination of tile and plaster of good quality |
| Electrical | Conduit—average fixtures; ample lighting |
| Plumbing | Usual floor drains and hose bibs |
| **Square-Foot Cost** | **Without gates and feeding equipment—$39.50 to $49.50** per square foot |

**Total Building Cost**: includes equipment room, milk room, office, bath, supply, milking parlor, and wash and drip area—Average quality **$46.50 to $58.50** per square foot
Good quality **$60.00 to $65.00** per square foot

## HOLDING, WASH, AND DRIP AREA EQUIPMENT

| | |
|---|---|
| Floor or Ramp | Sloping concrete with carborundum finish.<br>**$3.80 - $4.40** per square foot |
| Walls | Concrete block 5' to 6' high with smooth plaster.<br>**$47.00 to $52.00** per linear foot |
| Metal Rail Fence | Welded pipe 7'—10' o.c. in concrete.<br>**$12.00 - $14.00** per linear foot |
| Cable Fence | 1 1/4" top rail, 2 7/8" post, 7' o.c.<br>3 cable—**$9.30 to $10.10** per linear foot<br>4 cable—**$10.40 to $11.50** per linear foot |
| Gates | 54" high, pipe with bracing.<br>**$15.60** per linear foot of gate width |
| Sprinkler System | Hooded sprinkler, including pump. **$157 - $191** per sprinkler,<br>or per double 30 barn—60 cows **$19,725 - $22,175** |
| Roof Structure and Roofing | Average quality: Pipe supports, wood or light steel frame and corrugated iron roofing—**$5.40 to $8.20** per square foot<br>Good quality: Box beam columns, hot-dip galvanized and box beam galvanized rafters and purlins; quality steel roofing with skylights and electric lighting—**$8.90 to $10.40** per square foot |
| Total Area Cost Including All Components | **$22.20 - $26.70** per square foot |

***(Photograph shown on AH 534.20, page 21)***

# DAIRY BARNS

## DAIRY EQUIPMENT

**PARALLEL STALLS (DOUBLE 30)**

| | |
|---|---|
| 2' x 30' parallel stall package includes galvanized reels, reel support post, sequencing panels, galvanized rump rail assembly, kick bar support, entrance gate, and hardware. 2' x 30' parallel drive kit includes air controls, air tubing, rump panels, drive guards, air cylinders, hardware, stainless steal curbing, and top rail. Air operated catch lane gates include air control ram, hardware to mount, step ladders with hand rails (front), and miscellaneous hardware. | $110,600 |

**VACUUM PUMP**

| | |
|---|---|
| Air vacuum pump with 30 HP motor, stand, pulleys, belts, guards, filter assembly, miscellaneous pipe valves, and electrical. | $11,900 |

**PIPELINE AND EQUIPMENT**

| | |
|---|---|
| Claws with pulsators and pulsator controller, master control panel, 2 HP milk pump, milk receiver, jetter assembly and hose, fresh air kit, clean-in-place sink. Also includes all stainless steel pipelines, elbows, valves, all PVC lines, electrical wiring and panels, and miscellaneous hardware. | $96,700 |

**MILK TRANSFER SYSTEM**

| | |
|---|---|
| Control assembly and miscellaneous equipment. | $5,100 |

**DETACHERS**

| | |
|---|---|
| Air operated retraction with both manual and automatic operation, indicator lights indicating milking mode and milk flow, air operated shutoff valve/sensor combination, all related electric wiring, air filter, and hardware. | $84,000 |

**MILK TANKS (7,000 GALLON)**

| | |
|---|---|
| 2 stainless steel 7,000-gallon tanks with agitators and wash pumps. Includes control panel, calibration gauge, temperature recorder with probe assembly, hot milk alarm, miscellaneous piping, and electrical. | $119,800 |

**REFRIGERATION SYSTEM**

| | |
|---|---|
| Freon compressor, air condensers, related hardware, pipes, valves, and electrical. Plate cooler with 100 plates and all hardware. | $54,100 |

Above costs include tax and labor

# DAIRY BARNS

## DAIRY EQUIPMENT

**HEAT RECOVERY SYSTEM**

| | |
|---|---|
| Heat recovery system and all hardware. | $12,000 |

**HOT WATER SYSTEM**

| | |
|---|---|
| Boiler with insulated 500-gallon storage tank, insulated piping, and electrical. | $16,900 |

**SPRINKLER PEN HARDWARE**

| | |
|---|---|
| Pumps, sprinklers, and all related pipelines and miscellaneous hardware. | $22,800 |

**AIR COMPRESSOR**

| | |
|---|---|
| 10 HP air compressor with 120-gallon tank. Includes miscellaneous hardware and electrical. | $9,000 |

**ELECTRIC OR AIR CROWD GATE**

| | |
|---|---|
| 30 to 50 foot electric gate with track and control kit, motor, panel, and electrical. | $24,300 |

Above costs include tax and labor

**EQUIPMENT ONLY (Including tax and labor)**

| | |
|---|---|
| Double 14' Parallel | Total - **$320,300 to $336,200** |
| Double 16' Parallel | Total - **$353,000 to $367,700** |
| Double 18' Parallel | Total - **$378,200 to $420,200** |
| Double 24' Herringbone | Total - **$462,300 to $499,000** |
| Double 25' Parallel | Total - **$478,000 to $504,300** |
| Double 30' Parallel | Total - **$525,300 to $572,600** |
| 50-Cow Rotary Barn | Total - **$640,900 to $735,400** |
| 70-Cow Rotary Barn | Total - **$893,300 to $1,027,300** |

# DAIRY BARNS

## FREESTALL BARN

### STANCHIONS, LOOPS, AND FENCES

| | |
|---|---|
| Foundation | Reinforced concrete |
| Floors | Sloping concrete with dirt in loop areas. Concrete drive lanes and flush areas. |
| Walls | Open; poles with steel supports |
| Roof Structure | Steel frame with steel cover; good quality, with gutters |
| Electrical | Minimum lighting |
| Plumbing | Water troughs in each pen with underground flushing |
| Stanchions | Steel; self locking – 5 hole per 10 feet |
| Fencing | Cable with steel or wood posts |
| Capacity | 250 to 600 cows; one stanchion per cow |
| **Cost** | **$940 to $1,200** per stanchion **or $9.40 to $12.00** per square foot |

Some barns now have 10 percent more stanchions and cows than beds.

Hot dipped galvanized steel framed barns – add 5 percent to above costs.

Cow water beds – **$158 to $194** each

***(Photographs shown on AH 534.20, page 22)***

## HOSPITAL BARN

### AVERAGE QUALITY

| | |
|---|---|
| Floors | Concrete slab with flush curbs |
| Walls | Light steel poles, all sides open |
| Roof | Average wood frame or light metal, with metal cover |
| Interior | Several small pens with metal pipe fencing and gates and water troughs |
| Electrical | Average light fixtures |
| Plumbing | Concrete water troughs |
| **Cost** | **$7.60 to $8.20** per square foot |

Hospital barns without small divided pens, with dirt floors, low to average quality: **$5.15 to $6.20** per square foot

***(Photograph shown on AH 534.20, page 23)***

# DAIRY BARNS

## CORRALS

| Components | Cost |
|---|---|
| Concrete Flatwork<br>Large areas/not reinforced | 4" to 4½"—**$2.15 to $2.50** per square foot<br>6"—**$2.60 to $3.15** per square foot |
| Rubber Belting | **$1.60 to $2.40** per square foot |
| Curbs | 8" x 16"—**$7.60** per linear foot<br>8" x 24"—**$8.90** per linear foot |
| Cable Fence | 2 3/8" top rail, 2 7/8" post—10' o.c.<br>3 cable—**$9.40 to $10.00** per linear foot<br>4 cable—**$10.05 to $11.30** per linear foot |
| Concrete Water Tank | **$590 to $650** each |
| Steel Stanchions<br>Without Stanchion Curb | **$46.50 to $51.90** each hole<br>**$25.30 to $28.80** per linear foot |
| Steel Self-Locking Stanchions<br>Without Stanchion Curb | **$49.40 to $53.60** each hole<br>**$24.20 to $27.30** per linear foot |
| 12" PVC Flush Line | **$11.90 to $13.50** per foot |
| Sump Pumps | 3 HP **$2,930 to $3,135**<br>5 HP **$3,945 to $4,160** |
| Floating Agitator Pump | 75 HP **$18,925 to $21,190**<br>40 HP **$14,600 to $15,680** |
| Gates | 12' to 16'—**$185 to $230** each |
| Loafing Sheds | Wood—**$4.55 to $5.80** per square foot<br>Steel—**$5.40 to $6.90** per square foot |

## COMMODITY BARNS

| | Per Square Foot |
|---|---|
| With Dividers | $12.80 - $19.05 |
| Without Dividers | $11.05 - $14.85 |

***(Photograph shown on AH 534.20, page 23)***

### COMMODITY BARN ADDITIVES

| | |
|---|---|
| Concrete Dividers—8' high 6" thick | **$131.00** per linear foot or **$16.40** per square foot |

## HAY BARNS

| | |
|---|---|
| Floors | Dirt |
| Walls | Open; used oil field pipe to support roof |
| Roof | 20' eve; low pitch; light wood or steel frame; metal cover |
| Electrical | None |
| Plumbing | None |
| **Cost** | **$3.75 to $4.65** per square foot |

***(Photograph shown on AH 534.20, page 24)***

# DAIRY BARNS

## MISCELLANEOUS EQUIPMENT

### CURBS

| | Per Linear Foot |
|---|---|
| 8" x 8" | $3.70 to $4.85 |
| 8" x 16" | $7.40 to $8.45 |
| 8" x 20" | $8.45 |

### CABLE FENCE

| | Per Linear Foot |
|---|---|
| 2 3/8" top rail with 2 7/8" post 10' o.c. | 3 cable—$9.25 to $9.80<br>4 cable—$9.80 to $10.80<br>5 cable—$10.30 to $11.35 |
| Cattle guard | $1,326.00 to $1,910.00 each |

### SOLID RAIL FENCE

| | Per Linear Foot |
|---|---|
| (4) 2 3/8" rails with 2 7/8" post 10' o.c. | $12.70 to $14.40 |

### TANKER PAD

| | Per Square Foot |
|---|---|
| 6" to 7" rebar reinforced concrete with footings | $2.95 to $3.45 |

### WATER TROUGHS

| | |
|---|---|
| Concrete water troughs - 2' x 12' | $455 to $475 |
| Concrete water troughs - 2' x 16' | $505 to $615 |
| Mineral troughs - 20' | $170 to $200 |

### CORRAL SHADES

| | Per Square Foot |
|---|---|
| Pipe poles, wood frame, metal cover | $2.25 to $2.50 |
| Pipe poles, steel frame, metal cover | $2.50 to $3.05 |

### WATER LINES

| | | |
|---|---|---|
| 2" Water line | $2.40 | per linear foot |
| 3" Water line | $2.70 | per linear foot |
| 12" Flush line | $13.00 | per linear foot |
| 18" Drain line | $22.65 | per linear foot |
| Flush valves | $1,620 | each |
| Drain boxes | $1,730 | each |

# DAIRY BARNS

## SEPTIC TANKS

| | |
|---|---|
| 1,000 – 1,500 gallon with lines | $3,785 to $4,325 |
| Cistern - per gallon | $.67 to $.72 |

## BARN FANS

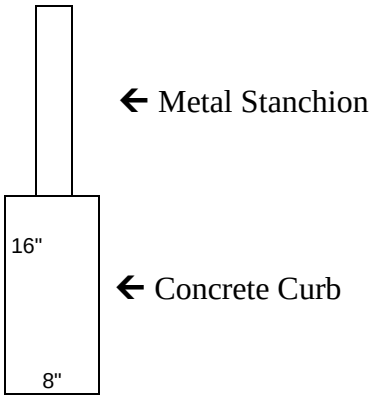
| | |
|---|---|
| With misters and automatic controls | $755 to $975 each—installed |

## FEEDLANE STANCHIONS WITH CURB

Galvanized stanchions, 5–hole/10'
Cow-type self-locking with release
with 2 7/8" post in 8" x 16" concrete curb

Cost Per Linear Foot: **$33.90 to $35.50**, stanchion and curb only

Additional concrete
- Drivelane 6" reinforced - **$2.60 to $3.15** per sq. ft.
- Walklane 4" concrete - **$2.15 to $2.40** per sq. ft.
- Flush curb 8" x 8" - **$4.10** per linear foot




| | |
|---|---|
| Cow lane 12' wide with locking stanchions and stanchion curb and 10' feed lane | **$86.50 to $88.60** per linear foot |

***(Photograph shown on AH 534.20, page 25)***

## SILAGE PITS

Tilt-up of 6" concrete or 8" reinforced concrete block, 8' high, and enclosed on three sides with 6" concrete slabs.

| Size | Cost Per Square Foot |
|---|---|
| 75 x 100 | $6.00 |
| 100 x 200 | $5.00 |
| 100 x 300 | $4.75 |

Concrete Silage Slab Only
5 ½" to 6" reinforced with footings - **$3.20 to $3.75** with footings
6" rebar reinforced with footings - **$3.85 to $4.40**

***(Photograph shown on AH 534.20, page 25)***

# DAIRY BARNS

## LIQUID MANURE SYSTEMS (MANURE SEPARATOR)

Cost includes tanks, pumps, screens, valves, pipes, sump, and drainage system, but excludes cost of all holding ponds or lagoons. Typically one unit per 800 to 1,000 cows. **$42,000 to $55,000**

***(Drawing shown on AH 534.20, page 26)***

### STEEL BULK FEED TANKS ON CONCRETE PAD WITH HOPPER BOTTOM

| Components | Cost |
|---|---|
| 5 Ton | 2,040 |
| 9 Ton | 2,780 |
| 10.5 Ton | 2,830 |
| 13 Ton | 3,400 |
| 15 Ton | 4,020 |
| 20 Ton | 4,895 |
| 25 Ton | 5,335 |
| 31 Ton | 6,450 |
| 34 Ton | 6,490 |
| 40 Ton | 7,355 |
| 45 Ton | 8,435 |
| 60 Ton | 9,270 |

***(Photographs shown on AH 534.20, page 27)***

### ADDITIVES AND ACCESSORIES

| | |
|---|---|
| Feeder lines (Per linear foot) | $7.20 |
| Partition | $3.20 |
| Ladder | $210 to $265 |
| Augar | $315 to $415 |

# DAIRY BARNS

## GRADE "B" BARNS

Use upper end of cost range for Sacramento Valley and north

**MILK HOUSE**

| | |
|---|---|
| Foundation | Concrete |
| Floors | Concrete slab |
| Walls | 6" or 8" concrete block 36" high with 2" x 4"—16" on center framing above |
| Roof | Average wood frame, corrugated iron, or aluminum cover |
| Windows | Metal sash or metal louvers, 5 percent of wall area |
| Interior | Smooth finish plaster |
| Electrical | Fair fixtures |
| Plumbing | One wash basin |
| **Square-Foot Cost** | **$40.00 to $55.50** per square foot (including breezeway) |

**MILKING BARNS**

| | |
|---|---|
| Foundation | Light concrete |
| Floors | Concrete—cow stands |
| Walls | Box frame, 4" x 6"—10' on center |
| Roof | Average wood frame, wood shingles, corrugated iron, or aluminum cover |
| Windows | Barn sash |
| Interior | Unfinished |
| Electrical | None |
| Plumbing | None |
| Stanchions | Wood stanchions |
| **Square-Foot Costs** | **$17.00 to $21.50** per square foot |

Building costs do not include milking equipment

***(Drawing with labels shown on AH 534.20, page 28)***

# DAIRY BARNS

## STANCHION BARNS

High end of range in cost is for Sacramento and Northern California

### MILK, WASH, AND EQUIPMENT ROOMS

| | |
|---|---|
| Foundation | Reinforced concrete |
| Floors | Concrete slab |
| Walls | 6" or 8" concrete block 36" high with 2" x 4"—16" on center framing above |
| Roof | Average wood frame, corrugated iron, or aluminum cover |
| Windows | Metal sash or metal louvers, 10 percent of wall area |
| Interior | Smooth finish plaster—cove base |
| Electrical | Conduit—average fixtures |
| Plumbing | One wash basin—usual floor drains |
| **Square-Foot Cost** | **$42.65 to $51.60** per square foot (including breezeway) |

### MILKING BARNS

| | |
|---|---|
| Foundation | Reinforced concrete |
| Floors | Concrete—well-formed gutters and mangers |
| Walls | 6" or 8" concrete block 36" high with 2" x 4"—16" on center framing above |
| Roof | Average wood frame, corrugated iron, or aluminum cover |
| Windows | Metal sash or metal louvers |
| Interior | Smooth plaster 36" high |
| Electrical | Conduit—average fixtures |
| Plumbing | Usual floor drains and hose bibs |
| Stanchions | Metal stanchions |
| **Square-Foot Cost** | **$42.65 to $51.00** per square foot |

### FEED ROOM

| | |
|---|---|
| Foundation | Reinforced concrete |
| Floors | Concrete slab |
| Walls | 2" x 4" or 2" x 6"—16" on center framing |
| Roof | Average wood frame, corrugated iron, or aluminum cover |
| Windows | None |
| Interior | Unfinished |
| Electrical | Conduit—average fixtures |
| Plumbing | None |
| **Square-Foot Cost** | **$16.65 to $28.10** per square foot |

Building costs do not include milking equipment

***(Drawing with labels and descriptions shown on AH 534.20, page 29)***

# DAIRY BARNS

## WALK-THROUGH TYPE BARNS

High end of the range in cost is for Sacramento and Northern California

**MILK, WASH, AND EQUIPMENT ROOMS**

| | |
|---|---|
| Foundation | Reinforced concrete |
| Floors | Concrete slab |
| Walls | 6" or 8" concrete block 36" high with 2" x 4"—16" on center framing above or all concrete block |
| Roof | Average wood frame, corrugated iron, or aluminum cover |
| Windows | Metal sash or metal louvers, 10 percent of wall area |
| Interior | Smooth finish plaster—cove base |
| Electrical | Conduit—average fixtures |
| Plumbing | One wash basin—usual floor drains |
| **Square-Foot Cost** | **$35.90 to $38.20** per square foot (including breezeway) |

**MILKING BARNS**

| | |
|---|---|
| Foundation | Reinforced concrete |
| Floors | Concrete—well-formed gutters and mangers |
| Walls | 6" or 8" concrete block 36" high with 2" x 4"—16" on center framing above, or all concrete block |
| Roof | Average wood frame, corrugated iron, or aluminum cover |
| Windows | Metal sash or metal louvers |
| Interior | Smooth plaster 36" high |
| Electrical | Conduit—average fixtures |
| Plumbing | Usual floor drains and hose bibs |
| Stanchions | Metal stanchions |
| **Square-Foot Cost** | **$32.75 to $35.90** per square foot |

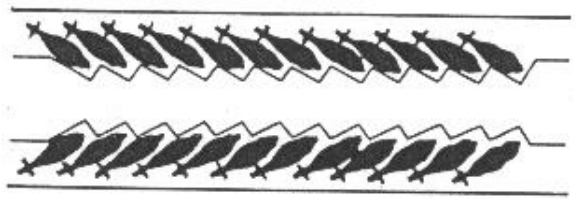
Building costs do not include milking equipment

***(Drawing with labels and descriptions shown on AH 534.20, page 30)***

# DAIRY BARNS

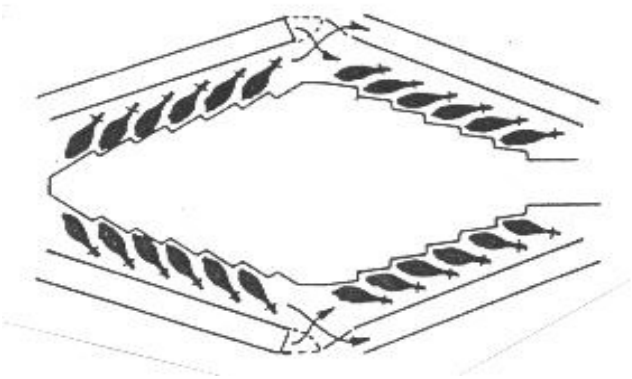
## COMMONLY USED MILKING PARLORS

### HERRINGBONE (DOUBLE 12)



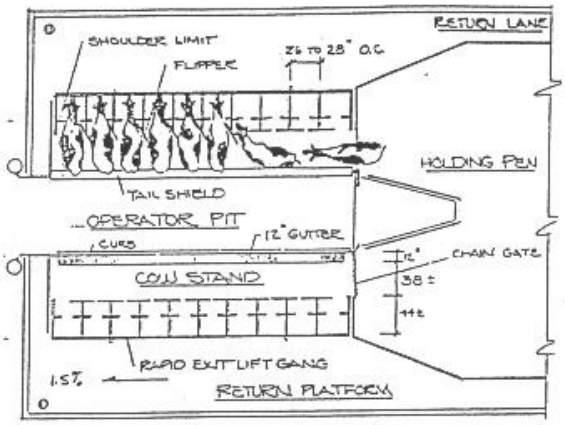
All cows on either side of the pit enter and leave as a group. Newer parlors may have 20 to 30 cows to a side. Some have rapid exit group side release.

### POLYGON



Each of the four sides has separate group entry and exit. Usually each side is a herringbone configuration, but can have angle modifications.

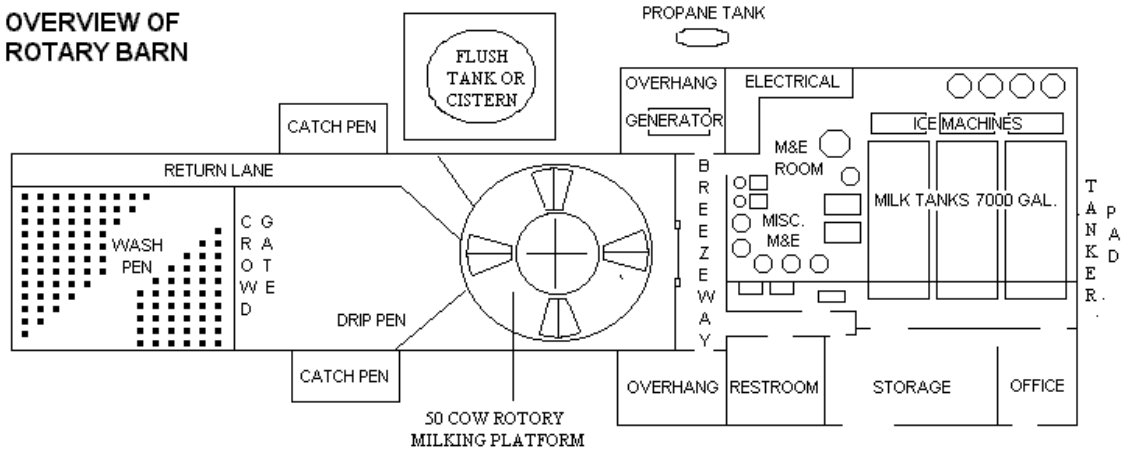
### PARALLEL (DOUBLE 10)

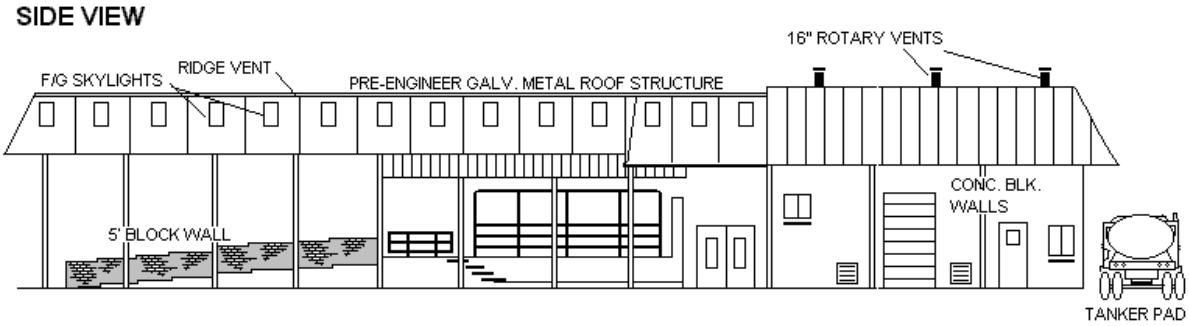



In this design, cows are milked from the rear, rather than the side. Thus, more cows can be milked in a given space than with other designs. Usually a rapid gang exit is present. Typical size is a double 20' to 30'.

# DAIRY BARNS

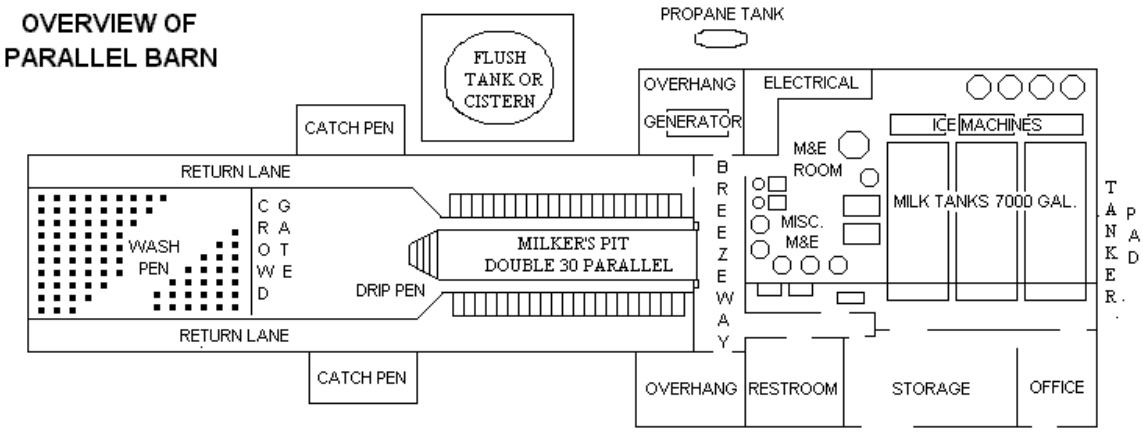
## 50-COW ROTARY BARN

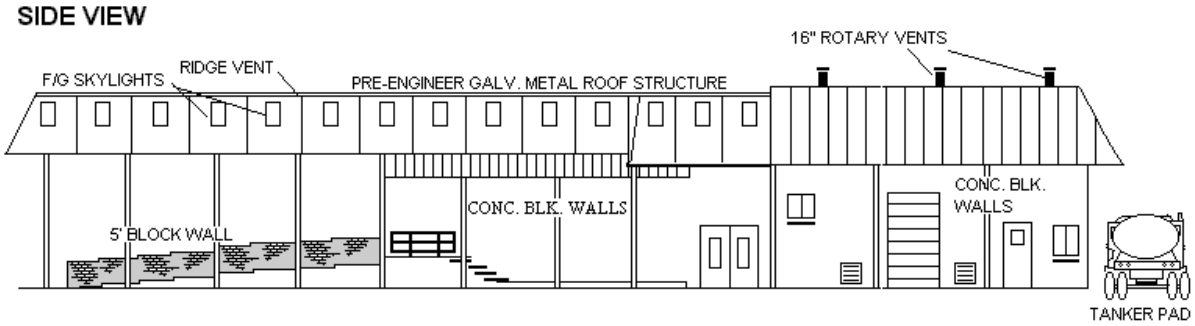


# DAIRY BARNS

## DOUBLE 30 PARALLEL BARN



# DAIRY BARNS

## 50-COW ROTARY MILKING PARLOR

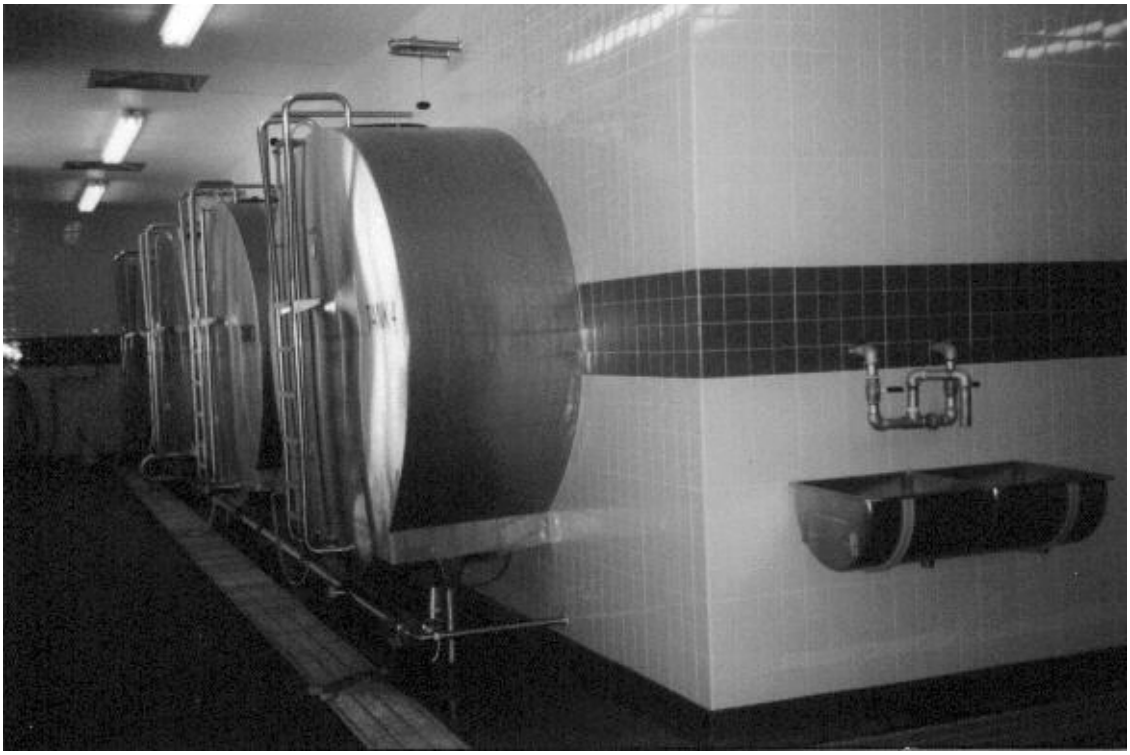
# DAIRY BARNS

## EXTERIOR MODERN HERRINGBONE, PARALLEL, OR ROTARY

Equipment, office, milk room

# DAIRY BARNS

## INTERIOR MODERN HERRINGBONE, PARALLEL, OR ROTARY



# DAIRY BARNS

## INTERIOR MODERN HERRINGBONE, PARALLEL, OR ROTARY

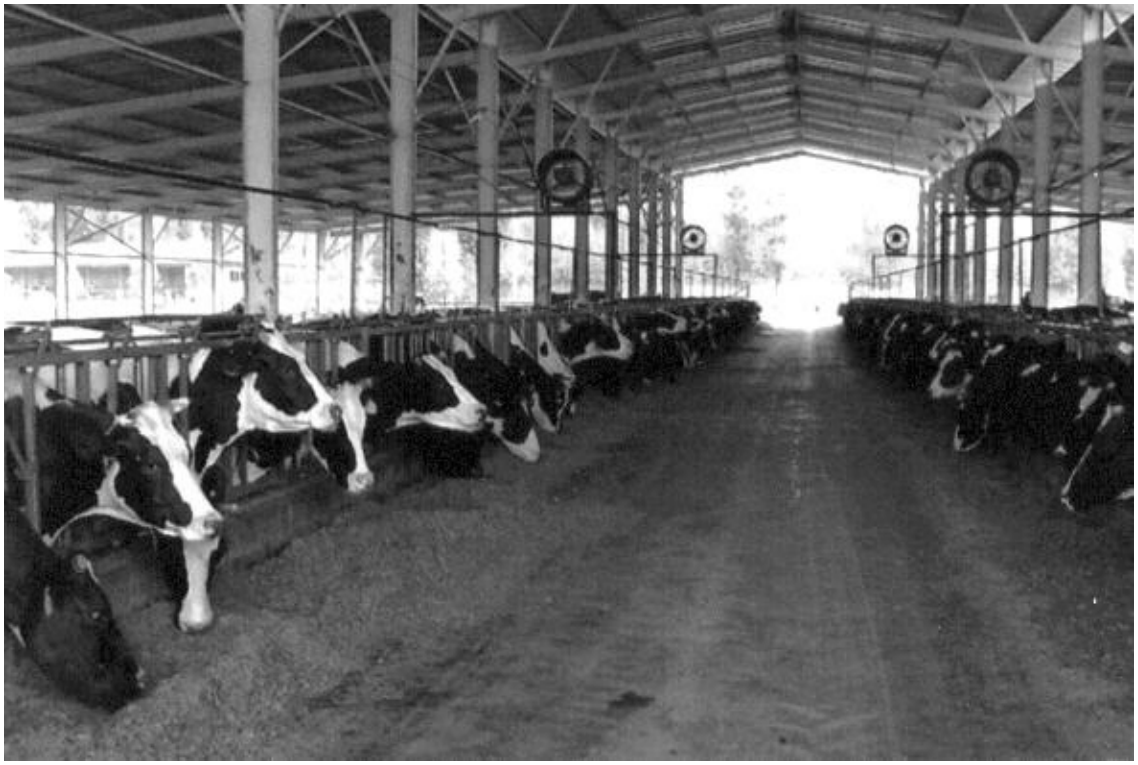
# DAIRY BARNS

## HOLDING, WASH, AND DRIP AREA EQUIPMENT

Wash Pen

# DAIRY BARNS

## FREESTALL BARN



# DAIRY BARNS

## HOSPITAL BARN

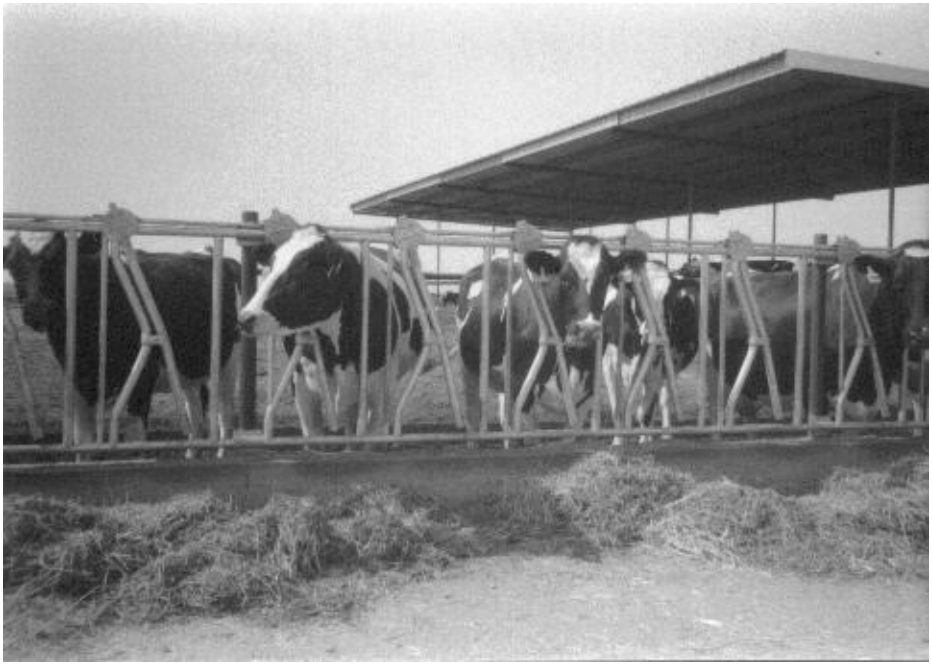
Commodity Barn

# DAIRY BARNS

## HAY BARNS

# DAIRY BARNS

## MISCELLANEOUS

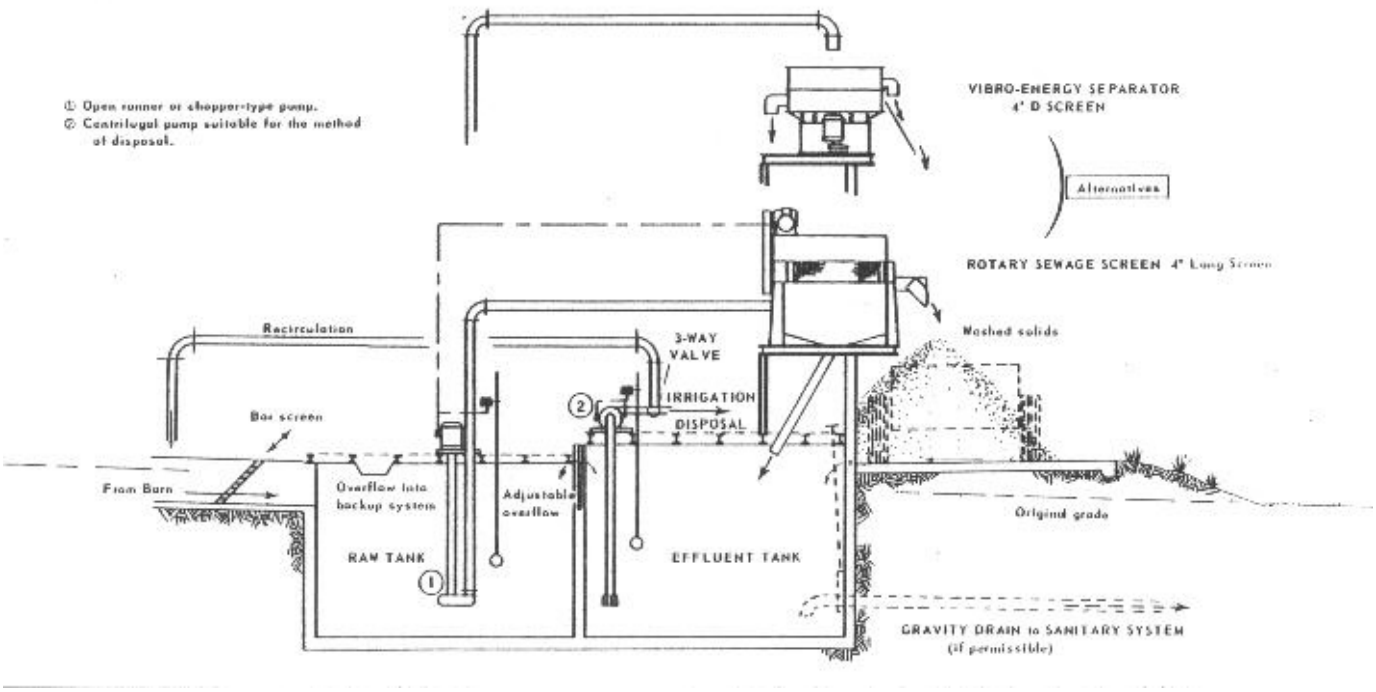


Feedlane Stanchions

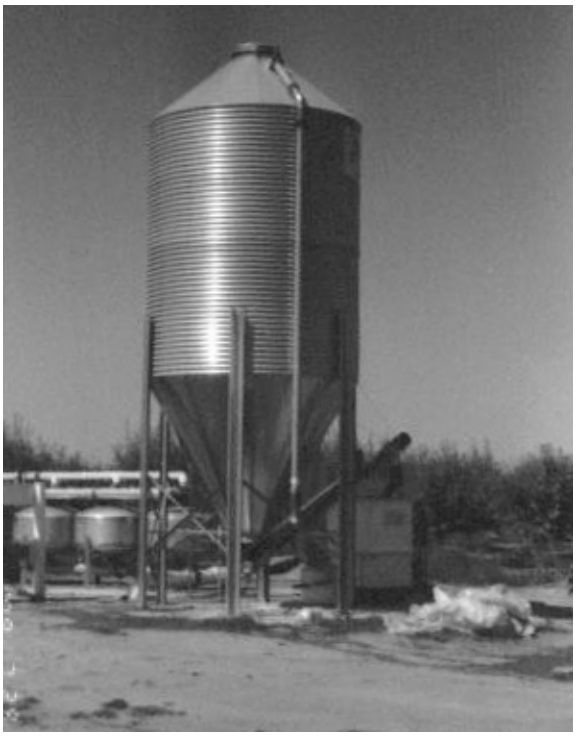
Silage Pits

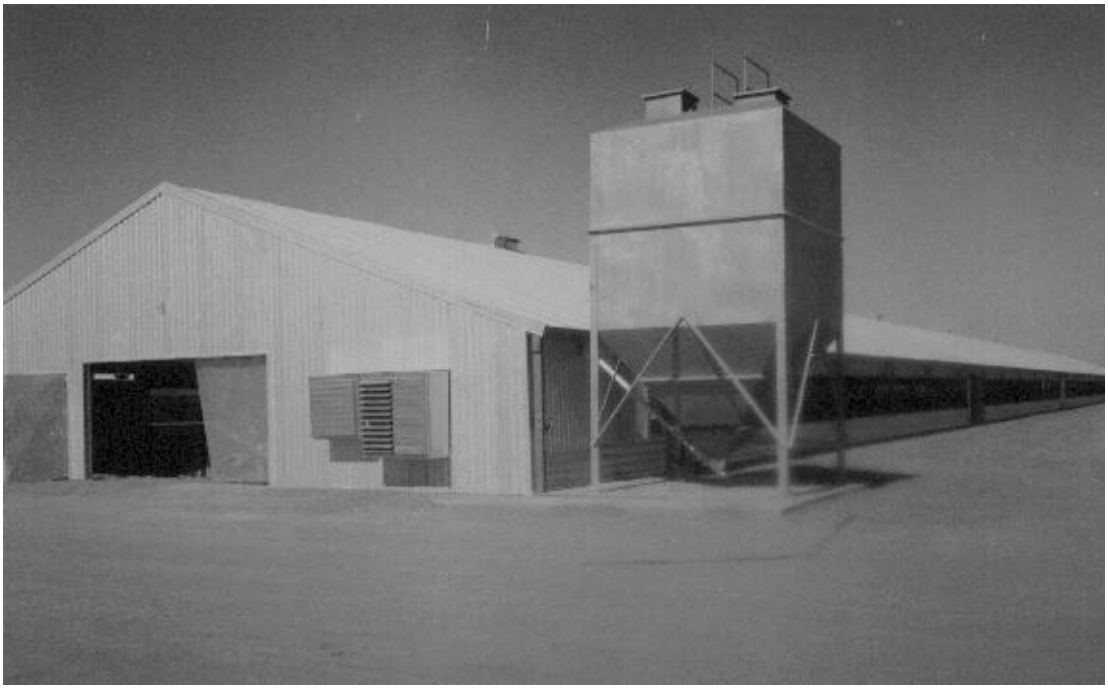
# DAIRY BARNS

## LIQUID MANURE SYSTEMS (MANURE SEPARATOR)



# DAIRY BARNS

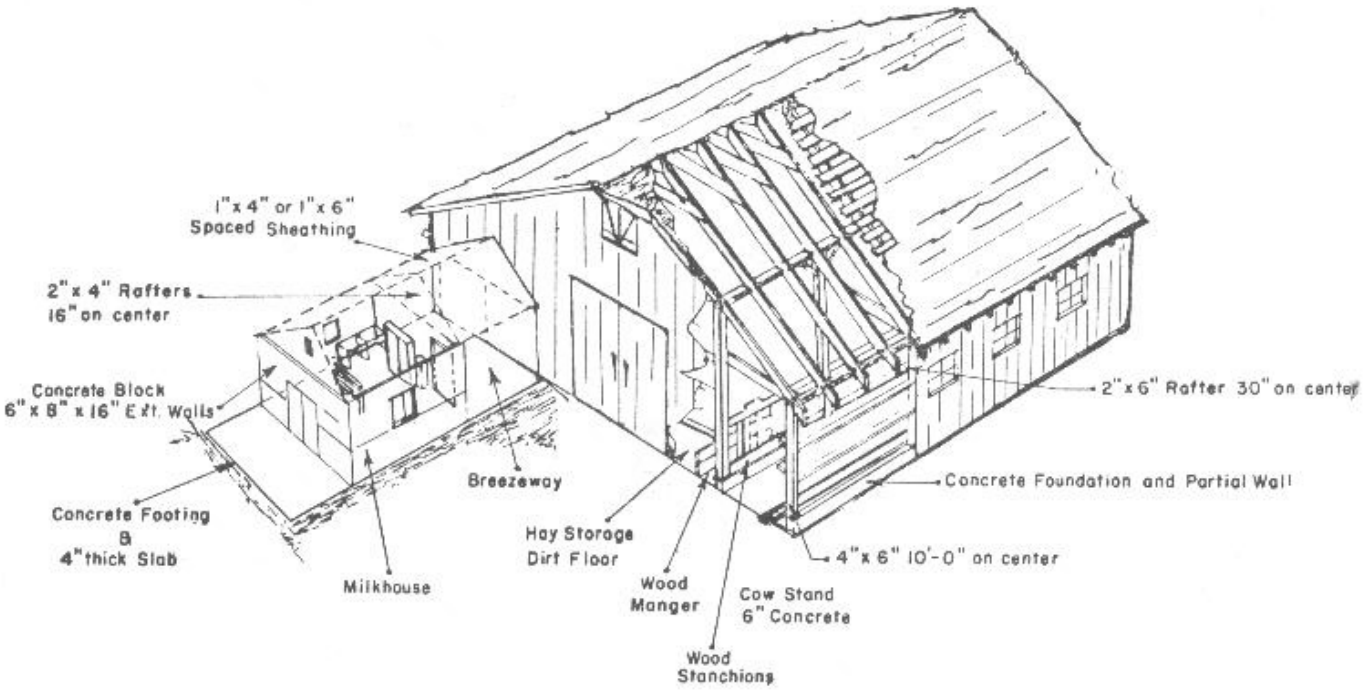




Steel Bulk Feed Tanks on Concrete Pad with Hopper Bottom

# DAIRY BARNS

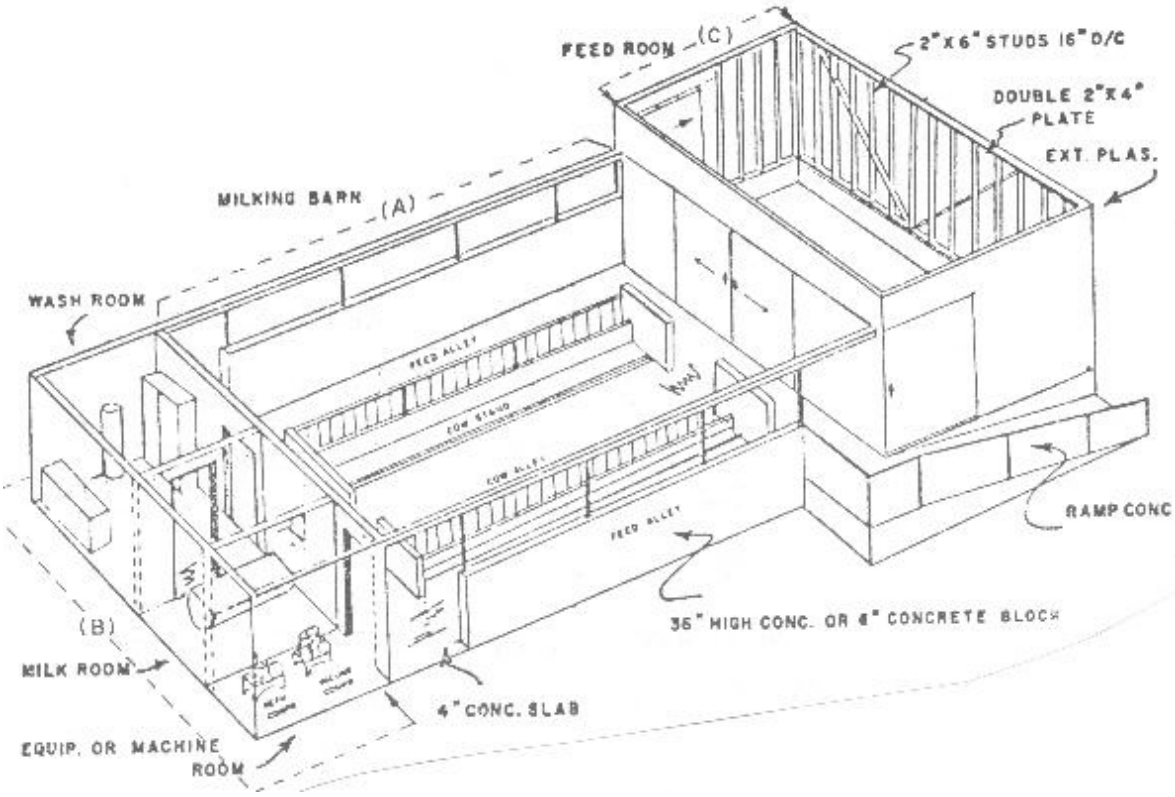
## GRADE "B" BARNS




**TYPICAL GRADE "B" DAIRY BARN**

# DAIRY BARNS

## STANCHION BARNS




Component Parts of This Dairy

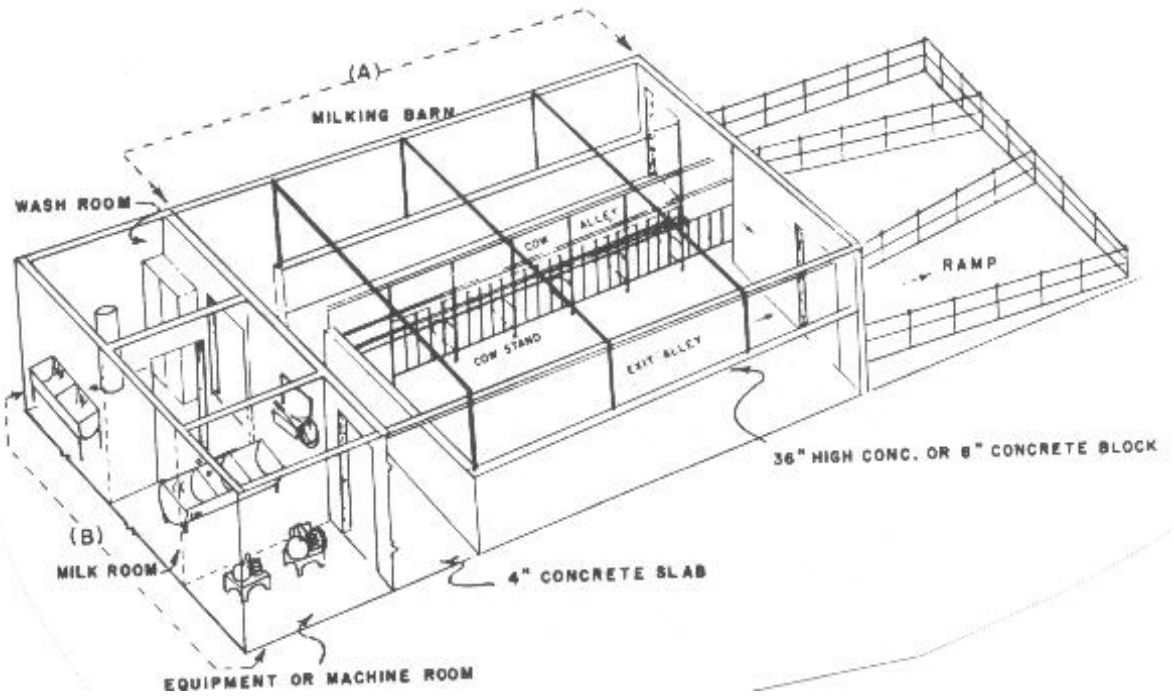
A. Milking Barn
B. Milk, Wash, and Equipment Rooms
C. Feed Room

**TYPICAL STANCHION BARN**

# DAIRY BARNS

## WALK-THROUGH TYPE

### TYPICAL WALK-THROUGH BARN




Component Parts of This Dairy
- A. Milking Barn
- B. Milk, Wash, and Equipment Rooms

# AH 534.30: POULTRY HOUSES

Poultry houses can be tailored to fulfill a variety of needs depending on the type of farming operation. The three most common types of poultry farming are for egg production, meat production, and "chick" production. Chickens which are farmed mainly for their eggs are called "egg laying hens," chickens farmed for meat are called "broilers," and chickens that lay fertilized eggs for the purpose of producing live "chicks" are called "breeders." The structures which house these three kinds of chickens are known respectively as "layer houses," "broiler houses," and "breeder houses."

This chapter contains specifications and costs for modern poultry structures and equipment used in both types of operations as well as breeder houses. The building and equipment costs listed below may be used as a baseline for costing other types of poultry houses not specifically mentioned here.

The basic building costs are for the structure only and include only those components specified. The cost of all items of equipment such as cages, drinking water systems, feeding systems, egg-gathering systems, ventilation systems, and heating and cooling systems must be added to the basic building cost to arrive at a total cost.

Drawings and photographs showing examples of the buildings and equipment discussed are located at the end of this chapter.

**HOUSING - CONVENTIONAL LAYER HOUSES**

| Components | Average Quality | Good Quality |
|---|---|---|
| Foundation | Concrete slab | Concrete slab |
| Floor | Concrete with some partitions | Concrete with drains or plank floor with drains |
| Frame | Pole frame | Pole frame |
| Roof Cover | 28-gauge galvanized steel | 28-gauge galvanized steel |
| Exterior | Vinyl curtains or plywood | Plywood with metal siding, air inlets |
| Lighting | Average system, automatic controls | Good system, excellent wiring, automatic controls |
| Plumbing | Average system | Good system |
| Interior | Only roof insulated | Fully insulated, interior sheathing, finished walls |
| **Basic Building Cost Per Square Foot** | **$18.55 to $20.40 per square foot** | **$26.85 to $29.55 per square foot** |

Typical Size 40' x 400'

***(Photograph and drawing shown on AH 534.30, page 4)***

# POULTRY HOUSES

## HOUSING - BROILER HOUSES

| Components | Average Quality | Good Quality |
|---|---|---|
| Foundation | Concrete slab | Concrete slab |
| Floor | Dirt | Concrete or dirt |
| Frame | Pole frame | Pole frame |
| Roof Cover | 28-gauge galvanized steel | 28-gauge galvanized steel |
| Exterior | Vinyl curtains or plywood | Plywood with metal siding |
| Lighting | Average system, automatic controls | Average system, automatic controls |
| Plumbing | Average system | Average system |
| Interior | Only roof insulated, shutters or vents | Fully insulated and ventilated with interior sheathing |
| **Basic Building Cost Per Square Foot** | **$10.60 to $11.70 per square foot** | **$12.75 to $14.00 per square foot** |

Typical Size 40' x 400'

***(Photograph shown on AH 534.30, page 5)***

## HOUSING - BREEDER HOUSES

| Components | Average Quality | Good Quality |
|---|---|---|
| Foundation | Concrete slab | Concrete slab |
| Floor | Dirt | Dirt with some concrete slab |
| Frame | Pole frame | Pole frame |
| Roof Cover | 28-gauge galvanized steel | 28-gauge galvanized steel |
| Exterior | Vinyl curtains or plywood | Plywood with metal siding |
| Lighting | Minimal | Average |
| Plumbing | Minimal | Average |
| Interior | Only roof insulated, natural ventilation only | Fully insulated and ventilated, interior sheathing |
| **Basic Building Cost Per Square Foot** | **$11.75 to $12.95 per square foot** | **$13.85 to $15.20 per square foot** |

Typical Size 40' x 400'

***(Photograph shown on AH 534.30, page 6)***

# POULTRY HOUSES

## EQUIPMENT - CONVENTIONAL LAYER CAGE HOUSES

| Components | A-Frame Cages | Battery Cages |
|---|---|---|
| Cages | 3 to 5 tier | 4 to 8 tier |
| Watering System | Automatic nipple system | Automatic nipple system |
| Feeding System | Automatic auger system | Automatic auger system |
| Egg-Gathering System | Automatic belt system | Automatic belt system |
| Manure Management System | Manual tray | Automatic belt |
| Cooling | Evaporative cooling pad and house fan system | Evaporative cooling pad and house fan system |
| Heating | None | None |
| **Basic Building Cost Per Square Foot** | **$9.35 to $10.30 per bird** | **$15.70 to $17.25 per bird** |

Assuming 0.48 square feet per bird

***(Photographs and drawings shown on AH 534.30, pages 7 and 8)***

## EQUIPMENT - MODERN BROILER HOUSES

| Components | |
|---|---|
| Watering System | Automatic nipple system |
| Feeding System | Automatic auger system |
| Cooling | Pad and fan system |
| Heating | Gas brooders |
| **Total Cost Per Bird Equipment** | **$3.60 to $3.95 per bird** |

Assuming 0.80 square feet per bird

***(Photographs and drawing shown on AH 534.30, pages 9 - 11)***

## EQUIPMENT - MODERN BREEDER HOUSES

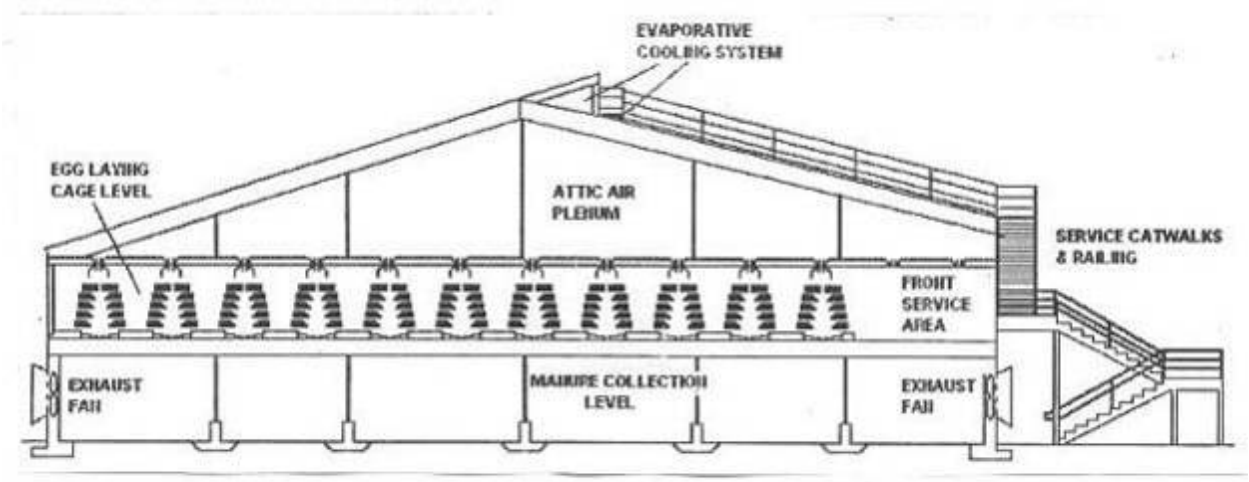
| Components | |
|---|---|
| Watering System | Automatic nipple system |
| Feeding Systems | Female and male bin and fill system |
| Cooling | Pad and fan system |
| Egg-Gathering System | Nest and egg collection system |
| **Total Cost Per Bird Equipment** | **$9.50 to $10.50 per bird per bird** |

Assuming 1.90 square feet per bird

***(Photographs and drawing shown on AH 534.30, pages 9 - 11)***

# POULTRY HOUSES

## CONVENTIONAL LAYER HOUSE




TYPICAL CROSS SECTION

# POULTRY HOUSES

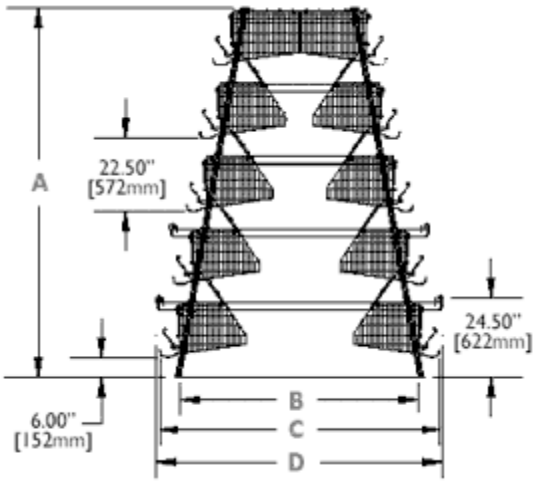
## BROILER HOUSE

# POULTRY HOUSES

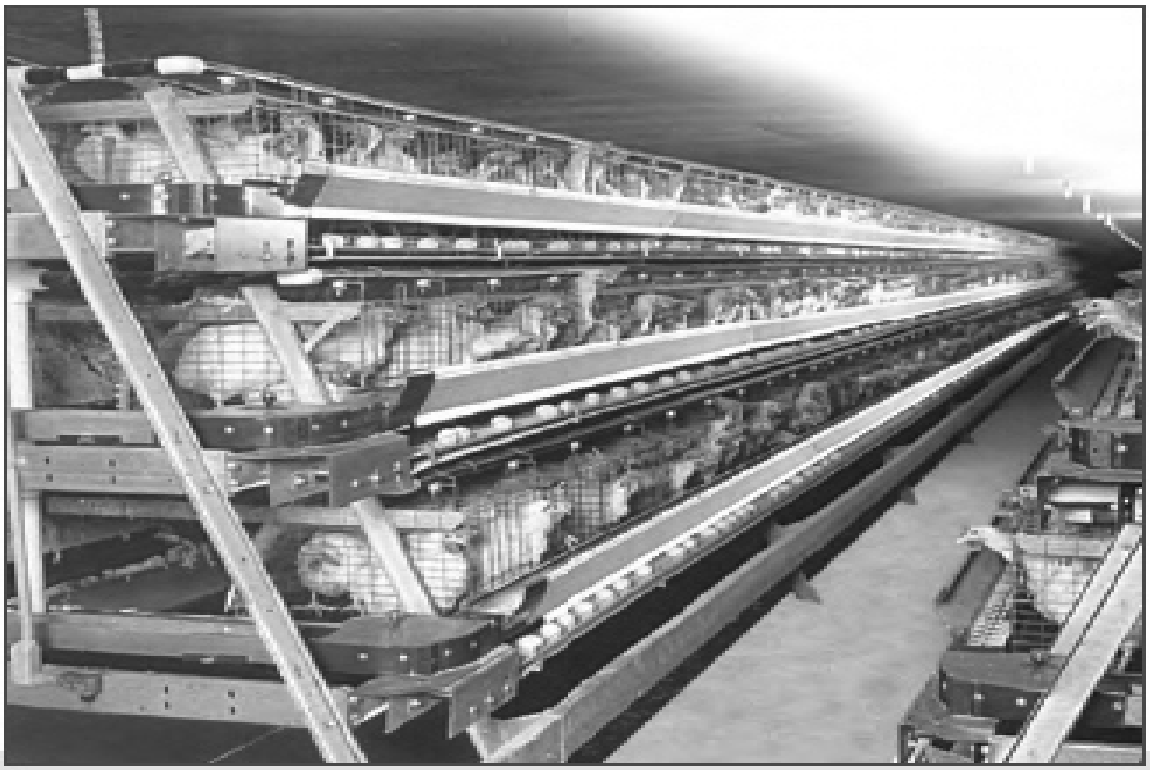
## BREEDER HOUSE

# POULTRY HOUSES

## A-FRAME CAGE EQUIPMENT

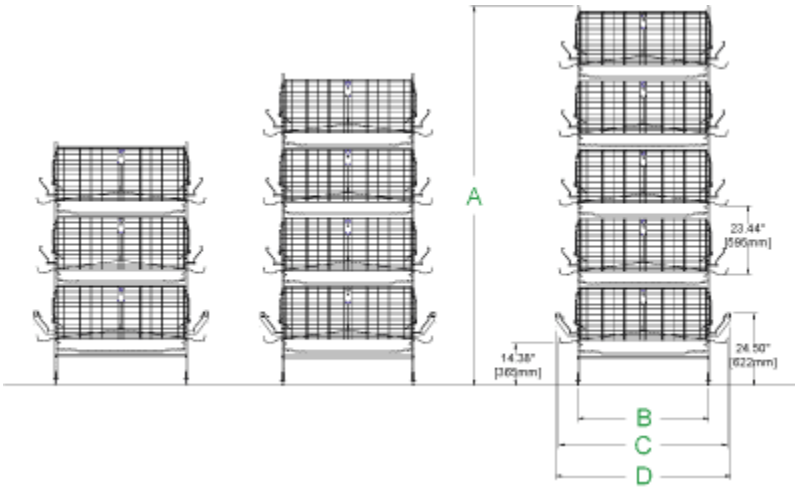



## CONVENTIONAL A-FRAME CAGE LAYER HOUSE



# POULTRY HOUSES

## BATTERY CAGE EQUIPMENT

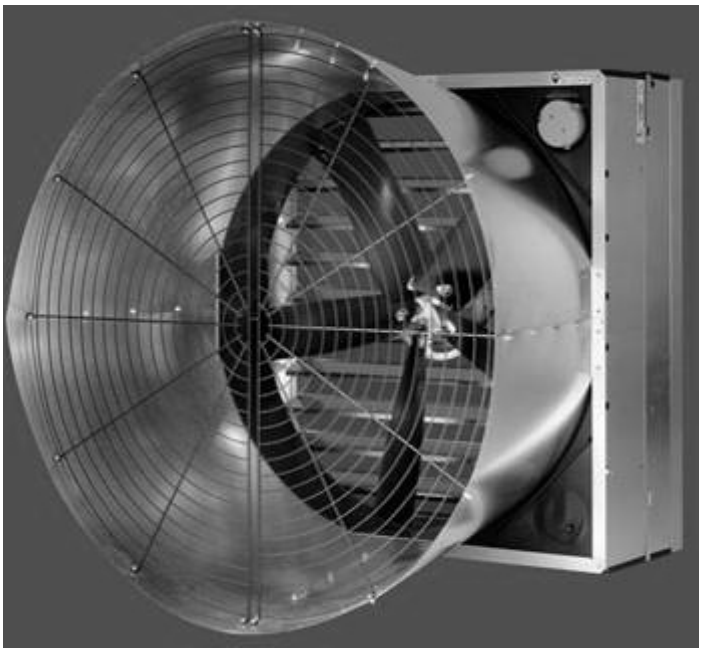



## CONVENTIONAL BATTERY CAGE LAYER HOUSE

# POULTRY HOUSES

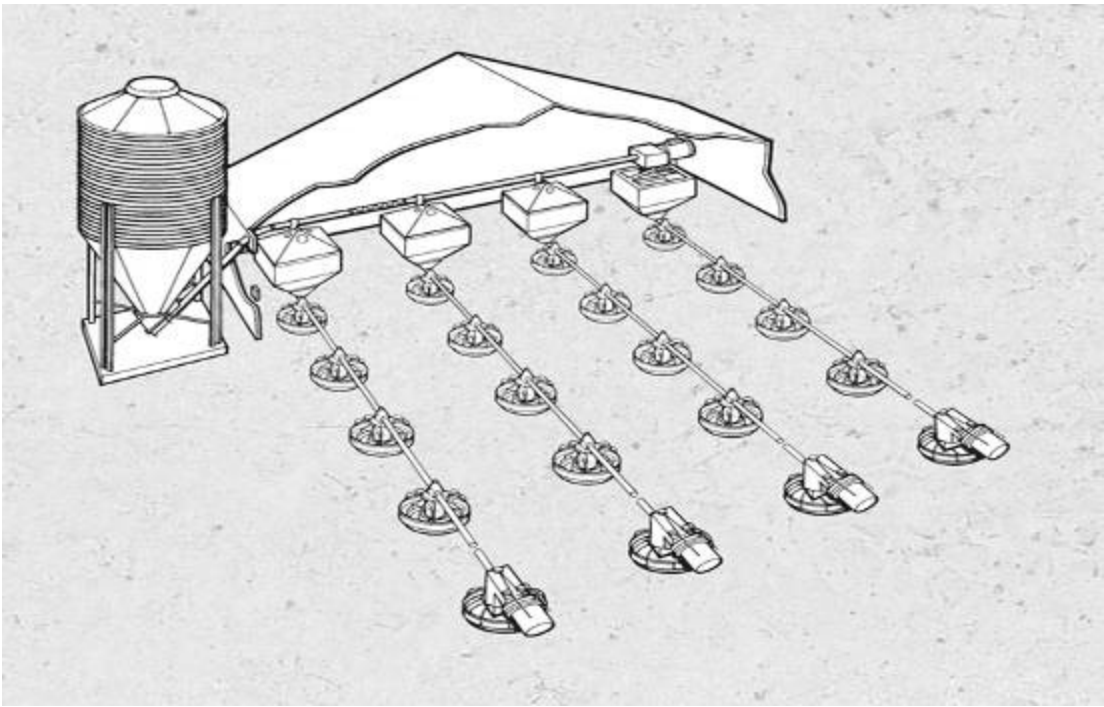
## EVAPORATIVE COOLING PADS

## HOUSE FAN



# POULTRY HOUSES

## AUGER FEEDING SYSTEM DIAGRAM



## EGG COLLECTION SYSTEM

# POULTRY HOUSES

## GAS BROODER

# AH:534.61: IRRIGATION SYSTEMS

This chapter contains specifications and costs for various irrigations systems, including:

- Concrete pipe
- PVC pipe
- Aluminum pipe
- Irrigation valves
- Permanent irrigation system
- Concrete ditch

Photographs showing examples of systems discussed are located at the end of this chapter.

The following costs for irrigation system components have been derived from information gathered, for the most part, in the San Joaquin and Sacramento Valleys. Costs have been collected for only the more widely used components. Many areas will have types of equipment not usually found in other locations. Costs for those items or systems should be checked locally.

## CONCRETE PIPE - INSTALLED

| Size in Inches | Cost Installed Per Linear Foot | | Vertical Stand Pipe Including Base Installed Cost Per Foot of Height | |
|---|---|---|---|---|
| | Fresno Area | Sacramento North | Fresno Area | Sacramento North |
| 8 | 8.50 | 8.90 | 19.25 | 20.20 |
| 10 | 8.80 | 9.20 | 23.50 | 24.70 |
| 12 | 9.80 | 10.30 | 24.60 | 25.80 |
| 14 | 10.80 | 11.30 | 26.75 | 28.10 |
| 16 | 12.00 | 12.60 | 40.40 | 42.40 |
| 18 | 12.80 | 13.40 | 45.60 | 47.90 |
| 20 | 15.55 | 16.30 | 46.65 | 49.00 |
| 24 | 24.00 | 25.20 | 82.80 | 86.95 |
| 30 | 60.00 | 63.00 | 144.65 | 151.90 |
| 36 | 77.90 | | 160.60 | 168.60 |
| 42 | | | 227.50 | 238.90 |
| 48 | | | 321.20 | 337.25 |

The prices shown above are for installations over 700 feet in length. Adjust these prices for installations less than 700 feet by using an appropriate dollar figure from the next page. The use of PVC pipe has become more prevalent than concrete pipe in most areas. Concrete pipe is still used primarily in the southern San Joaquin Valley.

# IRRIGATION SYSTEMS

## CONCRETE PIPE - INSTALLED

Adjust the prices from the previous page for installations less than 700 feet by the following amount.

| Length of Pipe | Add to All Sizes |
|---|---|
| Up to 100' | $7.50 per foot |
| 100' to 200' | $5.90 per foot |
| 200' to 300' | $4.90 per foot |
| 300' to 400' | $3.20 per foot |
| 400' to 500' | $2.70 per foot |
| 500' to 600' | $2.15 per foot |
| 600' to 700' | $1.60 per foot |

**PRESSURE BOXES** (Reinforced concrete with capped top)

| Size | Price Per Linear Foot of Height |
|---|---|
| 24" | 370 |
| 30" | 520 |
| 36" | 645 |

**STAND PIPE INCLUDING THE BASE-COST PER LINEAR FOOT**

| Size | 6' | 9' | 12' | 15' |
|---|---|---|---|---|
| 24" | 530 | 795 | 1,060 | 1,330 |
| 30" | 930 | 1,390 | 1,855 | 2,320 |
| 36" | 1,030 | 1,545 | 2,060 | 2,575 |
| 42" | 2,100 | 2,185 | 2,915 | 3,645 |
| 48" | 2,105 | 3,090 | 4,120 | 5,145 |

**VENT PIPE—PLASTIC—COST PER FOOT**

| Size | 9' Height Limit |
|---|---|
| 2" | 12 per foot |
| 3" | 13 per foot |
| 4" | 17 per foot |

# IRRIGATION SYSTEMS

## CONCRETE PIPE - INSTALLED

**VENT PIPE—STEEL—COST PER FOOT**

| Size | 9' Height Limit |
|---|---|
| 2" | 14 per foot |
| 4" | 20 per foot |
| 6" | 24 per foot |
| 8" | 31 per foot |
| 10" | 39 per foot |
| 12" | 43 per foot |

**ADD HOOK-UP (**When new concrete pipe is connected to old concrete pipe, add the following)

| Size | Add |
|---|---|
| 8", 10", and 12" | $262 |
| 14", 16", and 18" | $315 |
| 20" and 24" | $367 |

## PVC PIPE

Cost includes components and installation, but not hook-up to pump. As pressure requirements rise, the pipe becomes more costly.

**PVC PIPE— COST INSTALLED (PER LINEAR FOOT)**

| Size | Class 63<br>Low Head (Flood) | 100 P S I (Sprinkler) |
|---|---|---|
| 6" | 4.75 | 5.70 |
| 8" | 5.50 | 7.00 |
| 10" | 8.25 | 9.70 |
| 12" | 11.30 | 12.40 |
| 15" | 12.10 | 17.15 |
| 18" | 22.00 | 23.90 |

PVC hook-up to pump—includes relief valves, check valves, dresser couplings, elbows, and labor.

# IRRIGATION SYSTEMS

## PVC PIPE

### ADD HOOK-UP

| Size | Cost |
|---|---|
| 6" | 848 |
| 8" | 1,270 |
| 10" | 1,695 |
| 12" | 2,225 |

### VALVE, SADDLE, AND RISER (FOR SURFACE LATERALS)

| Size | Sprinkler | Flood |
|---|---|---|
| 4" | $82 | $114 |
| 8" | - | $197 |
| 10" | - | $244 |
| 12" | - | $300 |
| 14" | - | $400 |

## ALUMINUM PIPE

Aluminum pipe costs include sales tax, but exclude installation costs due to their portable nature.

| Main Lines Per Linear Foot | Diameter | | | |
|---|---|---|---|---|
| | **6"** | **8"** | **10"** | **12"** |
| Ring Lock Type | | | | |
| 40' joints without valve | $4.35 | $6.00 | $7.60 | $8.20 |
| 40' joints with valve | $4.80 | $7.20 | $9.00 | $9.75 |
| Latch Type | **3"** | **4"** | **6"** | |
| 30' joints without valve | $1.40 | $2.35 | $3.40 | |

### SPRINKLER LINES

18" Risers—30' lengths 3"—**$1.85** per linear foot 4"—**$2.50** per linear foot

# IRRIGATION SYSTEMS

**GALVANIZED FITTINGS**

| Valve Openers | | End Plugs | | 90° Elbows | |
|---|---|---|---|---|---|
| **Size** | **Cost** | **Size** | **Cost** | **Size** | **Cost** |
| 4" | 160 | 6" | 45 | 6" | 115 |
| 6" | 190 | 8" | 60 | 8" | 155 |
| 8" | 245 | 10" | 90 | 10" | 200 |

## IRRIGATION VALVES

Flood valves are set near the top or flush on top of a concrete pipe riser. Several types are in general use, i.e., Yakima and Alfalfa. They are made with either a solid arch or a removable arch. The removable arch type is more expensive, but it allows for replacement of the arch without complete valve removal when breakage occurs. The solid arch is usually found to be a Yakima and the removable arch is an Alfalfa.

**FLOOD VALVES—COST PER VALVE**

| Size in Inches | Solid Arch Yakima | Size in Inches | Alfalfa |
|---|---|---|---|
| 3 x 8 | 88 | | |
| 4 x 8 | 91 | 8 x 8 | $200 |
| 5 x 8 | 99 | 10 x 10 | $230 |
| 6 x 10 | 125 | 12 x 12 | $290 |
| 8 x 12 | 156 | 14 x 14 | $320 |
| 10 x 14 | 208 | | |
| 12 x 16 | 255 | | |
| 14 x 18 | 315 | | |
| 16 x 20 | 490 | | |
| 18 x 20 | 520 | | |
| 20 x 20 | 630 | | |

***(Photographs shown on AH 534.61, page 12)***

# IRRIGATION SYSTEMS

## IRRIGATION VALVES

### OVERFLOW VALVES

| Size in Inches | Cost Installed |
|---|---|
| 3 x 8 | 85 |
| 3 1/2 x 8 | 85 |
| 4 x 8 | 87 |
| 5 x 8 | 97 |
| 5 x 10 | 97 |
| 6 x 10 | 131 |
| 6 1/2 x 10 | 131 |
| 8 x 12 | 155 |
| 10 x 14 | 220 |
| 12 x 16 | 283 |
| 14 x 18 | 350 |
| 16 x 20 | 504 |
| 18 x 20 | 625 |
| 20 x 24 | 782 |

The orchard valve is a solid arch set down in a riser. Although it is generally used in orchards, it may also be found in row crops and pastures.

### PVC ORCHARD VALVE

| Valve Size | Riser Size | Cost |
|---|---|---|
| 3 1/2" | 8" | 82 |
| 4" | 8" | 103 |
| 5" | 8" | 103 |
| 6" | 10" | 132 |
| 6 1/2" | 10" | 132 |
| 8" | 12" | 157 |
| 10" | 14" | 220 |
| 12" | 16" | 278 |
| 14" | 18" | 327 |
| 16" | 20" | 488 |
| 18" | 21" | 598 |
| 20" | 24" | 730 |

# IRRIGATION SYSTEMS

## IRRIGATION VALVES

The vineyard valve is a modification of the orchard valve. The riser is pierced with two or more small galvanized tubes which have small sliding galvanized gates. This arrangement allows a choice of direction and volume of water flow. This valve is found mainly in the Central San Joaquin Valley.

**VINEYARD VALVE**

| Valve Size | Riser Size | Number of Gates | Gate Size | Cost Installed |
|---|---|---|---|---|
| 3 1/2" | 8" | 2 | 2" | 83 |
| 3 1/2" | 8" | 2 | 2 1/2" | 86 |
| 3 1/2" | 8" | 2 | 3" | 91 |
| 3 1/2" | 8" | 3 | 2" | 93 |
| 3 1/2" | 10" | 2 | 2" | 89 |
| 3 1/2" | 10" | 2 | 2 1/2" | 90 |
| 3 1/2" | 10" | 2 | 3" | 90 |
| 4" | 8" | 2 | 2" | 91 |
| 4" | 8" | 2 | 2 1/2" | 92 |
| 4" | 8" | 2 | 3" | 96 |
| 4" | 10" | 2 | 2" | 93 |
| 4" | 10" | 2 | 2 1/2" | 95 |
| 4" | 10" | 2 | 3" | 101 |
| 4" | 10" | 3 | 2" | 99 |
| 4" | 10" | 4 | 2" | 103 |
| 5" | 10" | 4 | 2" | 125 |
| 5" | 12" | 2 | 3" | 122 |
| 6" | 10" | 2 | 3" | 109 |
| 6" | 10" | 4 | 3" | 125 |
| 6" | 12" | 2 | 3" | 130 |
| 6" | 12" | 2 | 4" | 137 |

# IRRIGATION SYSTEMS

## IRRIGATION VALVES

Gate valves have different designs depending on the use. The canal gate is for general low-pressure uses as canal discharges, pressure pipelines, etc. The screw-pressure gate is a high-pressure gate valve used for reservoirs, etc. The hub-end gate is designed for use in pipelines.

**GATE VALVES—COST PER VALVE**

| Size in Inches | Screw Pressure | Canal Gate | Hub-End Gate | Clamp Gate | Baxter Gate | Galvanized Gate |
|---|---|---|---|---|---|---|
| **6** | | | | | | 85 |
| **8** | 710 | | 1,130 | 470 | | 115 |
| **10** | 820 | 800 | 1,330 | 730 | | 125 |
| **12** | 930 | 810 | 1,570 | 780 | 1,250 | 145 |
| **14** | 1,200 | 950 | 1,890 | 1,040 | | 175 |
| **16** | 1,920 | 1,050 | 2,450 | 1,250 | 1,560 | 205 |
| **18** | 2,630 | 1,160 | 3,100 | | | 225 |
| **20** | 2,970 | 1,520 | 3,750 | | | 250 |
| **24** | 3,400 | 1,700 | 8,200 | | | 250 |
| **36** | | 3,120 | | | | |
| **48** | | 6,960 | | | | |
| **60** | | 12,400 | | | | |

***(Photographs shown on AH 534.61, page 12)***

Capped riser irrigation systems are generally found in old orange groves. The galvanized gates are diamond shaped.

**CAPPED RISERS**

| Size | Number of Gates | Size of Gates | Installed Cost |
|---|---|---|---|
| 8" | 2 | 2" | 44 |
| 8" | 3 | 1" | 45 |
| 8" | 4 | 1" | 51 |

**AIR RELIEF VALVES—COST PER VALVE**

| Size | Installed on PVC | Installed on Concrete Pipe |
|---|---|---|
| 2" | 130 | 150 |
| 3" | 215 | 240 |
| 4" | 275 | 350 |

# IRRIGATION SYSTEMS

## PERMANENT IRRIGATION SYSTEM

The larger set-ups are at lower end of range

**SPRINKLERS— "SOLID SET"—UNDER TREES**

| Type | Cost Per Acre |
|---|---|
| Manual system | $900 to $1,300 |
| Automatic system | $1,150 to $1,600 |
| Frost protection system | $1,260 to $1,820 |
| Automatic system with frost protection | $1,560 to $2,210 |

PVC underground lines, 12" risers, impact sprinkler heads, screen filter

**SPRINKLERS—"SOLID SET"—OVER VINES**

| Type | Cost Per Acre |
|---|---|
| Manual system | $1,050 to $1,350 |
| Automatic system | $1,350 to $1,650 |
| Frost protection system | $1,870 to $2,600 |
| Automatic system with frost protection | $2,190 to $3,230 |

PVC underground lines, 12" risers, impact sprinkler heads, screen filter

**DRIP SYSTEM—ORCHARD**

| Type | Cost Per Acre |
|---|---|
| New planting (1 to 4 emitters per tree) | $1,200 to $1,700 |
| Mature orchard (4 emitters per tree) | $1,300 to $1,900 |

**DRIP SYSTEM—VINEYARD**

| Type | Cost Per Acre | Total Cost |
|---|---|---|
| Ratio of cost—70 percent above ground, 30 percent below ground, add | $1,500 to $2,400 | |
| Elaborate sand filters (for dirty water-aqueduct and river water), add | $210 to $350 | |
| Fertilizer application equipment, add | | $800 to $950 |
| When proportion pumps are used, add | | $1,450 to $2,330 |

Market research indicates that most new irrigation systems installed for orchard and vineyard crops utilize drip systems. Automatic systems can add $300 to $400 to the total cost while frost protection can add 40 percent to 60 percent to the total cost.

# IRRIGATION SYSTEMS

## PERMANENT IRRIGATION SYSTEMS

### HOSE PULL SYSTEM

| Type | Cost Per Acre |
|---|---|
| Plus pump and filter | $550 to $700 |

### LINEAR OVERHEAD SPRINKLER SYSTEM

| Size | Cost Each |
|---|---|
| 320 Acres | $152,000 to $180,000 |

The linear overhead sprinkler system is used on a level parcel usually a one-half section of land. A canal runs through the parcel as a water supply.

***(Photographs shown on AH 534.61, page 13 and 14)***

### ELECTRIC CENTER PIVOT SPRINKLER—Including concrete base

| Size | Cost Each |
|---|---|
| 160 acres (130 acres net) – New | $52,000 to $60,000 |
| 160 acres (130 acres net) – Used 12-15 years | $22,000 to $30,000 |

***(Photographs shown on AH 534.61, page 15)***

| | |
|---|---|
| Concrete Structures | **$400** per cubic yard |
| Control Gates | **$200** |
| Hook-up and Connections | Between no charge and **$240** |

### CRIBBINGS

| Size in Inches | Cost Per Linear Foot |
|---|---|
| 24 | 153 |
| 30 | 204 |
| 36 | 224 |

The concrete riser above the valve is cut in half to direct the flow of water

# IRRIGATION SYSTEMS

## CONCRETE DITCHES

Costs are for one-half to one mile runs. Shorter runs are a little higher.

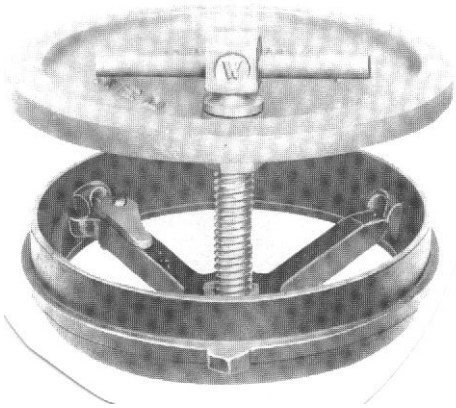
| Bottom | Depth | Cost Per Foot |
|---|---|---|
| 1' | 16" | 12.00 |
| 1' | 18" | 12.30 |
| 1' | 20" | 12.90 |
| 1' | 22" | 13.70 |
| 1' | 24" | 14.10 |
| 1' | 26" | 14.90 |
| 1' | 28" | 15.30 |
| 1' | 30" | 16.20 |
| 2' | 24" | 20.60 |
| 2' | 27" | 21.30 |
| 2' | 30" | 24.00 |
| 2' | 34" | 25.80 |
| 2' | 36" | 26.70 |
| 2' | 38" | 27.60 |
| 2' | 40" | 28.50 |
| 2' | 42" | 29.40 |
| 2' | 44" | 31.50 |
| 2' | 46" | 32.60 |
| 2' | 48" | 35.40 |

The above costs do not include end gates and turn out gates. They range from **$125 to $155** each (three joints 12" x 14" in diameter). Check gates cost **$450**.

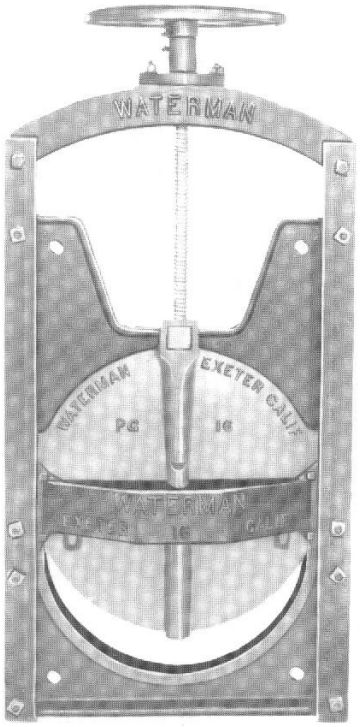
The above prices do include the land shaping.

# IRRIGATION SYSTEMS

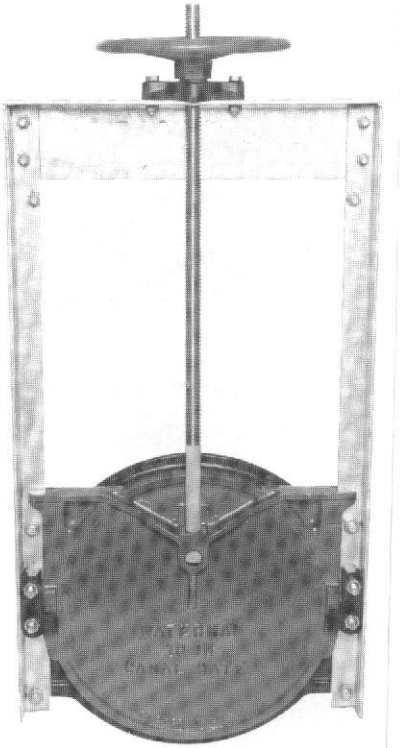
ALFALFA VALVE



YAKIMA VALVE




PRESSURE SLIDE GATE



CANAL GATE

HUB END GATE

# IRRIGATION SYSTEMS

LINEAR OVERHEAD SPRINKLER

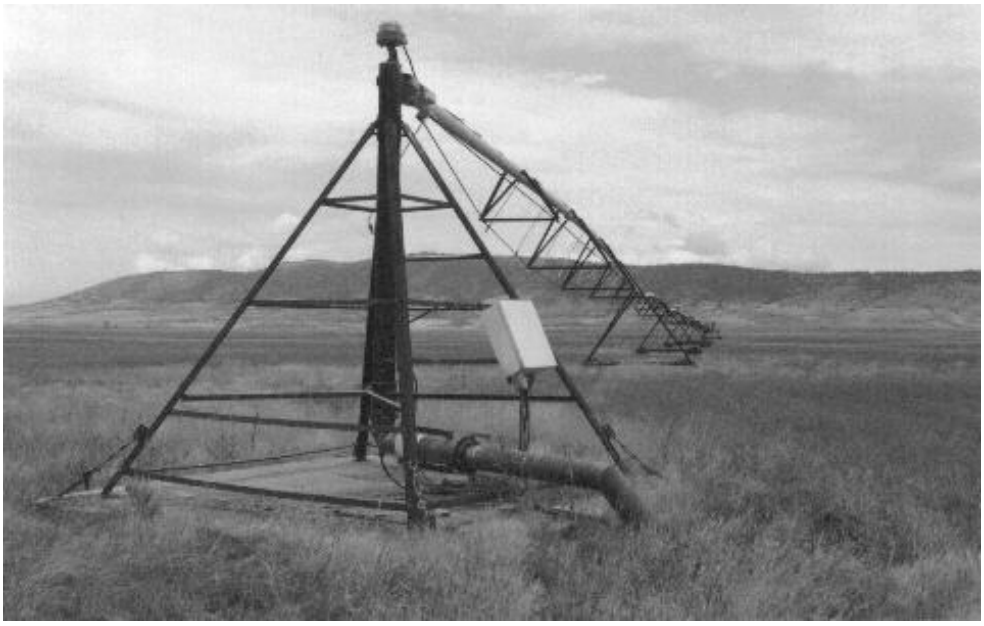
LINEAR OVERHEAD SPRINKLER

# IRRIGATION SYSTEM

LINEAR OVERHEAD SPRINKLER

LINEAR OVERHEAD SPRINKLER

# IRRIGATION SYSTEM



CENTER PIVOT SPRINKLER (PIVOT SIDE)

CENTER PIVOT SPRINKLER (OPPOSITE PIVOT)

# AH 534.62: PUMPS

This chapter contains specifications and costs for various pumps used with irrigation systems, including:

- Turbine pumps
- Diesel powered pumps
- Submersible pumps
- Wells
- Windmills

Photographs showing examples of the pumps discussed are shown at the end of this chapter.

### SAN JOAQUIN VALLEY BASE TURBINE PUMPS
### 3-PHASE FREE FLOW DISCHARGE

1,800 RPM, 5 to 350 HP installed, including pump complete in place with normal stages, power pole, pads, and control panel. Well and casing excluded.

## COST INSTALLED

| | Depth of Setting | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **HP** | **40'** | **60'** | **80'** | **100'** | **120'** | **140'** | **160'** | **180'** | **200'** | **220'** | **260'** | **300'** |
| 5 | 7,928 | 7,851 | 8,925 | 9,659 | 10,929 | | | | | | | |
| 8 | 8,006 | 8,006 | 9,297 | 9,896 | 11,859 | 12,747 | 14,121 | 15,123 | 16,332 | | | |
| 10 | 8,357 | 9,297 | 10,392 | 11,291 | 12,375 | 12,913 | 14,379 | 15,495 | 16,569 | 17,664 | 19,865 | |
| 15 | 9,752 | 10,692 | 11,838 | 12,789 | 13,770 | 13,770 | 15,474 | 16,714 | 18,150 | 19,296 | 21,962 | 24,069 |
| 20 | 12,459 | 13,260 | 13,520 | 14,893 | 15,579 | 16,338 | 17,087 | 17,888 | 19,292 | 20,831 | 23,327 | 25,522 |
| 25 | 13,260 | 13,655 | 14,872 | 16,484 | 17,087 | 17,670 | 19,094 | 20,498 | 21,913 | 23,098 | 23,702 | 26,114 |
| 30 | 14,882 | 15,673 | 16,255 | 17,295 | 18,096 | 19,094 | 20,114 | 21,102 | 22,110 | 23,327 | 25,137 | 27,134 |
| 40 | 16,463 | 16,869 | 17,295 | 18,283 | 20,488 | 21,705 | 22,922 | 24,128 | 25,334 | 26,114 | 29,099 | 31,158 |
| 50 | 17,087 | 19,094 | 21,102 | 22,100 | 23,098 | 24,138 | 25,137 | 26,114 | 29,130 | 30,150 | 34,164 | 36,171 |
| 60 | | 22,100 | 23,098 | 25,137 | 26,114 | 27,144 | 28,153 | 29,130 | 31,148 | 34,164 | 38,189 | 40,196 |
| 75 | | 25,147 | 26,114 | 29,130 | 30,285 | 31,169 | 32,167 | 34,164 | 36,171 | 38,189 | 44,242 | 46,228 |
| 100 | | 26,125 | 29,130 | 31,169 | 34,164 | 36,182 | 38,199 | 40,186 | 41,205 | 43,212 | 46,218 | 48,246 |
| 125 | | 31,169 | 34,164 | 36,171 | 38,189 | 40,196 | 43,212 | 45,219 | 48,547 | 52,250 | 56,815 | 58,219 |
| 150 | | | 36,171 | 37,773 | 40,217 | 43,212 | 46,228 | 48,235 | 50,253 | 55,266 | 60,310 | 62,296 |
| 200 | | | 38,189 | 39,042 | 44,242 | 50,253 | 52,260 | 56,285 | 58,292 | 62,317 | 68,349 | 70,283 |
| 250 | | | | | | 65,752 | 67,934 | 70,181 | 74,515 | 78,891 | 81,085 | 87,665 |
| 300 | | | | | | 76,719 | 78,902 | 83,310 | 87,665 | 89,859 | 94,246 | 96,428 |
| 350 | | | | | | 92,469 | 94,160 | 96,428 | 100,815 | 102,988 | 105,202 | 109,482 |

Note: The appraiser must know the horsepower and depth of setting in order to estimate the replacement cost new from the chart.

Turbine pumps are more commonly used than submersibles, primarily due to accessibility of the pump for maintenance purposes. Submersibles tend to exceed the cost of turbines at high settings and tend to be less costly at lower settings.

Add 10 percent to the above replacement cost new factors for irrigated sprinkler systems.

***(Photograph shown on AH 534.62, page 10)***

# PUMPS

## DIESEL POWERED DEEP WELL IRRIGATION PUMPS

The complete costs installed are divided into three parts: engines, gear heads, and below ground assembly. Costs are based on data from Fresno to the Southern San Joaquin Valley.

**DIESEL ENGINES NEW (Includes Tax and Delivery)**

| HP | Cost |
|---|---|
| 75 – 100 | $11,825 - $15,400 |
| 100 – 150 | $15,400 - $20,680 |
| 150 – 200 | $20,680 - $24,860 |
| 200 – 250 | $24,860 - $29,590 |
| 250 – 300 | $29,590 - $35,475 |
| 300 – 400 | $35,475 - $45,540 |

Reconditioned engines, deduct 20 to 30 percent

***(Photograph shown on AH 534.62, page 10)***

**GEAR HEADS**

| HP | DRIVE | SHAFT | FLANGES (2) | GUARD | LABOR | TOTAL |
|---|---|---|---|---|---|---|
| 100 | $2,580 | $675 | $375 | $190 | $1,765 | $5,585 |
| 125 | $2,795 | $800 | $495 | $190 | $1,765 | $6,045 |
| 150 | $3,430 | $800 | $495 | $190 | $1,765 | $6,680 |
| 200 | $4,180 | $800 | $495 | $190 | $1,765 | $7,430 |
| 250 | $6,955 | $1,235 | $615 | $190 | $1,765 | $10,760 |
| 300 | $7,675 | $1,235 | $615 | $190 | $1,765 | $11,480 |
| 350 | $8,985 | $1,235 | $615 | $190 | $1,765 | $12,790 |
| 400 | $11,115 | $1,365 | $615 | $190 | $1,765 | $15,050 |

**BELOW GROUND ASSEMBLY (Includes Column—Tube and Shaft and Bowls)**

| Gear Head HP | 200' Lift | 300' Lift | 400' Lift | 500' Lift | 600' Lift | 700' Lift |
|---|---|---|---|---|---|---|
| 100 | $21,400 | $25,900 | | | | |
| 125 | $27,650 | $32,350 | $35,900 | | | |
| 150 | $30,550 | $35,900 | $37,750 | | | |
| 200 | | $38,800 | $40,950 | $43,850 | | |
| 250 | | | | $46,550 | $49,450 | |
| 300 | | | | $48,500 | $51,400 | $54,300 |
| 400 | | | | | | $57,850 |

Add to engine and gear head figures.

RULE OF THUMB: The horsepower of the gear head will require an engine with bulk or gross horsepower of about 1-1/2 times the size of the gear head, i.e., 200 HP gear head x 1.5 = 300 HP engine. 300 bulk HP engine x 80 percent = continuous HP x 80 percent = 192 HP to gear head. NOTE: Costs do not include fuel tanks or fuel tank saddles.

# PUMPS

## DISCHARGE HEADS

| Discharge Size | Price Includes Head, Solenoid, Oiler, Column, Nipple, and Flange |
|---|---|
| 4" x 12" | $1,530 |
| 6" x 12" | $1,830 |
| 8" x 12" | $1,890 |
| 8" x 16 ½" | $2,370 |
| 10" x 20" | $2,760 |

## COLUMN ASSEMBLY (In 20' lengths)

| Column | Tube | Shaft | Cost Per Foot |
|---|---|---|---|
| 4" | 1 1/2" | 1" | 38 |
| 6" | 2" | 1 1/4" | 52 |
| 8" | 2 1/2" | 1 1/2" | 62 |
| 10" | 2 1/2" | 1 11/16" | 75 |
| 10" | 3" | 1 15/16" | 83 |
| 12" | 3" | 1 15/16" | 91 |
| 12" | 3 1/2" | 2 1/4" | 102 |

Column assembly in 10' lengths—add 10 percent

Reduce the above costs 10 percent for the San Joaquin Valley.

# PUMPS

**BOWLS**

| Stages | 8" | 10" | 12" | 14" | 16" |
|---|---|---|---|---|---|
| **1** | $1,660 | $2,010 | $2,630 | $3,880 | $5,500 |
| **2** | $1,790 | $2,480 | $3,260 | $4,730 | $6,000 |
| **3** | $2,170 | $2,950 | $4,180 | $5,740 | $9,610 |
| **4** | $2,630 | $3,550 | $4,850 | $6,670 | $9,770 |
| **5** | $3,270 | $4,030 | $5,910 | $8,150 | $12,090 |
| **6** | $3,400 | $4,730 | $6,520 | $9,460 | $13,640 |
| **7** | $3,730 | $5,290 | $7,300 | $10,780 | $15,510 |
| **8** | $4,030 | $5,900 | $8,150 | $12,090 | $17,060 |
| **9** | $4,580 | $6,570 | $9,150 | $13,030 | $19,070 |
| **10** | $4,880 | $6,830 | $9,770 | $14,350 | $20,860 |
| **11** | $5,340 | $7,450 | $10,620 | | |
| **12** | $5,890 | $8,150 | $11,400 | | |
| **13** | $6,190 | $8,750 | | | |
| **14** | $6,520 | $9,310 | | | |
| **15** | $7,140 | $9,770 | | | |

Reduce the above costs 10 percent for the San Joaquin Valley

| | | | |
|---|---|---|---|
| 5 HP | to | 7 1/2 HP | Use 8" bowls |
| 10 HP | to | 20 HP | Use 10" bowls |
| 25 HP | to | 60 HP | Use 12" bowls |
| 75 HP | to | 350 HP | Use 14" bowls up to 150' setting |

8" bowls—25' per stage (100' = 4 stages)
10" bowls—35' per stage (100' = 3 stages)
12" bowls—50' per stage (100' = 2 stages)
14" bowls—60' per stage (100' = 2 stages)

**CENTRIFUGAL BOOSTER PUMPS**

| Size | Cost |
|---|---|
| 10 HP | $3,600 - $4,150 |
| 20 HP | $4,500 - $5,150 |
| 30 HP | $5,450 - $5,800 |
| 40 HP | $6,150 - $6,650 |
| 50 HP | $7,400- $7,950 |
| 60 HP | $8,750 - $9,350 |
| 80 HP | $9,850 - $10,300 |
| 100 HP | $10,600 - $11,050 |

# PUMPS

**TURBINE BOOSTER PUMPS**

| Size | Cost |
|---|---|
| 40 HP | $8,700 |
| 50 HP | $9,600 |
| 60 HP | $11,200 |
| 75 HP | $12,400 |
| 100 HP | $13,300 |
| 125 HP | $17,000 |
| 150 HP | $18,900 |

## SUBMERSIBLE PUMPS

Costs are based on 3-phase, 3,600 RPM pump in a 6" to 18" well. They include normal stages, check valve, power pole, control panel, and installation labor at 0' setting. Costs are relative to settings—low for shallow, high for deep—for installations typical to the horsepower. Add riser pipe and wire costs per linear foot to setting depth. Add well and casing.

| HP | Motor, Pump, and Stages | Column Assembly | Recommended Well Size |
|---|---|---|---|
| 5 | 3,000 to 3,900 | $12.00 to $16.50 | 8" |
| 7 ½ | 3,900 to 4,600 | $12.00 to $16.50 | 8" |
| 10 | 4,400 to 4,900 | $12.00 to $16.50 | 8" to 10" |
| 15 | 5,000 to 5,900 | $14.00 to $19.00 | 10" to 12" |
| 20 | 6,100 to 6,900 | $14.00 to $21.50 | 12" |
| 25 | 6,500 to 7,400 | $17.50 to $23.50 | 12" |
| 30 | 8,400 to 9,700 | $17.50 to $23.50 | 12" |

High capacity—1,760 RPM (little used) for deep wells. Cost includes pump end and one stage, control panel, power pole, tax, and installation labor.

| HP | Motor and Pump | Stages | Riser Pipe and Wire Per Foot | Recommended Well Size |
|---|---|---|---|---|
| 40 | $12,400 + | $370 per stage | $21.00 | 12" |
| 50 | 13,500 + | 440 per stage | 26.20 | 14" |
| 60 | 14,600 + | 480 per stage | 26.20 | 14" |
| 75 | 15,600 + | 500 per stage | 26.20 | 14" |
| 100 | 16,800 + | 520 per stage | 26.20 | 14" |

# PUMPS

## SUBMERSIBLE PUMPS

### TAIL WATER PUMPS

| HP | Cost | HP | Cost |
|---|---|---|---|
| 2 | 4,000 | 20 | 7,800 |
| 3 | 4,200 | 25 | 8,400 |
| 5 | 4,600 | 30 | 8,700 |
| 7 ½ | 5,100 | 40 | 9,700 |
| 10 | 5,400 | 50 | 10,600 |
| 15 | 7,000 | | |

## WELLS

### REVERSE ROTARY DRILLING COSTS

**(Includes Casing, Gravel Pack, Cement Seal, Development of Well) Cost per foot of depth.**

| Size | To 700' | Over 700' | Over 1,000' |
|---|---|---|---|
| 6" 12 ga. | 34 | 46 | |
| 6" 10 ga. | 40 | | |
| 8" 12 ga. | 46 | | |
| 8" 10 ga. | 51 | | |
| 8" 3/16 in. | 56 | 54 | |
| 10" 10 ga. | 60 | | |
| 10" 3/16 in. | 63 | | |
| 10" 1/4 in. | 72 | 80 | |
| 12" 10 ga. | 73 | | |
| 12" 3/16 in. | 78 | | |
| 12" 1/4 in. | 87 | 96 | 95 |
| 14" 3/16 in. | 90 | | |
| 14" 1/4 in. | 99 | 129 | 131 |
| 14" 5/16 in. | 106 | 142 | 142 |
| 16" 3/16 in. | 98 | | |
| 16" 1/4 in. | 112 | | |
| 16" 5/16 in. | 121 | 166 | 166 |
| 18" 3/16 in. | 115 | | |
| 18" 1/4 in. | 137 | | |
| 18" 5/16 in. | 159 | 189 | 189 |
| 20" 3/16 in. | 129 | | |
| 20" 1/4 in. | 156 | | |
| 20" 5/16 in. | 183 | 215 | 215 |

# PUMPS

## WELLS

| Cable Tool Drilling | Cost Per Foot of Depth |
|---|---|
| 6" | $25 - $30 |
| 8" | $29 - $30 |
| 10" | $33 - $39 |
| 12" | $49 - $65 |
| 14" | $55 - $70 |
| 16" | $66 - $78 |
| 18" | $76 - $100 |

**State law requires 20' seal in all well shafts.**

| | |
|---|---|
| 6" | $ 550 |
| 8" | $ 850 |
| 10" | $1,075 |
| 12" | $1,075 |
| 14" | $1,350 |
| 16" | $1,350 |
| 18" | $1,350 |

## WINDMILLS

**FAN COST INSTALLED**

| Wheel or Fan Diameter | Weight (Pounds) | Cost | Installation | Total |
|---|---|---|---|---|
| 6' | 200 | 2,900 | 1,300 | 4,200 |
| 8' | 370 | 3,000 | 1,350 | 4,350 |
| 10' | 660 | 4,350 | 1,520 | 5,570 |
| 12' | 1,100 | 6,500 | 1,840 | 8,340 |
| 14' | 1,700 | 9,900 | 2,100 | 12,000 |
| 16' | 2,500 | 13,200 | 2,520 | 15,720 |

**TOWER COST INSTALLED**

| | Windmill Size | | | | |
|---|---|---|---|---|---|
| Tower Height | 6' - 8' Fan | 10' Fan | 12' Fan | 14' Fan | 16' Fan |
| 21' | 2,200 | 2,500 | | | |
| 27' | 2,850 | 3,300 | 3,900 | 4,000 | |
| 33' | 3,100 | 3,500 | 4,100 | 4,700 | 6,250 |
| 40' | 3,750 | 4,200 | 4,900 | 5,100 | 7,100 |
| 47' | 4,725 | 5,700 | 5,700 | 7,200 | 8,700 |

# PUMPS

## WINDMILLS

Windmill installation costs are estimated by considering the following:

- Tower height
- Fan diameter
- Force pump: size and diameter
- Cylinder: size and type
- Pipe: size and length
- Rod: material, size and length.

Force pump, cylinder pipe, rod, and miscellaneous costs range from **$920 to $2,800**

Example

| | |
|---|---|
| 10' Fan | $5,570 |
| 33' Tower | 3,500 |
| Force Pump, Cylinder Pipe, Rod and Miscellaneous Costs | 1,900 |
| | $10,970 |

Refurbished windmill: deduct 35 to 40 percent from above prices.

# PUMPS

## WINDMILLS

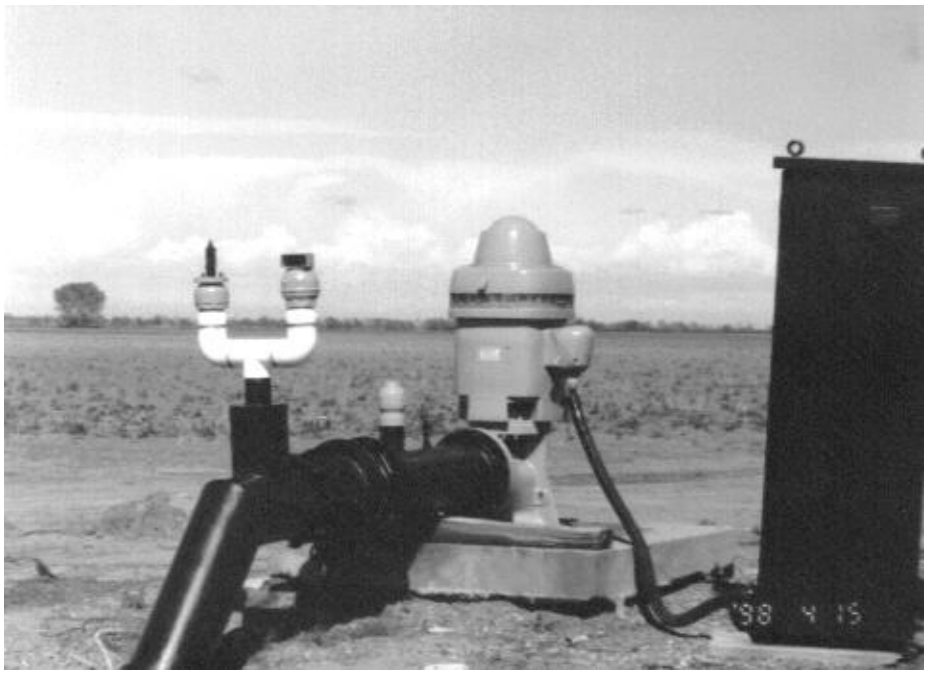
### WATER STORAGE TANKS

**GALVANIZED COVERED STORAGE TANKS**

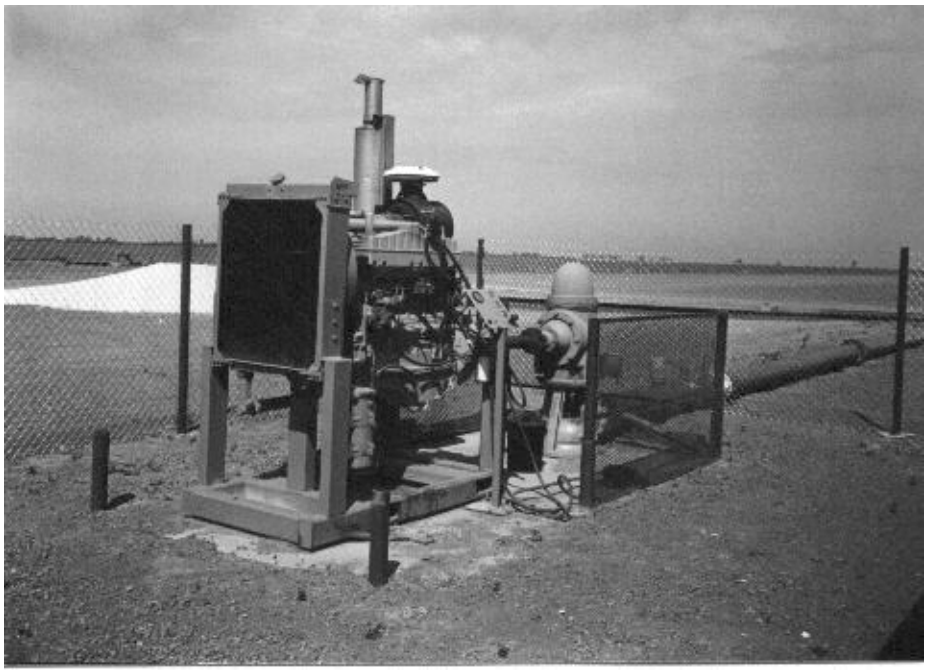
| Gallons | Diameter | Height | Gauge | Weight (Pounds) | Cost |
|---|---|---|---|---|---|
| 1,044 | 6' 8" | 48" | 12 | 670 | 1,430 |
| 1,504 | 8' 10" | 48" | 12 | 912 | 1,775 |
| 1,900 | 6' 4" | 96" | 12 | 1,014 | 1,850 |
| 2,500 | 7' 4" | 96" | 12 | 1,321 | 2,300 |
| 2,880 | 7' 10" | 96" | 12 | 1,329 | 2,460 |
| 3,200 | 8' 3" | 96" | 12 | 1,423 | 2,630 |
| 3,500 | 8' 8" | 96" | 12 | 1,520 | 2,825 |
| 4,200 | 9' 5 1/2" | 96" | 12 | 1,724 | 3,490 |
| 5,000 | 10' 4" | 96" | 12 | 1,924 | 3,720 |
| 5,500 | 10' 10" | 96" | 12 | 2,080 | 4,120 |
| 6,000 | 11' 4" | 96" | 12 | 2,163 | 4,290 |
| 6,500 | 11' 10" | 96" | 12 | 2,210 | 4,575 |
| 7,500 | 10' 4" | 12' | 12 | 2,553 | 4,975 |
| 8,600 | 9' 7" | 16' | 12 | 2,856 | 5,490 |
| 10,000 | 9' 9" | 18' | 12 | 3,169 | 6,360 |
| 12,000 | 10' 2" | 20' | 12 | 3,667 | 7,210 |
| 15,000 | 11' 11" | 18' | 10 | 5,376 | 9,495 |
| 17,500 | 11' 2" | 24' | 10 | 5,995 | 10,580 |
| 20,000 | 11' 11" | 24' | 10 | 6,480 | 12,300 |
| 25,000 | 18' 10" | 12' | 10 | 7,320 | 14,870 |
| 30,000 | 20' 9" | 12' | 10 | 8,500 | 16,875 |

Tanks should be set on a level foundation of ¾" crushed rock that is 4" to 6" deep

# PUMPS




TURBINE PUMP



DIESEL ENGINE
WITH GEAR HEAD DRIVE

# AH 534.71: CORRALS AND FENCES

This chapter contains various costs associated with corrals and fences. Specifications and costs are included for:

- Steel fencing
- Barbed wire fencing
- Wood fencing
- Wood gates
- Metal gates
- Metal panels
- Vinyl/PVC fencing
- Cattle squeeze

Photographs showing examples of equipment discussed are located at the end of the chapter.

## STEEL FENCING

| Height and Type | Fence Cost Per Linear Foot | Additions |
|---|---|---|
| 11 Gauge | | |
| 3' chain link | 8.65 | Top Rail: $1.75 per linear foot |
| 4' chain link | 9.70 | |
| 5' chain link | 12.50 | Barbed wire, 3 strands: |
| 6' chain link | 14.05 | $2.70 per linear foot |
| 8' chain link | 17.75 | |
| 10' chain link | 21.75 | Barbed coils: $9.45 per |
| 12' chain link | 26.70 | linear foot |
| 9 Gauge | | |
| 3' chain link | $9.80 | Barbed wire, 3 strands: |
| 4' chain link | 10.50 | $2.85 per linear foot on |
| 5' chain link | 12.50 | 10' and 12' fence |
| 6' chain link | 15.30 | |
| 8' chain link | 19.55 | |
| 10' chain link | 24.95 | |
| 12' chain link | 29.20 | |

Fences over 1,000 feet, deduct 10 percent.

# CORRALS AND FENCES

## BARBED WIRE FENCING

| Size and Type | Cost per Linear Foot/1 Mile or More |
|---|---|
| Barbed wire, 3 strand | $2.50 to $3.10 |
| Barbed wire, 4 strand | $2.75 to $3.30 |
| Barbed wire, 5 strand | $3.00 to $3.60 |
| 2 strands barbed, 32" woven wire, steel posts | $4.35 to $4.80 |

Fence costs are complete—fencing and posts. Gates are to be added. When gates are added, continue using the total linear distance of the fence for costing and do not deduct for the linear distance of the fence replaced by the gate. Posts are set in concrete on 10' centers.

## WOOD FENCING

**COST PER LINEAR FOOT**

| Rail Size | Post Size | Number of Rails | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 6 |
| 2" x 8" | 6" x 6" | 7.65 | 8.85 | 11.35 | 14.40 |
| 2" x 6" | 6" x 4" | 5.90 | 6.45 | 6.95 | 8.50 |
| 2" x 4" | 6" x 4" | 5.70 | 6.05 | 6.40 | 7.65 |
| 1" x 8" | 6" x 4" | 5.50 | 6.20 | 6.60 | 7.95 |
| 1" x 6" | 6" x 4" | 5.15 | 5.60 | 6.35 | 7.62 |
| 1 ¼" x 6" | 6" x 4" | 5.30 | 5.40 | 6.65 | 8.00 |
| 2" x 6" | 4" x 4" | 5.40 | 5.80 | 6.40 | 7.70 |

All posts figured at 8' on center.

## WOOD GATES

**COST PER GATE**

| Height/ Description | Width | | | | | | |
|---|---|---|---|---|---|---|---|
| | 4' | 6' | 8' | 10' | 12' | 16' | 20' |
| 4' 5 Rails | 60 | 76 | 97 | 187 | 193 | 213 | 227 |
| 5' 6 Rails | 75 | 90 | 144 | 203 | 218 | 235 | 250 |
| 6' 7 Rails | 88 | 104 | 208 | 222 | 242 | 255 | 276 |

# CORRALS AND FENCES

## METAL GATES

**COST PER GATE**

| Height/ Description | Width | | | | | |
|---|---|---|---|---|---|---|
| | 3' | 4' | 10' | 12' | 14' | 16' |
| 4' 1 3/8" Galvanized Tube Galvanized Fabric Including Hardware | 84 | 92 | 194 | 209 | 235 | 270 |
| 5' 1 5/8" Standard Pipe Fabric Including Hardware | 148 | 170 | 301 | 347 | 377 | 405 |
| 6' 1 5/8" Standard Pipe Fabric Including Hardware | 161 | 182 | 328 | 392 | 439 | 483 |

**5-BAR ADJUSTABLE GATES—5' IN HEIGHT**

| Size | Cost Per Gate |
|---|---|
| 3' to 4' | 95.00 |
| 4' to 6' | 105.00 |
| 6' to 8' | 134.00 |
| 8' to 10' | 152.00 |
| 10' to 12' | 165.00 |
| 12' to 14' | 197.00 |
| 14' to 16' | 233.00 |
| 16' to 20' | 297.00 |

**6-BAR ADJUSTABLE GATES—5' IN HEIGHT**

| Size | Cost Per Gate |
|---|---|
| 3' to 4' | 103.00 |
| 4' to 6' | 120.00 |
| 6' to 8' | 153.00 |
| 8' to 10' | 173.00 |
| 10' to 12' | 185.00 |
| 12' to 14' | 223.00 |
| 14' to 16' | 234.00 |
| 16' to 20' | 290.00 |

# CORRALS AND FENCES

## METAL PANELS

### 5-BAR ADJUSTABLE PANEL USED FOR STALLS OR PENS

| Size | Cost Per Gate |
|---|---|
| 8' to 10' | 128.00 |
| 10' to 12' | 148.00 |
| 12' to 14' | 159.00 |
| 14' to 16' | 185.00 |
| 16' to 18' | 207.00 |
| 18' to 20' | 224.00 |
| 20' to 22' | 240.00 |
| 22' to 24' | 246.00 |
| 24' to 26' | 262.00 |

Add for the hinge and latch posts - **$35 to $40**

### 6-BAR ADJUSTABLE PANEL USED FOR STALLS OR PENS

| Size | Cost Per Gate |
|---|---|
| 8' to 10' | 153.00 |
| 10' to 12' | 170.00 |
| 12' to 14' | 187.00 |
| 14' to 16' | 216.00 |
| 16' to 18' | 233.00 |
| 18' to 20' | 266.00 |
| 20' to 22' | 278.00 |
| 22' to 24' | 300.00 |
| 24' to 26' | 311.00 |

### 3-BAR FENCE PANEL

| Size | Cost Per Gate |
|---|---|
| 10' | 83.00 |
| 12' | 98.00 |
| 16' | 113.00 |
| 18' | 121.00 |
| 20' | 134.00 |
| 24' | 151.00 |

### PORTABLE LOADING CHUTE

| Size | Cost Per Gate |
|---|---|
| 30" x 5' High | 1,695 |

# CORRALS AND FENCES

## METAL PANELS

**5-BAR SOLID PANEL**

| Size | Cost Per Gate |
|---|---|
| 10' | 121.00 |
| 12' | 134.00 |
| 16' | 178.00 |
| 18' | 191.00 |
| 20' | 207.00 |
| 24' | 232.00 |

**6-BAR SOLID PANEL**

| Size | Cost Per Gate |
|---|---|
| 10' | 133.00 |
| 12' | 150.00 |
| 16' | 199.00 |
| 18' | 207.00 |
| 20' | 230.00 |
| 24' | 263.00 |

## VINYL/PVC FENCING

**White**

| Post Size | Rail Size | Number of Rails | Cost Per Linear Foot Installed |
|---|---|---|---|
| 5" x 5" | 1-1/2" x 5-1/2" x 16' | 3 | 16.05 |
| 5" x 5" | 1-1/2" x 5-1/2" x 16' | 4 | 16.90 |

Prices based on 1,000' +

**Height:** 60 inches

**Posts:** Set in concrete—10" diameter, 30" deep, 8' on center

**Gates:** 12' Metal gates (preferred)—$**745** installed, plus paint

12' PVC gates (have tendency to sag)—$**1,175** installed

**Color:** Add 10 percent

***(Photograph shown on AH 534.71, page 7)***

# CORRALS AND FENCES

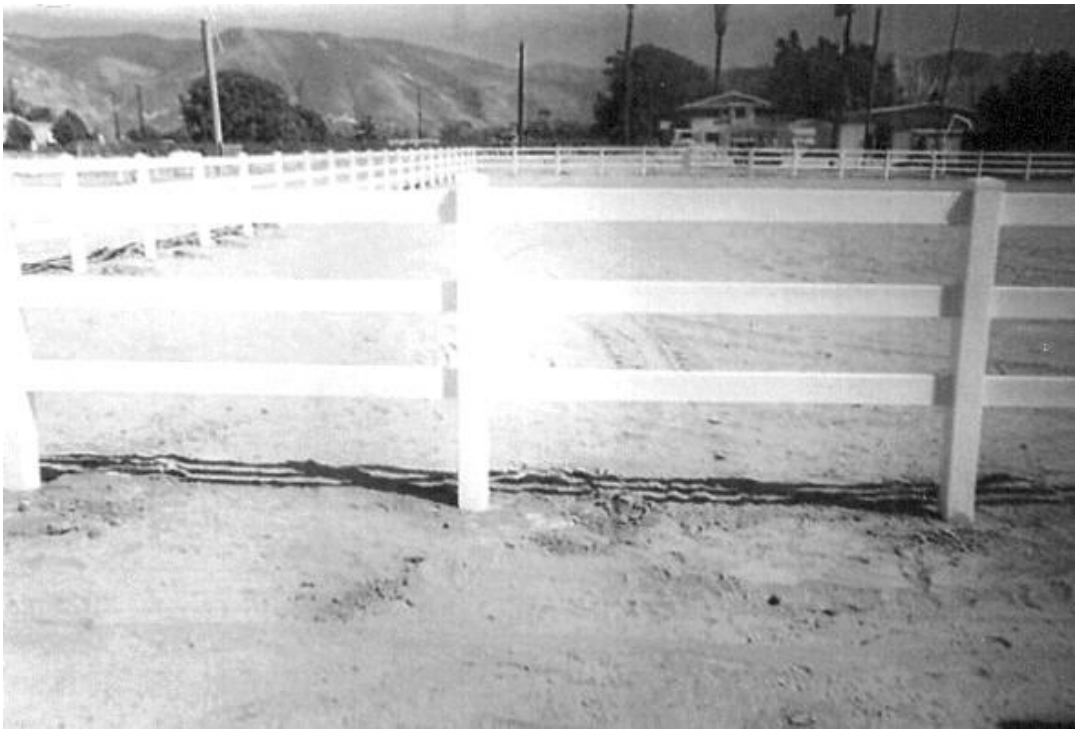
## CATTLE SQUEEZE

Examples may vary in cost significantly depending on manufacturer, model, and features. These listed costs are representative of models that range from economy to lower range deluxe models. High end hydraulic models produced by the highest quality manufacturers can be sold for amounts that exceed the listed costs by more than fifty percent.

| | |
|---|---|
| Hydraulic Metal | $10,500 to $14,500 |
| Upright Metal Economy Model | $2,400 to $2,900 |
| Upright Metal Extended/Deluxe | $4,800 to $6,500 |
| Calf Chute or Table | $1,500 to $2,000 |

***(Photograph shown on AH 534.71, page 8)***

# CORRALS AND FENCES



VINYL FENCING

CATTLE SQUEEZE

# AH 534.75: GREENHOUSES

All greenhouses are designed to provide a controlled and ideal environment in which to cultivate plants. While all greenhouses share the same objective, there are many different types of greenhouses made from various construction materials. This allows growers a great deal of freedom in choosing an appropriate configuration consistent with the needs of the plants being grown. Appropriate ventilation is important to prevent mold growth and to maintain an even temperature throughout the greenhouse. Some houses require misting systems to keep the relative humidity elevated for certain species of plants.

Commercial greenhouses are constructed with steel or wooden posts and trusses on a typical 10' center. The span of a truss is generally 20 to 40 feet. Typical commercial greenhouses use either glass or polycarbonate covers. Fiberglass or polyethylene plastic covers are cheaper alternative materials but generally need more frequent replacement. Sometimes a combination of materials can be used such as for the exterior and polyethylene in the interior to separate plants with different environmental requirements. High quality polyethylene is also available with infrared retention and anti-condensate properties. The energy savings for this type of polyethylene can reduce heating requirements significantly. Although requiring more frequent replacement than either glass or polycarbonate, the energy savings can make this an economic choice. Additionally, the anti-condensate properties reduce incidence of plant diseases, yet another benefit of using this product.

Basic building costs shown here are for the structure only and include only those components specified. The cost of other items or equipment such as a ventilation system or a watering system must be added to the basic building cost to arrive at a total cost.

Photographs showing examples of greenhouse types discussed are located at the end of this chapter.

- Wall heights vary from 7 feet to 10 feet on the straight wall construction.

**BUILDING SPECIFICATIONS**

| Components | Low Quality | Average Quality | High Quality |
|---|---|---|---|
| Wall and Roof | Light pipe, 4' wall, single light polyethylene cover, fiberglass ends | Galvanized steel frame, 8' wall, double polycarbonate or fiberglass cover | Heavy steel frame, 8' wall, glass or multi-wall polycarbonate cover |
| Floor | Dirt—some gravel | Gravel—some concrete walks | Adequate concrete walks, concrete foundation |
| Interior | No lighting, minimum water | Average lighting, water, and roof vents | Ample lighting, water, roof vents, and exhaust fans |

***(Photographs shown on AH 534.75, page 3)***

# GREENHOUSES

**SQUARE-FOOT COSTS**

| | Square-Foot Area | | | | | |
|---|---|---|---|---|---|---|
| **Quality** | **3,000-5,000** | **10,000** | **20,000** | **30,000** | **40,000** | **50,000** |
| **Low** | 4.16 | 3.74 | 3.64 | 3.43 | 3.02 | 2.81 |
| **Average** | 15.86 | 14.82 | 12.48 | 11.96 | 11.44 | 10.92 |
| **High** | 24.44 | 22.62 | 19.45 | 18.51 | 17.37 | 16.43 |

## ADDITIVES

| | |
|---|---|
| Additional concrete walk | **$3.43 to $3.90** per square foot |
| Benching | **$3.22 to $5.10** per square foot – average quality |
| Gravel floor | **$0.37 to $0.47** per square foot |

## SHADE CLOTH HOUSES

In anticipation of the threat of citrus greening disease (huanglongbing) many commercial citrus nursery stock growers have installed shade cloth houses to protect the mother plants that are used as a source for budwood in production of nursery stock. The Asian citrus psyllid, now found to be present in California, spreads the disease by feeding on new growth. The purpose of the shade cloth is to physically prevent the psyllid from entering the growing area to prevent transmitting the disease to the mother plants. For this type of installation the shade cloth will be installed on top and sides of the support structure to entirely screen out the psyllid. There is no treatment currently for the disease (caused by bacteria), so screening out the insect is the only preventive measure that can be taken by growers at this time. Once infected the fruit produced becomes unmarketable and leads to the premature death of the tree.

## FAIR TO LOW COST

**BUILDING SPECIFICATIONS**

| Components | Low Quality |
|---|---|
| Wall and Roof | Wood or steel post construction, no walls, overhead cable support with wire, covered by a flat shade fabric. Normally 7 feet to 9 feet high. |
| Floor | Dirt |
| Interior | No lighting, no water |

***(Photographs shown on AH 534.75, page 4)***

**SQUARE-FOOT COSTS**

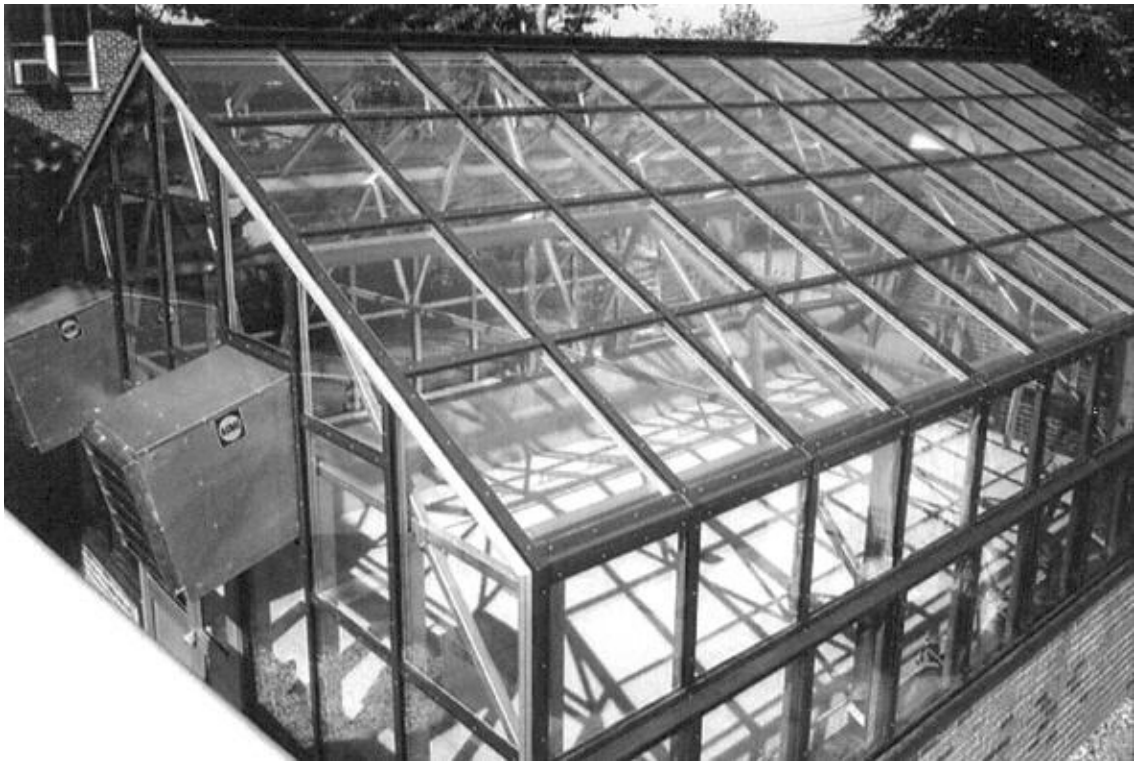
| Square-Foot Area | Cost Per Square Foot |
|---|---|
| Under 10,000 | $1.75 to $1.90 |
| 10,000 – 20,000 | $1.35 to $1.50 |
| 20,000 – 40,000 | $1.25 to $1.40 |
| 40,000 Up | $1.15 to $1.35 |

## ADDITIVE

| | |
|---|---|
| Gravel Floor | **$0.32 to $0.47** per square foot |

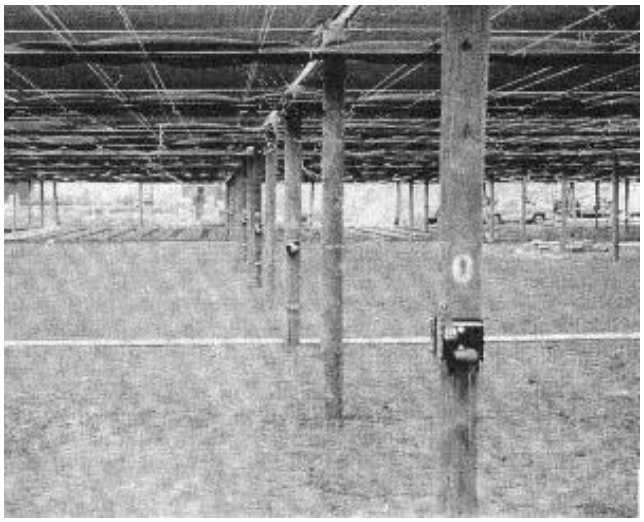
# GREENHOUSES

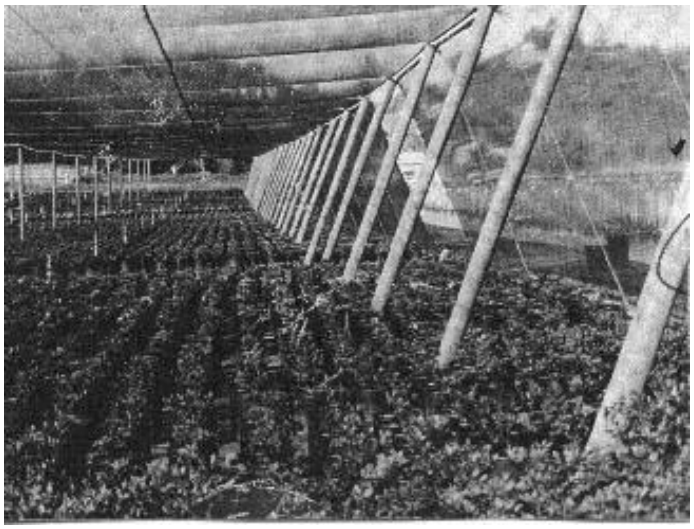
## CLIMATE CONTROL



# GREENHOUSES

## SHADE CLOTH HOUSES





# AH 534.76: LAND DEVELOPMENT AND DRAINAGE TILE

This chapter presents some of the costs incurred in the process of converting raw land to that which is suitable for its intended agricultural purpose. The land development portion provides costs for leveling of land, moving soil, and ripping of the land. The drainage portion provides drainage pipe costs to allow control of water on the land.

## LAND DEVELOPMENT

### LEVELING

| Item | Cost per Acre |
|---|---|
| Native Land | $385 to $750 |
| Ripping and Relieving | $440 to $700 |
| Touch-Up Leveling—Laser | $120 to $150 |
| Rescaping | $77 to $100 |

The cost of precision grading varies widely depending on the amount of soil moved, the distance the soil is moved, how far the earthmoving equipment must travel, and the costs of diesel fuel for the earthmoving equipment. Contractors charge $100 to $150 per hour for leveling land where the amount of soil to be moved is undetermined.

### EARTH MOVING

| Size | Cost |
|---|---|
| Per cubic yard | $.95 to $1.25 |

### RIPPING

| Item | Cost per Acre |
|---|---|
| Clay 5' deep | $440 to $520 |
| Clay 6' deep | $440 to $650 |
| Loamy or sandy soil | $275 to $440 |
| Hard pan 4' - 6' deep | $460 to $750 |

NOTE:

1. Ripping costs are based on four-foot centers.
2. Ripping cost with a slip plow attached to shank (superior mixing and breaking of soils) is typically done on six-foot centers, and the cost is equal to standard ripping on four-foot centers.
3. It typically takes ten hours to rip seven acres on four-foot centers.

# LAND DEVELOPMENT AND DRAINAGE TILE

## DRAINAGE

Modern drainage tile installations use corrugated plastic tubing. The spacing varies from 100 feet to 400 feet on centers. The older type installation includes perforated tile with wide trenches. A 5-inch corrugated plastic drain tubing is installed in a 12-inch trench versus a 24-inch to 27-inch trench for the older type installation. The cost for gravel fill is much less because of the narrower trench.

The installed cost of 5-inch corrugated plastic tubing on 400-foot centers, 7 1/2-feet deep including sump and pump, and trench width of 12 inches with gravel fill over the pipe is as follows.

**DRAINAGE PIPE**

| | |
|---|---|
| Loamy soils | $495 to $715 per acre |
| Rocky soils | $715 to $1,105 per acre |

Reduce the above cost 25 percent if system lacks a pump or sump.

Increase the above cost 25 percent if the system has 100-foot centers, with 4-inch lines

# AH 534.77: VINEYARD STAKES AND TRELLIS SYSTEMS

Vine training systems are used primarily to assist in good canopy management which is important due to its positive effect on yield, quality, vigor, and disease prevention of grapes resulting in potential profitability for a vineyard operation.

The selection of an appropriate grape variety with a compatible trellis system is of utmost importance in the growing of grapevines. Pruning and training the grapevine on a trellis system helps a grower develop the ideal balance of vegetative growth and fruit which can lead to higher production and better fruit quality while reducing the incidence of disease.

By managing the amount of sunlight reaching the fruit and fruiting buds, a grower can assure full ripening of the grapes during a growing season and increase chances that there will be more fruit production from fruiting buds the following year. Controlling sunlight levels in the canopy also limits sun damage to the fruit.

The ultimate selection of a grapevine trellis system depends on various factors such as the variety of grape and whether it is a table, raisin or wine grape. The vigor of a particular variety, soil fertility, and local climate conditions will also affect the selection. The popularity of any system may be influenced by recent research and studies or even by word of mouth among growers.

This chapter contains costs for various stake and trellis systems used in the production of table, raisin, and wine grapes. Miscellaneous vineyard component costs are also provided for the following:

- Wire price per acre
- Metal stakes and cross-arms
- Wood stakes and cross-arms
- Deer fence

Vineyard stakes and trellis costs can vary significantly due to differences in the following:

- Nature and quality of material
- Spacing between the rows of vines
- Type of vineyard
- Cost of labor (farm labor or commercial contractor)

The Useful Information page at the end of the chapter contains a conversion chart for wire sizes, along with a chart for the spacing of plants and an estimate of the amount of wire required.

Photographs showing examples of the improvements discussed are located at the end of this chapter.

# VINEYARD STAKES AND TRELLIS SYSTEMS

## TABLE GRAPES

### SINGLE CROSS-ARM

**10 FOOT ROWS**

| | Spacing —6' x 10' or 7 ' x 10' or 8' x 10' | | |
|---|---|---|---|
| | **Cost Per Unit** | **Posts Per Acre** | **Cost Per Acre** |
| Post and cross-arm assembly | $6.80 | | |
| Every 15 feet | $6.80 | 290 | $1,972 |
| Every 18 feet | $6.80 | 242 | $1,646 |
| Every 21 feet | $6.80 | 207 | $1,408 |
| Every 24 feet | $6.80 | 182 | $1,238 |
| Four wires | | | $478 |
| End post with anchor (installed) | $39.00 | 14 | $546 |
| End post without anchor (installed) | $30.00 | 14 | $420 |

**11 FOOT ROWS**

| | Spacing—6' x 11' or 7 ' x 11' or 8' x 11' | | |
|---|---|---|---|
| | **Cost Per Unit** | **Posts Per Acre** | **Cost Per Acre** |
| Post and cross-arm assembly | $6.80 | | |
| Every 15 feet | $6.80 | 264 | $1,795 |
| Every 18 feet | $6.80 | 220 | $1,496 |
| Every 21 feet | $6.80 | 188 | $1,278 |
| Every 24 feet | $6.80 | 165 | $1,122 |
| Four wires | | | $442 |
| End post with anchor (installed) | $39.00 | 13 | $507 |
| End post without anchor (installed) | $30.00 | 13 | $390 |

**12 FOOT ROWS**

| | Spacing—6' x 12' or 7 ' x 12' or 8' x 12' | | |
|---|---|---|---|
| | **Cost Per Unit** | **Posts Per Acre** | **Cost Per Acre** |
| Post and cross-arm assembly | $6.80 | | |
| Every 15 feet | $6.80 | 242 | $1,646 |
| Every 18 feet | $6.80 | 201 | $1,367 |
| Every 21 feet | $6.80 | 172 | $1,170 |
| Every 24 feet | $6.80 | 151 | $1,027 |
| Four wires | | | $390 |
| End post with anchor (installed) | $39.00 | 12 | $468 |
| End post without anchor (installed) | $30.00 | 12 | $360 |

Based on 600 foot rows

***(Photographs shown on AH 534.77, page 17)***

# VINEYARD STAKES AND TRELLIS SYSTEMS

## TABLE GRAPES

### DOUBLE CROSS-ARM

**10 FOOT ROWS**

| | Spacing—6' x 10' or 7 ' x 10' or 8' x 10' | | |
|---|---|---|---|
| | **Cost Per Unit** | **Posts Per Acre** | **Cost Per Acre** |
| Post and cross-arm assembly | $8.10 | | |
| Every 15 feet | $8.10 | 290 | $2,349 |
| Every 18 feet | $8.10 | 242 | $1,960 |
| Every 21 feet | $8.10 | 207 | $1,677 |
| Every 24 feet | $8.10 | 182 | $1,474 |
| Six wires | | | $715 |
| End post with anchor (installed) | $39.00 | 14 | $546 |
| End post without anchor (installed) | $30.00 | 14 | $420 |

**11 FOOT ROWS**

| | Spacing—6' x 11' or 7 ' x 11' or 8' x 11' | | |
|---|---|---|---|
| | **Cost Per Unit** | **Posts Per Acre** | **Cost Per Acre** |
| Post and cross-arm assembly | $8.10 | | |
| Every 15 feet | $8.10 | 264 | $2,138 |
| Every 18 feet | $8.10 | 220 | $1,782 |
| Every 21 feet | $8.10 | 188 | $1,523 |
| Every 24 feet | $8.10 | 165 | $1,337 |
| Six wires | | | $650 |
| End post with anchor (installed) | $39.00 | 13 | $507 |
| End post without anchor (installed) | $30.00 | 13 | $390 |

**12 FOOT ROWS**

| | Spacing—6' x 12' or 7 ' x 12' or 8' x 12' | | |
|---|---|---|---|
| | **Cost Per Unit** | **Posts Per Acre** | **Cost Per Acre** |
| Post and cross-arm assembly | $8.10 | | |
| Every 15 feet | $8.10 | 242 | $1,960 |
| Every 18 feet | $8.10 | 201 | $1,628 |
| Every 21 feet | $8.10 | 172 | $1,393 |
| Every 24 feet | $8.10 | 151 | $1,223 |
| Six wires | | | $600 |
| End post with anchor (installed) | $39.00 | 12 | $468 |
| End post without anchor (installed) | $30.00 | 12 | $360 |

Based on 600 foot rows

***(Photographs shown on AH 534.77, page 18)***

# VINEYARD STAKES AND TRELLIS SYSTEMS

## TABLE GRAPES/RAISINS

### OPEN GABLE TRELLIS

**10 FOOT ROWS**

| | Spacing—6' x 10' or 7 ' x 10' or 8' x 10' | | |
|---|---|---|---|
| | **Cost Per Unit** | **Posts Per Acre** | **Cost Per Acre** |
| Post and cross-arm assembly | $14.00 | | |
| Every 18 feet | $14.00 | | $3,388 |
| Every 21 feet | $14.00 | | $2,898 |
| Every 24 feet | $14.00 | | $2,548 |
| Six wires | | | $717 |
| Eight wires | | | $955 |
| End post with anchor (installed) | $39.00 | | $546 |

**11 FOOT ROWS**

| | Spacing—6' x 11' or 7 ' x 11' or 8' x 11' | | |
|---|---|---|---|
| | **Cost Per Unit** | **Posts Per Acre** | **Cost Per Acre** |
| Post and cross-arm assembly | $14.00 | | |
| Every 18 feet | $14.00 | 220 | $3,080 |
| Every 21 feet | $14.00 | 188 | $2,632 |
| Every 24 feet | $14.00 | 165 | $2,310 |
| Six wires | | | $652 |
| Eight wires | | | $867 |
| End post with anchor (installed) | $39.00 | 13 | $507 |

**12 FOOT ROWS**

| | Spacing—6' x 12' or 7 ' x 12' or 8' x 12' | | |
|---|---|---|---|
| | **Cost Per Unit** | **Posts Per Acre** | **Cost Per Acre** |
| Post and cross-arm assembly | $14.00 | | |
| Every 18 feet | $14.00 | 201 | $2,814 |
| Every 21 feet | $14.00 | 172 | $2,408 |
| Every 24 feet | $14.00 | 151 | $2,114 |
| Six wires | | | $598 |
| Eight wires | | | $796 |
| End post with anchor (installed) | $39.00 | 12 | $468 |

Based on 600 foot rows

***(Photographs shown on AH 534.77, page 19)***

# VINEYARD STAKES AND TRELLIS SYSTEMS

## RAISIN GRAPES

### TRELLIS

**10 FOOT ROWS**

| | Cost Per Unit | Posts Per Acre | Cost Per Acre | | |
|---|---|---|---|---|---|
| | | | 5' x 10' | 6' x 10' | 7' x 10' |
| Light 7' stake and 24" cross-arm | $5.85 | | | | |
| Every 5 feet | $5.85 | 871 | $5,095 | | |
| Every 6 feet | $5.85 | 726 | | $4,247 | |
| Every 7 feet | $5.85 | 622 | | | $3,639 |
| Two wires | | | $243 | $243 | $243 |
| End post | $30.00 | 14 | $423 | $423 | $423 |
| Light 7' stake with no cross-arm | $4.05 | | $3,528 | $2,940 | $2,519 |
| One wire | | | $121 | $121 | $121 |

**11 FOOT ROWS**

| | Cost Per Unit | Posts Per Acre | Cost Per Acre | | |
|---|---|---|---|---|---|
| | | | 5' x 11' | 6' x 11' | 7' x 11' |
| Light 7' stake and 24" cross-arm | $5.85 | | | | |
| Every 5 feet | $5.85 | 792 | $4,633 | | |
| Every 6 feet | $5.85 | 660 | | $3,861 | |
| Every 7 feet | $5.85 | 566 | | | $3,311 |
| Two wires | | | $220 | $220 | $220 |
| End post | $30.00 | 13 | $390 | $390 | $390 |
| Light 7' stake with no cross-arm | $4.05 | | $3,208 | $2,673 | $2,292 |
| One wire | | | $110 | $110 | $110 |

**12 FOOT ROWS**

| | Cost Per Unit | Posts Per Acre | Cost Per Acre | | |
|---|---|---|---|---|---|
| | | | 5' x 12' | 6' x 12' | 7' x 12' |
| Light 7' stake and 24" cross-arm | $5.85 | | | | |
| Every 5 feet | $5.85 | 726 | $4,247 | | |
| Every 6 feet | $5.85 | 605 | | $3,539 | |
| Every 7 feet | $5.85 | 518 | | | $3,030 |
| Two wires | | | $185 | $185 | $185 |
| End post | $30.00 | 12 | $360 | $360 | $360 |
| Light 7' stake with no cross-arm | $4.05 | | $2,940 | $2,450 | $2,098 |
| One wire | | | $92 | $92 | $92 |

***(Drawing and photograph shown on AH 534.77, page 20)***

# VINEYARD STAKES AND TRELLIS SYSTEMS

## RAISIN GRAPES

### OVERHEAD DRY ON VINE TRELLIS

Commonly used in 12' row with 6' between vines; occasionally used on 10' and 11' rows; a few 8' and 9' rows.

**Materials:** Wood post 12' on ends, 9' on sides, 10' wood post every third vine with 36" cross-arm, 8 wires per row, and cable support.

**Trellising Cost Per Acre:**
$5,500 to $5,900 on 6' x 12' spacing
$5,900 to $6,600 on 10' and 11' rows
$6,500 to $7,700 on 8' and 9' rows

***(Drawing and photograph shown on AH 534.77, page 21)***

### T-POST DRY ON VINE TRELLIS

**T-Posts:**
V8' T-post every 28' with two 10' cross-arms and 5 wires. In between T-posts are 2 bent 7' to 8' T-posts with 2 wires. Each vine will have a training stake. Each end has a heavy steel post with anchors.
Cost: **$2,800 to $3,400** for 7' x 12' spacing.

***(Photographs shown on AH 534.77, page 22)***

# VINEYARD STAKES AND TRELLIS SYSTEMS

## WINE GRAPES

### TRELLIS

**6 FOOT ROWS**

| | Cost Per Unit | Vines Per Acre | | |
|---|---|---|---|---|
| | | 1,815 | 1,452 | 1,210 |
| | | Cost Per Acre | | |
| | | 4' x 6' | 5' x 6' | 6' x 6' |
| 22 end posts per acre with anchor | $39 | $858 | $858 | $858 |
| 22 end posts per acre without anchor | $30 | $660 | $660 | $660 |
| 7' Light T-post (Add 30% for heavy T-post) | | | | |
| Every vine | $3.75 | $6,806 | $5,445 | $4,538 |
| Every other vine | $1.90 | $3,449 | $2,759 | $2,299 |
| Every third vine | $1.25 | $2,269 | $1,815 | $1,513 |
| Every fourth vine | $.94 | $1,706 | $1,365 | $1,137 |
| 8' Vertical line post (13 ga.) | | | | |
| Every vine | $8.05 | $14,611 | $11,689 | $9,741 |
| Every other vine | $4.03 | $7,314 | $5,852 | $4,876 |
| Every third vine | $2.68 | $4,864 | $3,891 | $3,243 |
| Every fourth vine | $2.00 | $3,630 | $2,904 | $2,420 |
| 4' Rebar or pencil rod at each vine (between T-post or vertical line) | $.72 | | | |
| One rebar between posts | $.36 | $653 | $523 | $436 |
| Two rebars between posts | $.48 | $871 | $697 | $581 |
| Three rebars between posts | $.54 | $980 | $784 | $653 |
| 24" cross-arm (Add 25% for 30" cross-arm) | | | | |
| Every vine | $1.85 | $3,358 | $2,686 | $2,239 |
| Every other vine | $.93 | $1,688 | $1,350 | $1,125 |
| Every third vine | $.62 | $1,125 | $900 | $750 |
| Every fourth vine | $.46 | $835 | $668 | $557 |
| Two wires | | $380 | $380 | $380 |
| Three wires | | $572 | $572 | $572 |
| Four wires | | $762 | $762 | $762 |
| Five wires | | $953 | $953 | $953 |
| Six wires | | $1,145 | $1,145 | $1,145 |
| Seven wires | | $1,335 | $1,335 | $1,335 |
| Eight wires | | $1,525 | $1,525 | $1,525 |

***(Photographs shown on AH 534.77, pages 23-28)***

# VINEYARD STAKES AND TRELLIS SYSTEMS

## WINE GRAPES

### TRELLIS

**7 FOOT ROWS**

| | Cost Per Unit | Vines Per Acre | | | |
|---|---|---|---|---|---|
| | | 1,555 | 1,245 | 1,037 | 889 |
| | | Cost Per Acre | | | |
| | | 4' x 7' | 5' x 7' | 6' x 7' | 7' x 7' |
| 20 end posts per acre with anchor | $39 | $780 | $780 | $780 | $780 |
| 20 end posts per acre without anchor | $30 | $600 | $600 | $600 | $600 |
| 7' Light T-post (Add 30% for heavy T-post) | | | | | |
| Every vine | $3.75 | $5,831 | $4,669 | $3,889 | $3,334 |
| Every other vine | $1.88 | $2,916 | $2,334 | $1,944 | $1,667 |
| Every third vine | $1.25 | $1,914 | $1,556 | $1,296 | $1,111 |
| Every fourth vine | $.94 | $1,458 | $1,167 | $972 | $833 |
| 8' Vertical line post (13 ga.) | | | | | |
| Every vine | $8.05 | $12,518 | $10,022 | $8,348 | $7,156 |
| Every other vine | $4.03 | $6,259 | $5,011 | $4,174 | $3,578 |
| Every third vine | $2.68 | $4,173 | $3,341 | $2,783 | $2,385 |
| Every fourth vine | $2.00 | $3,110 | $2,490 | $2,074 | $1,778 |
| 4' Rebar or pencil rod at each vine (between T-post or vertical line) | $.72 | | | | |
| One rebar between posts | $.36 | $560 | $448 | $373 | $320 |
| Two rebars between posts | $.48 | $747 | $598 | $498 | $427 |
| Three rebars between posts | $.54 | $836 | $669 | $557 | $478 |
| 24" cross-arm (Add 25% for 30" cross-arm) | | | | | |
| Every vine | $1.85 | $2,877 | $2,303 | $1,918 | $1,645 |
| Every other vine | $.93 | $1,438 | $1,152 | $959 | $822 |
| Every third vine | $.62 | $959 | $768 | $639 | $548 |
| Every fourth vine | $.46 | $719 | $576 | $480 | $411 |
| Two wires | | $324 | $324 | $324 | $324 |
| Three wires | | $491 | $491 | $491 | $491 |
| Four wires | | $654 | $654 | $654 | $654 |
| Five wires | | $818 | $818 | $818 | $818 |
| Six wires | | $980 | $980 | $980 | $980 |
| Seven wires | | $1,144 | $1,144 | $1,144 | $1,144 |
| Eight wires | | $1,295 | $1,295 | $1,295 | $1,295 |

***(Photographs shown on AH 534.77, pages 23-28)***

# VINEYARD STAKES AND TRELLIS SYSTEMS

## WINE GRAPES

### TRELLIS

**8 FOOT ROWS**

| | Cost Per Unit | Vines Per Acre | | | |
|---|---|---|---|---|---|
| | | 1,089 | 907 | 778 | 681 |
| | | Cost Per Acre | | | |
| | | 5' x 8' | 6' x 8' | 7' x 8' | 8' x 8' |
| 18 end posts per acre with anchor | $39 | $702 | $702 | $702 | $702 |
| 18 end posts per acre without anchor | $30 | $540 | $540 | $540 | $540 |
| 7' Light T-post (Add 30% for heavy T-post) | | | | | |
| Every vine | $3.75 | $4,084 | $3,401 | $2,918 | $2,554 |
| Every other vine | $1.88 | $2,047 | $1,705 | $1,463 | $1,280 |
| Every third vine | $1.25 | $1,361 | $1,134 | $973 | $851 |
| Every fourth vine | $.94 | $1,024 | $853 | $731 | $640 |
| 8' Vertical line post (13 ga.) | | | | | |
| Every vine | $8.05 | $8,766 | $7,301 | $6,263 | $5,482 |
| Every other vine | $4.03 | $4,389 | $3,655 | $3,135 | $2,744 |
| Every third vine | $2.68 | $2,919 | $2,431 | $2,085 | $1,825 |
| Every fourth vine | $2.00 | $2,178 | $1,814 | $1,556 | $1,362 |
| 4' Rebar or pencil rod at each vine (between T-post or vertical line) | $.72 | | | | |
| One rebar between posts | $.36 | $392 | $327 | $280 | $245 |
| Two rebars between posts | $.48 | $523 | $435 | $373 | $327 |
| Three rebars between posts | $.54 | $588 | $490 | $420 | $368 |
| 24" cross-arm (Add 25% for 30" cross-arm) | | | | | |
| Every vine | $1.85 | $2,015 | $1,678 | $1,439 | $1,260 |
| Every other vine | $.93 | $1,013 | $844 | $724 | $633 |
| Every third vine | $.62 | $675 | $562 | $482 | $422 |
| Every fourth vine | $.46 | $501 | $417 | $358 | $313 |
| Two wires | | $288 | $288 | $288 | $288 |
| Three wires | | $431 | $431 | $431 | $431 |
| Four wires | | $572 | $572 | $572 | $572 |
| Five wires | | $716 | $716 | $716 | $716 |
| Six wires | | $861 | $861 | $861 | $861 |
| Seven wires | | $1,005 | $1,005 | $1,005 | $1,005 |
| Eight wires | | $1,146 | $1,146 | $1,146 | $1,146 |

***(Photographs shown on AH 534.77, pages 23-28)***

# VINEYARD STAKES AND TRELLIS SYSTEMS

## WINE GRAPES

### TRELLIS

**9 FOOT ROWS**

| | Cost Per Unit | Vines Per Acre | | | |
|---|---|---|---|---|---|
| | | 968 | 807 | 691 | 605 |
| | | Cost Per Acre | | | |
| | | 5' x 9' | 6' x 9' | 7' x 9' | 8' x 9' |
| 16 end posts per acre with anchor | $39 | $624 | $624 | $624 | $624 |
| 16 end posts per acre without anchor | $30 | $480 | $480 | $480 | $480 |
| 7' Light T-post (Add 30% for heavy T-post) | | | | | |
| Every vine | $3.75 | $3,630 | $3,026 | $2,591 | $2,269 |
| Every other vine | $1.88 | $1,820 | $1,517 | $1,299 | $1,137 |
| Every third vine | $1.25 | $1,210 | $1,009 | $864 | $756 |
| Every fourth vine | $.94 | $910 | $759 | $650 | $569 |
| 8' Vertical line post (13 ga.) | | | | | |
| Every vine | $8.05 | $7,792 | $6,496 | $5,563 | $4,870 |
| Every other vine | $4.03 | $3,901 | $3,252 | $2,785 | $2,438 |
| Every third vine | $2.68 | $2,594 | $2,163 | $1,852 | $1,621 |
| Every fourth vine | $2.00 | $1,936 | $1,614 | $1,382 | $1,210 |
| 4' Rebar or pencil rod at each vine (between T-post or vertical line) | $.72 | | | | |
| One rebar between posts | $.36 | $348 | $291 | $249 | $218 |
| Two rebars between posts | $.48 | $465 | $387 | $332 | $290 |
| Three rebars between posts | $.54 | $523 | $436 | $373 | $327 |
| 24" cross-arm (Add 25% for 30" cross-arm) | | | | | |
| Every vine | $1.85 | $1,791 | $1,493 | $1,278 | $1,119 |
| Every other vine | $.93 | $900 | $751 | $643 | $563 |
| Every third vine | $.62 | $600 | $500 | $428 | $375 |
| Every fourth vine | $.46 | $445 | $371 | $318 | $278 |
| Two wires | | $271 | $271 | $271 | $271 |
| Three wires | | $405 | $405 | $405 | $405 |
| Four wires | | $542 | $542 | $542 | $542 |
| Five wires | | $678 | $678 | $678 | $678 |
| Six wires | | $813 | $813 | $813 | $813 |
| Seven wires | | $950 | $950 | $950 | $950 |
| Eight wires | | $1,156 | $1,156 | $1,156 | $1,156 |

***(Photographs shown on AH 534.77, pages 23-28)***

# VINEYARD STAKES AND TRELLIS SYSTEMS

## WINE GRAPES

### TRELLIS

**10 FOOT ROWS**

| | Cost Per Unit | Vines Per Acre | | | |
|---|---|---|---|---|---|
| | | 871 | 726 | 622 | 544 |
| | | Cost Per Acre | | | |
| | | 5' x 10' | 6' x 10' | 7' x 10' | 8' x 10' |
| 14 end posts per acre with anchor | $39 | $546 | $546 | $546 | $546 |
| 14 end posts per acre without anchor | $30 | $420 | $420 | $420 | $420 |
| 7' Light T-post (Add 30% for heavy T-post) | | | | | |
| Every vine | $3.75 | $3,266 | $2,723 | $2,333 | $2,040 |
| Every other vine | $1.88 | $1,637 | $1,365 | $1,169 | $1,023 |
| Every third vine | $1.25 | $1,089 | $908 | $778 | $680 |
| Every fourth vine | $.94 | $819 | $682 | $585 | $511 |
| 8' Vertical line post (13 ga.) | | | | | |
| Every vine | $8.05 | $7,012 | $5,844 | $5,007 | $4,379 |
| Every other vine | $4.03 | $3,510 | $2,926 | $2,507 | $2,192 |
| Every third vine | $2.68 | $2,334 | $1,946 | $1,667 | $1,458 |
| Every fourth vine | $2.00 | $1,742 | $1,452 | $1,244 | $1,088 |
| 4' Rebar or pencil rod at each vine (between T-post or vertical line) | $.72 | | | | |
| One rebar between posts | $.36 | $314 | $261 | $224 | $196 |
| Two rebars between posts | $.48 | $418 | $348 | $299 | $261 |
| Three rebars between posts | $.54 | $470 | $392 | $336 | $294 |
| 24" cross-arm (Add 25% for 30" cross-arm) | | | | | |
| Every vine | $1.85 | $1,611 | $1,343 | $1,151 | $1006 |
| Every other vine | $.93 | $810 | $675 | $578 | $506 |
| Every third vine | $.62 | $540 | $450 | $386 | $337 |
| Every fourth vine | $.46 | $401 | $334 | $286 | $250 |
| Two wires | | $243 | $243 | $243 | $243 |
| Three wires | | $365 | $365 | $365 | $365 |
| Four wires | | $488 | $488 | $488 | $488 |
| Five wires | | $583 | $583 | $583 | $583 |
| Six wires | | $731 | $731 | $731 | $731 |
| Seven wires | | $853 | $853 | $853 | $853 |
| Eight wires | | $974 | $974 | $974 | $974 |

***(Photographs shown on AH 534.77, pages 23-28)***

# VINEYARD STAKES AND TRELLIS SYSTEMS

## WINE GRAPES

### TRELLIS

**11 FOOT ROWS**

| | Cost Per Unit | Vines Per Acre | | | |
|---|---|---|---|---|---|
| | | 792 | 660 | 566 | 495 |
| | | Cost Per Acre | | | |
| | | 5' x 11' | 6' x 11' | 7' x 11' | 8' x 11' |
| 13 end posts per acre with anchor | $39 | $507 | $507 | $507 | $507 |
| 13 end posts per acre without anchor | $30 | $390 | $390 | $390 | $390 |
| 7' Light T-post (Add 30% for heavy T-post) | | | | | |
| Every vine | $3.75 | $2,970 | $2,475 | $2,123 | $1,856 |
| Every other vine | $1.88 | $1,489 | $1,241 | $1,064 | $931 |
| Every third vine | $1.25 | $990 | $825 | $708 | $619 |
| Every fourth vine | $.94 | $744 | $620 | $532 | $465 |
| 8' Vertical line post (13 ga.) | | | | | |
| Every vine | $8.05 | $6,376 | $5,313 | $4,556 | $3,985 |
| Every other vine | $4.03 | $3,192 | $2,660 | $2,281 | $1,995 |
| Every third vine | $2.68 | $2,123 | $1,769 | $1,517 | $1,327 |
| Every fourth vine | $2.00 | $1,584 | $1,320 | $1,132 | $990 |
| 4' Rebar or pencil rod at each vine (between T-post or vertical line) | $.72 | | | | |
| One rebar between posts | $.36 | $285 | $238 | $204 | $178 |
| Two rebars between posts | $.48 | $380 | $317 | $272 | $238 |
| Three rebars between posts | $.54 | $428 | $356 | $306 | $267 |
| 24" cross-arm (Add 25% for 30" cross-arm) | | | | | |
| Every vine | $1.85 | $1,465 | $1,221 | $1,047 | $916 |
| Every other vine | $.93 | $737 | $614 | $526 | $460 |
| Every third vine | $.62 | $491 | $409 | $351 | $307 |
| Every fourth vine | $.46 | $364 | $304 | $260 | $228 |
| Two wires | | $221 | $221 | $221 | $221 |
| Three wires | | $333 | $333 | $333 | $333 |
| Four wires | | $441 | $441 | $441 | $441 |
| Five wires | | $551 | $551 | $551 | $551 |
| Six wires | | $665 | $665 | $665 | $665 |
| Seven wires | | $775 | $775 | $775 | $775 |
| Eight wires | | $885 | $885 | $885 | $885 |

***(Photographs shown on AH 534.77, page 23-28)***

# VINEYARD STAKES AND TRELLIS SYSTEMS

## WINE GRAPES

### LYRE SYSTEM

**11 FOOT ROWS**

| | Cost Per Unit | Vines Per Acre | | | |
|---|---|---|---|---|---|
| | | 792 | 660 | 566 | 495 |
| | | Cost Per Acre | | | |
| | | 5' x 11' | 6' x 11' | 7' x 11' | 8' x 11' |
| 13 end posts per acre with anchor | $39 | $507 | $507 | $507 | $507 |
| 13 end posts per acre without anchor | $30 | $390 | $390 | $390 | $390 |
| Heavy steel stake with open lyre cross-arm | | | | | |
| Every vine | $15.60 | | | | |
| Every other vine | $7.80 | $6,178 | $5,148 | $4,415 | $3,861 |
| Every third vine | $5.20 | $4,118 | $3,432 | $2,943 | $2,574 |
| Every fourth vine | $3.90 | $3,089 | $2,574 | $2,207 | $1931 |
| 4' Rebar or pencil rod at each vine (between lyre cross-arm) | $.72 | | | | |
| One rebar between lyres | $.36 | $285 | $238 | $204 | $178 |
| Two rebars between lyres | $.48 | $380 | $317 | $272 | $238 |
| Three rebars between lyres | $.54 | $428 | $356 | $306 | $267 |
| Six wires | | $665 | $665 | $665 | $665 |
| Seven wires | | $775 | $775 | $775 | $775 |
| Eight wires | | $885 | $885 | $885 | $885 |
| Nine wires | | $993 | $993 | $993 | $993 |
| Ten wires | | $1,104 | $1,104 | $1,104 | $1,104 |

***(Drawing and photograph shown on AH 534.77, page 25)***

# VINEYARD STAKES AND TRELLIS SYSTEMS

## WINE GRAPES

### LYRE SYSTEM

**12 FOOT ROWS**

| | Cost Per Unit | Vines Per Acre | | | |
|---|---|---|---|---|---|
| | | 726 | 605 | 518 | 454 |
| | | Cost Per Acre | | | |
| | | 5' x 12' | 6' x 12' | 7' x 12' | 8' x 12' |
| 12 end posts per acre with anchor | $39 | $468 | $468 | $468 | $468 |
| 12 end posts per acre without anchor | $30 | $360 | $360 | $360 | $360 |
| Heavy steel stake with open lyre cross-arm | | | | | |
| Every vine | $15.60 | | | | |
| Every other vine | $7.80 | $5,663 | $4,719 | $4,040 | $3,541 |
| Every third vine | $5.20 | $3,775 | $3,146 | $2,694 | $2,361 |
| Every fourth vine | $3.90 | $2,831 | $2,360 | $2,020 | $1,771 |
| 4' Rebar or pencil rod at each vine (between lyre cross-arm) | $.72 | | | | |
| One rebar between lyres | $.36 | $261 | $218 | $186 | $163 |
| Two rebars between lyres | $.48 | $348 | $290 | $249 | $218 |
| Three rebars between lyres | $.54 | $392 | $327 | $280 | $245 |
| Six wires | | $608 | $608 | $608 | $608 |
| Seven wires | | $712 | $712 | $712 | $712 |
| Eight wires | | $813 | $813 | $813 | $813 |
| Nine wires | | $914 | $914 | $914 | $914 |
| Ten wires | | $1,009 | $1,009 | $1,009 | $1,009 |

***(Drawing and photograph shown on AH 534.77, page 25)***

# VINEYARD STAKES AND TRELLIS SYSTEMS

## MISCELLANEOUS

### COMPONENT COSTS TO CALCULATE COSTS PER ACRE

**WIRE PRICE PER ACRE**

| Based on 10' spacing between rows of vines and 13 gauge wire | |
|---|---|
| 2 wire | $238 |
| 3 wire | $358 |
| 4 wire | $478 |
| 5 wire | $598 |
| 6 wire | $717 |

**METAL STAKES AND CROSS-ARMS**

| T-Post Stakes and Training Stakes | | | Metal Cross-arms With U Bolts (Medium Grade) | |
|---|---|---|---|---|
| 7' | .95 lbs/ft | $3.69 | 6" | $.89 |
| 7' | 1.25 lbs/ft | $4.58 | 12" | $1.01 |
| 6' | .95 lbs/ft | $3.15 | 18" | $1.40 |
| 6' | 1.25 lbs/ft | $3.91 | 24" | $1.79 |
| 5' | .95 lbs/ft | $2.62 | 30" to 34" | $2.54 |
| 4' | Rebar Training Stake | $.70 | 36" | $2.66 |
| 4' | ¼" Steel Training Stake | $.59 | 48" | $3.56 |

Heavy duty elaborate galvanized cross-arms can run 40 to 50 percent more.

**WOOD STAKES AND CROSS-ARMS**

| Stakes | | | Cross-arms With Clips | | Cross-arms With U-Bolts | |
|---|---|---|---|---|---|---|
| 5' | 1 ¾" sq | $1.62 | 12" | $.56 | 12" | $.56 - $.67 |
| 6' | 1 ¾" sq | $1.96 | 24" | $.73 | 24" | $.90 - $1.12 |
| 7' | 1 ¾" sq | $2.35 | 30" | $.84 | 30" | $.1.06 - $1.18 |
| 8' | 3" to 4" | $4.31 – $5.54 | 36" | $.1.06 | 36" | $1.18 - $1.28 |

Price varies with quality

4' Pencil rod and rebar **$.68 to $.76** each

T-post with J.R. wire clips
7' heavy T-post: **$4.90** installed
7' light T-post: **$3.75** installed

Vertical line post with wire slots
8' Vertical line post (13 ga): **$8.05** installed
J.R. clips: **$.32** each

Steel end post with spade
**$25.00** to **$26.00** each
**$3.50** install

Screw-in earth anchor
6" x 48" : **$7.53** 6" x 36" : **$6.72**
**$4.80** install

***(Photographs shown on AH 534.77, page 26, 27, and 28)***

7' Deer fence made with 9' T-post and 9' wood stakes
6 ½' woven wire with 2 barbed wires on top and steel gates at drives
Cost: **$4.90** to **$6.35** per linear foot

***(Photographs shown on AH 534.77, page 29)***

# VINEYARD STAKES AND TRELLIS SYSTEMS

## USEFUL INFORMATION

### WIRE

| | |
|---|---|
| 10 Gauge | 2,060 ft. Per 100 lbs. roll |
| 11 Gauge | 2,580 ft. Per 100 lbs. roll |
| 12 Gauge | 3,370 ft. Per 100 lbs. roll |
| 13 Gauge | 4,470 ft. Per 100 lbs. roll |
| 14 Gauge | 5,860 ft. Per 100 lbs. roll |

### PLANTING SPACING AND WIRE CHART

| Planting Pattern Between Plants—Between Rows | One-Wire System No. of Wire Feet Required Per Acre | No. of Plants Required Per Acre |
|---|---|---|
| 3' x 6' | 7,260' | 2,420 |
| 4' x 6' | 7,260' | 1,815 |
| 5' x 6' | 7,260' | 1,452 |
| 6' x 6' | 7,260' | 1,210 |
| 3' x 7' | 6,222' | 2,074 |
| 4' x 7' | 6,222' | 1,555 |
| 5' x 7' | 6,222' | 1,245 |
| 6' x 7' | 6,222' | 1,037 |
| 7' x 7' | 6,222' | 889 |
| 3' x 8' | 5,445' | 1,815 |
| 4' x 8' | 5,445' | 1,361 |
| 5' x 8' | 5,445' | 1,089 |
| 6' x 8' | 5,445' | 907 |
| 7' x 8' | 5,445' | 778 |
| 8' x 8' | 5,445' | 681 |
| 3' x 9' | 4,850' | 1,613 |
| 4' x 9' | 4,850' | 1,210 |
| 5' x 9' | 4,850' | 968 |
| 6' x 9' | 4,850' | 807 |
| 7' x 9' | 4,850' | 691 |
| 8' x 9' | 4,850' | 605 |
| 5' x 10' | 4,355' | 871 |
| 6' x 10' | 4,356' | 726 |
| 7' x 10' | 4,354' | 622 |
| 8' x 10' | 4,352' | 544 |
| 5' x 11' | 3,960' | 792 |
| 6' x 11' | 3,960' | 660 |
| 7' x 11' | 3,962' | 566 |
| 8' x 11' | 3,960' | 495 |
| 5' x 12' | 3,630' | 726 |
| 5½' x 12' | 3,630' | 660 |
| 6' x 12' | 3,630' | 605 |
| 7' x 12' | 3,626' | 518 |
| 8' x 12' | 3,632' | 454 |

# VINEYARD STAKES AND TRELLIS SYSTEMS

## TABLE GRAPES

### SINGLE CROSS-ARM

Seven-foot stake and 36" to 42" cross-arm with four wires (13-gauge)

# VINEYARD STAKES AND TRELLIS SYSTEMS

## TABLE GRAPES

### DOUBLE CROSS-ARM

Seven-foot stake, 42" top cross-arm, 24" to 30" lower cross-arm, with six wires (13-gauge)

# VINEYARD STAKES AND TRELLIS SYSTEMS

## TABLE GRAPES/RAISINS

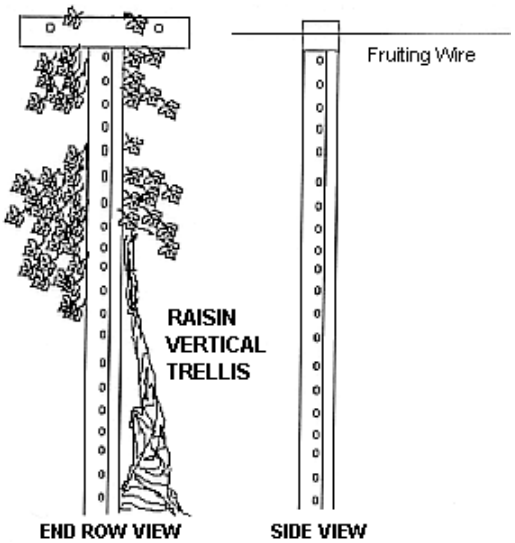
### OPEN GABLE TRELLISES

Eight-foot steel post, 4' angle iron on each side of post forming V with the tops approximately 6' to 7' apart, with 3 to 4 wires (13-gauge) on each side

# VINEYARD STAKES AND TRELLIS SYSTEMS

## RAISIN GRAPES

### VERTICAL TRELLIS



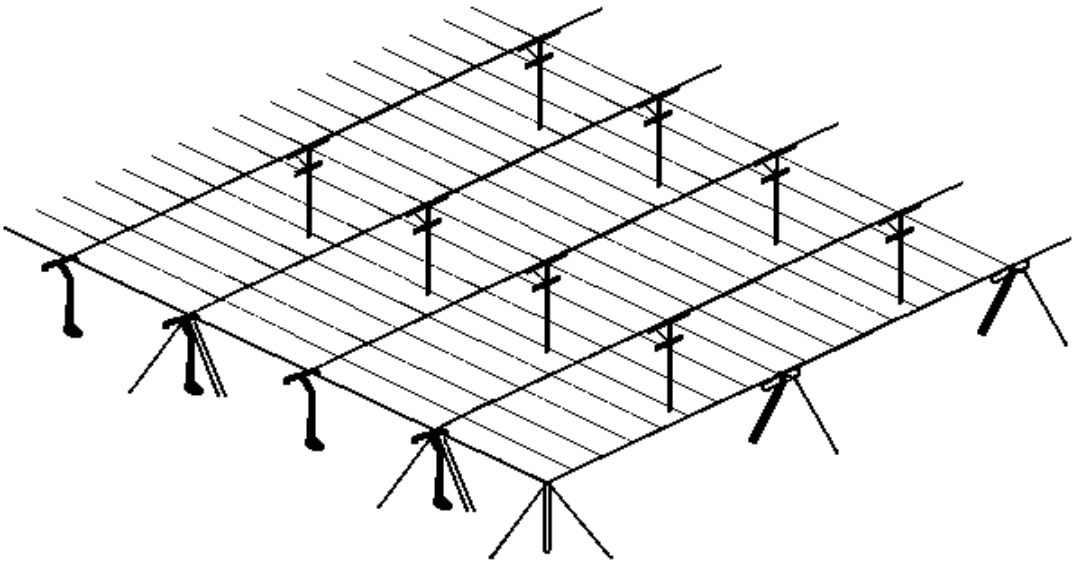

Commonly used for raisins with 12' spacing.

**Materials:** 8' wooden end posts with 7' medium T stakes at each vine. A single 24" metal cross-arm with two 13-gauge wires.

# VINEYARD STAKES AND TRELLIS SYSTEMS

## RAISIN GRAPES

### OVERHEAD DRY ON VINE TRELLIS



Commonly used in 12' row with 6' between vines; occasionally used on 10' and 11' rows; a few 8' and 9' rows.

**Materials:** Wood post 12' on ends, 9' on sides, 10' wood post every third vine with 36" cross-arm, 8 wires per row, and cable support.

# VINEYARD STAKES AND TRELLIS SYSTEMS

## RAISIN GRAPES

### SUN MAID SOUTHSIDE DRY ON VINE TRELLIS

8' T-post every 28' with two 10' cross-arms and 5 wires. In between T-posts are 2 bent 7' to 8' T-posts with 2 wires. Each vine will have a training stake. Each end has a heavy steel post with anchors.

# VINEYARD STAKES AND TRELLIS SYSTEMS

## WINE GRAPES

### TRELLIS

T-post with cross-arm every vine

T-post and V cross-arm

# VINEYARD STAKES AND TRELLIS SYSTEMS

## WINE GRAPES

### TRELLIS

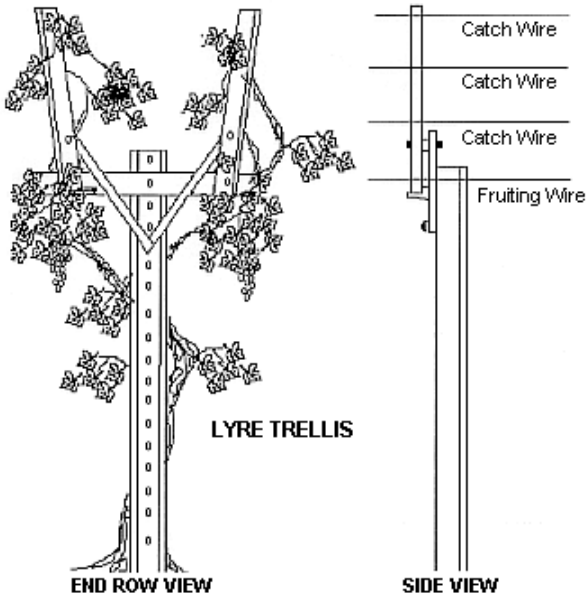
8' vertical line post with 4' T-posts in between

8' vertical line post with light grape stakes in between

# VINEYARD STAKES AND TRELLIS SYSTEMS

## WINE GRAPES

### LYRE TRELLIS

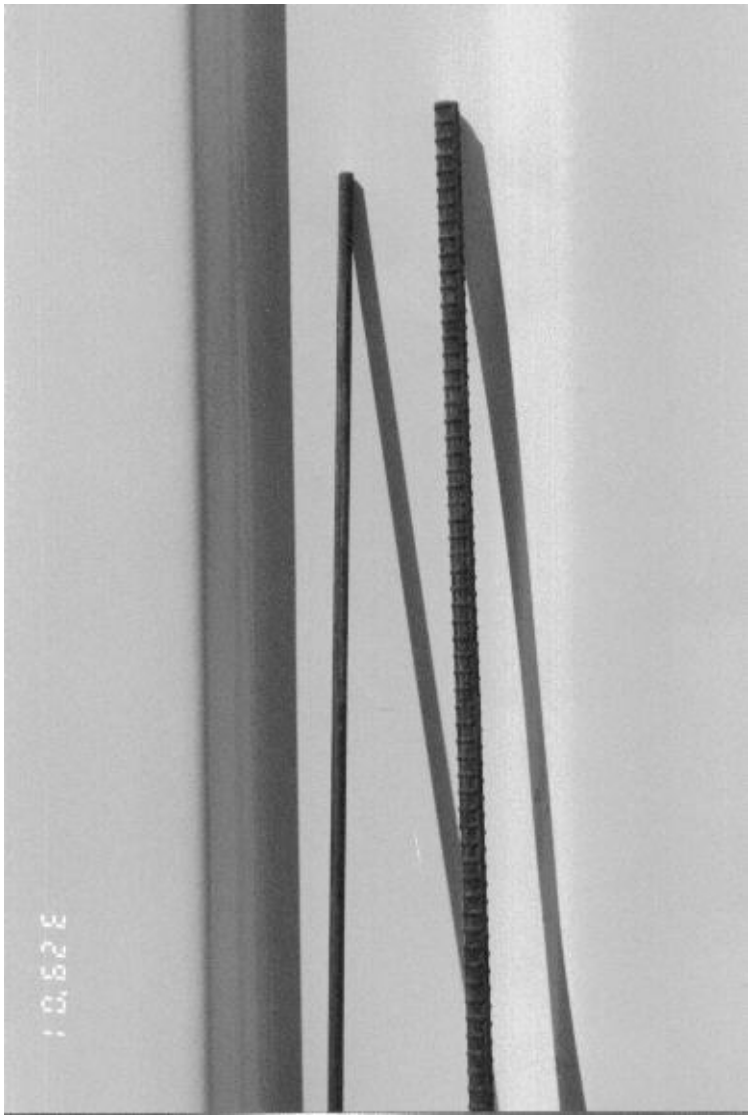



Commonly used in wide row of 11' to 12'.

**Materials:** Heavy steel or wood end posts; heavy and medium T stakes with anchor plates; 8' to 12' gauge wires on metal open Lyre cross-arms with a typical width of 42" at the top; 6 to 10 wires.

# VINEYARD STAKES AND TRELLIS SYSTEMS

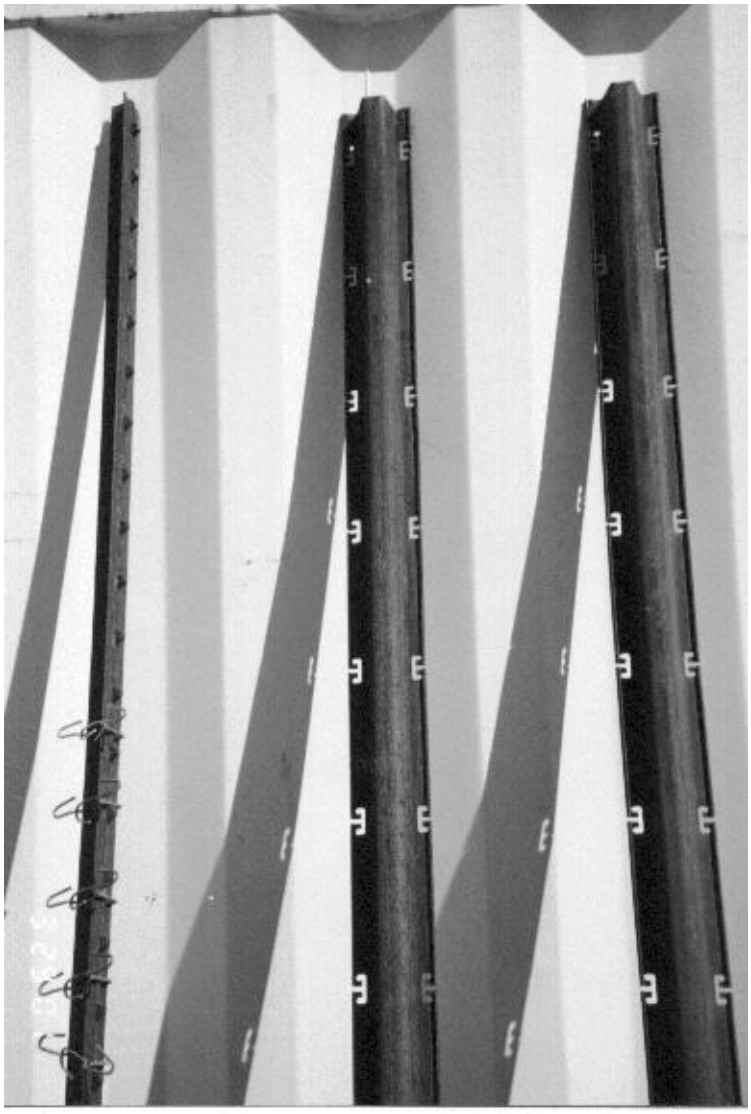
## MISCELLANEOUS



4' Pencil rod and rebar

# VINEYARD STAKES AND TRELLIS SYSTEMS

## MISCELLANEOUS



↑ T-post with J.R. wire clips

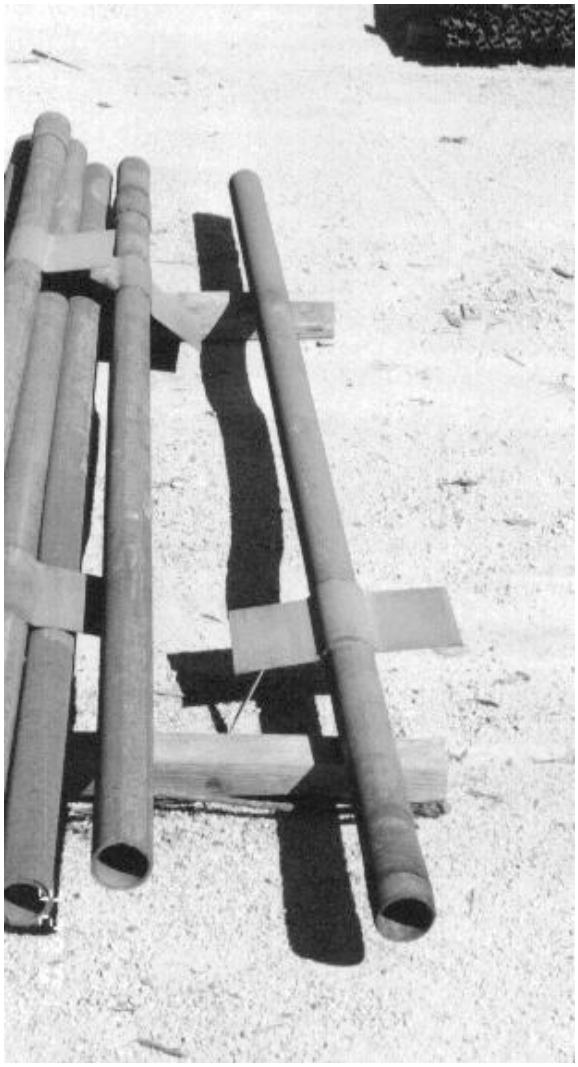
7' heavy T-post
7' light T-post
J.R. clips

↑ Vertical line post with wire slots

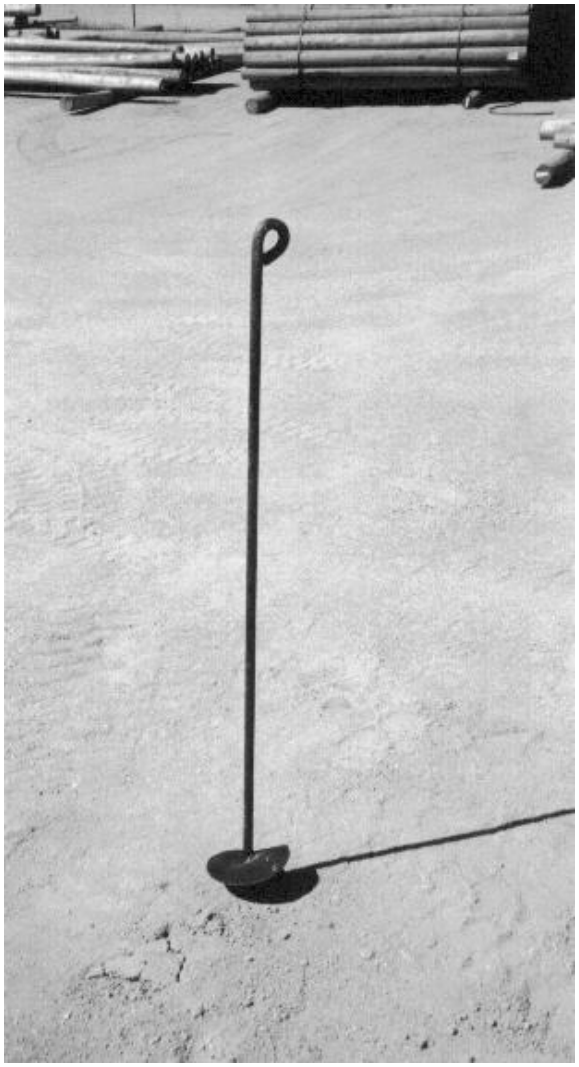
8' Vertical line post (13 ga)

# VINEYARD STAKES AND TRELLIS SYSTEMS

## MISCELLANEOUS



Steel end post with spade



Screw-in earth anchor

# VINEYARD STAKES AND TRELLIS SYSTEMS

## MISCELLANEOUS

### DEER FENCE

7' Deer fence made with 9' T-post and 9' wood stakes
6 ½' woven wire with 2 barbed wires on top and steel gates at drives

# AH 534.78: STEEL BUILDINGS

The *all steel* building performs a variety of functions for a farmer or rancher. The most common use is storage space for farm equipment and machinery. They are also used for storage of feed and grain and other agricultural products. Steel buildings commonly house livestock for protection and security.

Steel buildings have numerous advantages over wood construction including cost-effectiveness since steel is the least expensive method of constructing farm buildings. They have low maintenance costs to keep the structure in good working order and are not susceptible to pests such as termites. Steel structures also withstand the elements better and are less vulnerable to fire. Additions can be added at a lower cost, and they are much easier to improve with items such as windows or air conditioning.

The basic square foot building costs for a typical steel building may need to be adjusted where different specifications involving wall height, partitions, and extra electrical circuits within the structure are present. Specifications and costs for Quonset-style buildings are covered on AH 534.78, page 3. The specifications for a typical steel building are described below.

## BASIC BUILDING COST

Square-foot costs of basic steel buildings include the following:

**SPECIFICATIONS**

| | |
|---|---|
| Foundation | As required for normal soil conditions |
| Floor | Concrete slab, 4 inches to 6 inches thick with wire mesh |
| Frame or bents | Steel, 20, 25, or 30 feet on center |
| Roof purlins | Steel, 4 1/2 to 5 1/2 feet on center |
| Wall girts | Steel, 6 to 7 feet on center |
| Walls and roof | The exterior is made of 26 gauge steel |
| Window area | Equal to 2 percent of floor area |
| Lighting | Minimal light fixtures—including wiring |
| Ventilation | One rotary vent per bay |
| Doors | Two walk-in, two overhead or sliding |
| Eave height | 14 feet |

Basic steel buildings are of two types: the low profile roof pitch (1" in 12") and the more conventional barn-like roof pitch (4" in 12"). The cost differential between the two is considered immaterial for appraisal purposes.

***(Photographs shown on AH 534.78, page 6)***

# STEEL BUILDINGS

## COST PER SQUARE FOOT

| | Width | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Length** | **20'** | **25'** | **30'** | **35'** | **40'** | **45'** | **50'** | **55'** | **60'** | **65'** | **70'** | **80'** |
| 20' | 31.10 | | | | | | | | | | | |
| 25' | 30.16 | 29.60 | | | | | | | | | | |
| 30' | 29.07 | 28.84 | 28.29 | | | | | | | | | |
| 35' | 28.02 | 27.62 | 26.99 | 26.40 | | | | | | | | |
| 40' | 26.96 | 26.29 | 25.68 | 25.23 | 24.16 | | | | | | | |
| 50' | 25.94 | 25.23 | 24.81 | 24.38 | 23.34 | 23.22 | 22.88 | | | | | |
| 60' | 25.27 | 24.41 | 23.70 | 23.39 | 22.92 | 22.64 | 22.34 | 22.21 | | | | |
| 75' | 25.00 | 24.06 | 23.56 | 22.98 | 22.57 | 22.21 | 21.92 | 21.60 | | | | |
| 80' | 24.50 | 23.64 | 23.04 | 22.53 | 22.21 | 21.76 | 21.46 | 21.03 | 20.54 | 19.98 | 19.42 | 19.15 |
| 90' | 23.90 | 22.89 | 22.34 | 22.02 | 21.62 | 21.25 | 20.84 | 20.54 | 20.08 | 19.57 | 18.96 | 18.55 |
| 100' | 22.89 | 22.45 | 21.96 | 21.35 | 21.10 | 20.84 | 20.37 | 19.98 | 19.57 | 18.80 | 18.29 | 17.94 |
| 135' | | 22.07 | 21.25 | 20.49 | 20.13 | 19.90 | 19.57 | 19.40 | 18.98 | 18.40 | 17.84 | 17.59 |
| 150' | | | | 19.87 | 19.38 | 19.06 | 18.76 | 18.65 | 18.40 | 18.14 | 17.63 | 17.36 |
| 175' | | | | 19.34 | 19.04 | 18.80 | 18.55 | 18.37 | 18.14 | 17.73 | 17.38 | 17.08 |
| 200' | | | | | 18.80 | 18.57 | 18.38 | 18.14 | 17.78 | 17.37 | 17.08 | 16.88 |
| 225' | | | | | | 18.37 | 18.14 | 17.78 | 17.33 | 17.12 | 16.92 | 16.71 |
| 250' | | | | | | | 17.78 | 17.38 | 17.12 | 16.87 | 16.76 | 16.57 |

## ALTERNATE COSTS

Wall Height: Add or subtract 3 percent per square foot from basic cost for each foot of variation above or below the basic 14-foot eave height.

Missing Wall Cover: Deduct **$1.95** for each square foot of missing wall area.

Electrical Power: Deduct **$1.65 - $2.20** per square foot for lack of power.

The above costs are for 26 gauge steel cover.

# STEEL BUILDINGS

## QUONSET-STYLE BUILDINGS

Quonset-style buildings are pre-engineered structures assembled with a steel frame and galvanized steel panels on the exterior. The buildings have an arch shape with no distinction between the roof and sides. The costs provided are for a typical Quonset-style building constructed with a steel frame and exterior panels in the dimensions shown below.

Square-foot costs of basic Quonset-style steel buildings include the following:

**SPECIFICATIONS**

| | |
|---|---|
| Footings | As required for normal soil conditions |
| Floor | Dirt |
| Frame | Arched steel-the width of the building at the base of the arch is generally 30 feet to 70 feet |
| Walls and roof | The exterior panels are made of 26 gauge galvanized steel |
| Window area | None |
| Lighting | None |
| Ventilation/heat | Natural-building ends are open |
| Doors | None |

***(Photograph shown on AH 534.78, page 7)***

**COST PER SQUARE FOOT OF BUILDING**

| | Width of Building at the Base | | | |
|---|---|---|---|---|
| **Length** | **30'** | **40'** | **60'** | **70'** |
| 30' | 26.68 | | | |
| 36' | 25.46 | | | |
| 48' | 23.72 | 21.73 | | |
| 60' | 22.50 | 20.45 | 19.48 | |
| 72' | 21.54 | 19.54 | 18.71 | 17.94 |
| 84' | 20.77 | 18.90 | 17.87 | 17.36 |
| 96' | 19.99 | 18.25 | 17.36 | 16.71 |
| 108' | 19.42 | 17.74 | 16.78 | 16.27 |
| 120' | 18.90 | 17.30 | 16.33 | 15.75 |
| 160' | 17.68 | 16.07 | 15.17 | 14.65 |
| 200' | | 15.17 | 14.33 | 13.95 |
| 240' | | 14.47 | 13.76 | 13.44 |

ALTERNATE COSTS

Electrical Power: Add **$1.65 - $2.20** per square foot for electrical power.

# STEEL BUILDINGS

## ADDITIVE COSTS

Additive costs are the in-place cost components that are not included in the basic square-foot cost. Additive costs, where appropriate, are added to the basic building cost which results in a total building cost.

The cost of additives, such as doors and windows, that replace a portion of the exterior skin of the building, reflect the net added cost of the component in-place. The cost of the skin that is replaced has been deducted from the total cost of the additive components. No further deduction is necessary.

**OVERHEAD DOORS WITH CHAIN HOIST OPENER—COST PER DOOR**

| | Height | | | | |
|---|---|---|---|---|---|
| **Width** | **8'** | **10'** | **12'** | **14'** | **16'** |
| 8' | 945 | 1005 | 1,090 | 1,210 | |
| 10' | 970 | 1,055 | 1,170 | 1,370 | 1,570 |
| 12' | 1,065 | 1,165 | 1,315 | 1,510 | 1,705 |
| 14' | 1,305 | 1,350 | 1,570 | 1,705 | 2,085 |
| 16' | 1,435 | 1,576 | 1,800 | 2,105 | 2,340 |
| 18' | 1,737 | 1,875 | 2,105 | 2,340 | |

**WALK-IN DOORS**

| | |
|---|---|
| Flush 3' x 7' | $470 to $570 |
| Half Glass | $520 to $625 |

**ROTARY VENTS**

| | |
|---|---|
| 20" | $260 |

**RIDGE VENTS**

| | |
|---|---|
| 9" x 10' | $440 |
| 12" x 10' | $470 |

**GUTTERS AND DOWNSPOUTS**

| | |
|---|---|
| Per linear foot | $4.70 to $6.75 |

**SKYLIGHTS**

| | |
|---|---|
| 3' x 10' | $85 to $110 |

**WINDOWS**

| | |
|---|---|
| 3' x 3' | $155 |
| 3' x 6' | 185 |
| 4' x 6' | 250 |
| 4' x 8' | 305 |

# STEEL BUILDINGS

## ADDITIVE COSTS

### HEATING

| Overhead Suspended Unit | Cost Per Unit |
|---|---|
| 75,000 BTU | 1,465 |
| 100,000 BTU | 1,750 |
| 200,000 BTU | 2,370 |
| 300,000 BTU | 2,820 |

### RESTROOMS

| | Total Cost |
|---|---|
| Cost includes 2 fixtures, electrical service, and all partitions. Add for septic tank. | $6,865 - $8,500 |

### OFFICE AREAS

| | Square Foot |
|---|---|
| Cost includes partitioning, interior finish, trim, and doors | $58 - $76 |

### PARTITIONS

| | Per Square Foot of Wall Area |
|---|---|
| Drywall on wood frame | $3.85 |
| Plaster on wood frame | $5.50 |
| Paneling (average quality) | $4.35 - $5.50 |

### INSULATION

| | Square Foot |
|---|---|
| R-13 | $.62 - $.73 |

# STEEL BUILDINGS

## TYPICAL STEEL BUILDINGS

# STEEL BUILDINGS

## QUONSET-STYLE BUILDING

# AH 534.79: MISCELLANEOUS COSTS

Truck scales are used to weigh entire road or rail vehicles and their contents. By weighing the vehicle when empty and when loaded, the load carried by the vehicle can be calculated.
The table below now lists costs for electronic scales as it has been found to be the most popular and most commonly purchased truck scale. Previously this table listed costs for mechanical scales.

ELECTRONIC TRUCK SCALES WITH CONCRETE DECK

| Scales | | | Scale Pit | | |
|---|---|---|---|---|---|
| **Tons Capacity** | **Platform Size** | **Total Cost** | **Size** | **Standard Cost** | **Add Cost for: 12' Width** |
| 20 | 25' x 10' | 21,250 | 25' x 10' | 17,900 | 990 |
| 30 | 25' x 10' | 23,500 | 40' x 10' | 20,600 | 1,100 |
| 50 | 40' x 10' | 26,150 | 50' x 10' | 22,900 | 1,210 |
| 50 | 50' x 10' | 27,900 | 60' x 10' | 25,500 | 1,430 |
| 60 | 60' x 10' | 30,950 | 70' x 10' | 26,400 | 1,650 |
| 60 | 70' x 10' | 36,700 | 80' x 10' | 28,550 | 2,310 |
| 60 | 80' x 10' | 39,750 | 90' x 10' | 21,100 | |
| 80 | 80' x 10' | 42,100 | 90' x 10' | 33,750 | |
| 100 | 90' x 10' | 45,150 | 100' x 10' | 36,800 | |

**Mechanical scales add 30 to 40 percent**

**For pitless above-ground scales do not add scale pit cost**

**Used scales, deduct 25 to 40 percent**

**ADD FOR WEIGHT RECORDING EQUIPMENT**

Programmable indicator/controller $1,200 - $2,000
Ticket printer $600 - $1,400

**EXAMPLE OF MOTOR TRUCK SCALE COST**

Scales: 80 ton capacity, 80' x 10' platform $42,100
Scale Pit: 90' x 10' size, standard $33,750
Programmable weight recording equipment and printer $1,800
Total $77,650

***(Photograph shown on AH534.79, page 10)***

**ELEVATED HOPPER TANK – Steel Support Legs, Stiffened Side Walls, Ladder, Roof Access Door, includes Concrete Base**

| Size | Cost |
|---|---|
| 80 Tons | 14,900 |
| 100 Tons | 16,850 |
| 130 Tons | 19,800 |
| 160 Tons | 23,050 |
| 200 Tons | 28,750 |
| 235 Tons | 32,300 |
| 300 Tons | 40,750 |
| 350 Tons | 37,700 |
| 400 Tons | 54,050 |

# MISCELLANEOUS COSTS

**CONCRETE HORIZONTAL OR FLAT STORAGE**

| Cwt | Cost per Cwt (100 lbs) |
|---|---|
| 28,000 | 4.36 |
| 42,000 | 4.19 |
| 56,000 | 4.02 |
| 85,000 | 3.83 |
| 110,000 | 3.68 |
| 140,000 | 3.55 |
| 200,000 | 3.44 |
| 400,000 | 3.00 |
| 600,000 | 2.87 |

## ABOVE-GROUND FUEL TANKS & CONTAINMENT SYSTEMS

**PREFABRICATED CONCRETE FUEL CONTAINMENT TUBS**

| | |
|---|---|
| 400 gallon capacity containment | $843 |
| 500 gallon capacity containment | $1,092 |
| 1,000 gallon capacity containment | $1,588 |

**CONTAINMENT WITH TANK AND ELECTRIC PUMPS**

| | |
|---|---|
| 500 gallon – diesel | $4,851 |
| 1,000 gallon – diesel | $6,609 |
| 500 gallon – gasoline | $5,821 |
| 1,000 gallon – gasoline | $7,641 |

**ABOVE-GROUND FUEL TANKS (Steel Tanks with Thick Outer Shell of Concrete)**

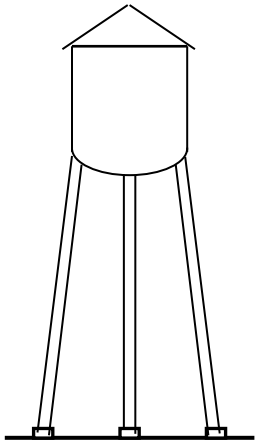
| Gallons | Cost |
|---|---|
| 500, with electric pump | $ 8,766 to $ 9,968 |
| 1,000, with electric pump | $12,012 to $13,814 |
| 2,000, with electric pump | $17,828 to $20,060 |
| Double unit—(1) 1,000 gallon, (1) 500 gallon with 2 electric pumps | $13,213 to $14,830 |

***(Photographs shown on AH 534.79, page 10)***

# MISCELLANEOUS COSTS

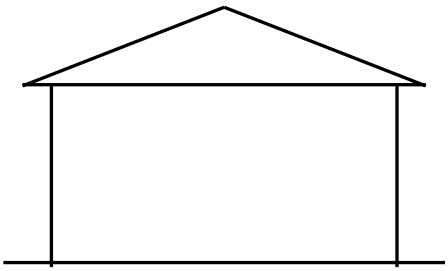
## WATER TANKS

### ELEVATED STEEL WATER STORAGE TANKS



| Gallon Capacity | Total Cost of 75' Tower and Tank | Total Cost of 100' Tower and Tank |
|---|---|---|
| 25,000 | 299,800 | 345,350 |
| 30,000 | 321,310 | 368,100 |
| 40,000 | 337,750 | 378,230 |
| 50,000 | 349,140 | 397,200 |
| 60,000 | 364,320 | 414,400 |
| 75,000 | 388,100 | 437,700 |
| 100,000 | 448,620 | 473,100 |
| 150,000 | 569,650 | 607,800 |
| 200,000 | 705,160 | 745,950 |
| 300,000 | 877,500 | 945,910 |
| 500,000 | 1,178,800 | 1,260,350 |
| 1,000,000 | 1,956,300 | 2,160,215 |

### WELDED STEEL WATER STORAGE TANKS ON GROUND WITH FOUNDATION

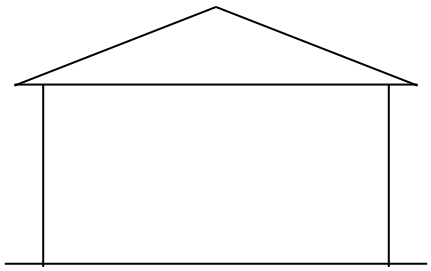


| Gallon Capacity | Total Cost of Tank on Ground |
|---|---|
| 25,000 | 66,500 |
| 30,000 | 75,100 |
| 40,000 | 85,800 |
| 50,000 | 102,900 |
| 60,000 | 116,000 |
| 75,000 | 138,300 |
| 100,000 | 157,400 |
| 150,000 | 197,900 |
| 200,000 | 224,550 |
| 300,000 | 281,000 |
| 500,000 | 297,800 |
| 1,000,000 | 617,200 |

# MISCELLANEOUS COSTS

## WATER TANKS

**BOLTED STEEL WATER TANKS**



| Gallon Capacity | Total Cost of Tank on Ground |
|---|---|
| 10,000 | 23,150 |
| 20,000 | 33,650 |
| 30,000 | 41,850 |
| 50,000 | 53,800 |
| 75,000 | 64,350 |
| 100,000 | 73,850 |
| 125,000 | 87,100 |
| 150,000 | 106,000 |
| 200,000 | 125,600 |

Price varies due to gauge, height, diameter, and delivery costs.
Price typically includes crushed rock base or concrete on longer tanks.

**POLYETHYLENE OR FIBERGLASS TANKS (Used for Ag Chemicals or Liquid Fertilizers)**

| Capacity (Gallons) | Cost |
|---|---|
| 1,000 | 1,225 |
| 2,000 | 2,250 |
| 3,000 | 3,450 |
| 4,000 | 4,375 |
| 5,000 | 5,625 |
| 6,000 | 6,475 |
| 8,000 | 8,425 |
| 10,000 | 10,075 |

Add **$4.10** per square foot for concrete base

**Polyethylene water only tanks, deduct 20 percent from above prices**.

# MISCELLANEOUS COSTS

## STEEL GRAIN BINS

Sacramento and Northern California

Steel grain bins are used for storage and drying of small grains. The typical storage bin has metal walls and roof, a concrete floor and foundation. The drying bin is of similar construction with a dryer floor, unloading auger, and leveler. Dryer fan, heater unit, and motor are also considered part of the drying bin.

**GRAIN DRYING BINS- COST PER BIN**

| | Eave Heights | | | | | |
|---|---|---|---|---|---|---|
| **Diameter** | **16'** | **18'** | **21'** | **24'** | **32'** | **40'** |
| 18' | 15,822 | 16,650 | 17,460 | 20,246 | 24,613 | 28,429 |
| 21' | 18,045 | 18,720 | 19,575 | 23,425 | 28,868 | 32,173 |
| 24' | 20,610 | 21,375 | 22,500 | 27,070 | 33,242 | 36,839 |
| 27' | 24,840 | 25,650 | 27,090 | 32,659 | 40,484 | 43,011 |
| 30' | 27,675 | 28,845 | 30,465 | 35,915 | 44,226 | 49,086 |
| 36' | 36,630 | 38,340 | 40,050 | 47,239 | 56,182 | 63,763 |
| 42' | 45,225 | 46,710 | 48,285 | 61,236 | 70,373 | 82,134 |
| 48' | 58,005 | 61,515 | 65,160 | 75,622 | 86,071 | 89,861 |

Includes cost of foundation, perforated floor, unloading auger, aeration unit, fan, dryer, and stirring devices.

**GRAIN STORAGE BINS- COST PER BIN**

| | Eave Heights | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Diameter** | **16'** | **18'** | **21'** | **24'** | **32'** | **40'** | **48'** | **58'** | **64'** |
| 18' | 9,315 | 9,450 | 10,485 | 12,420 | 16,200 | 20,368 | 23,516 | | |
| 21' | 10,575 | 10,980 | 12,060 | 14,490 | 18,900 | 23,278 | 27,380 | | |
| 24' | 12,825 | 13,410 | 13,995 | 17,190 | 21,555 | 27,141 | 31,673 | 37,778 | 41,976 |
| 27' | 14,625 | 15,840 | 17,775 | 21,015 | 27,405 | 32,293 | 39,162 | 47,128 | 51,993 |
| 30' | 16,470 | 17,640 | 20,205 | 22,770 | 29,745 | 36,157 | 42,930 | 53,758 | 60,436 |
| 36' | 22,050 | 23,310 | 25,830 | 29,610 | 37,800 | 46,746 | 56,191 | 69,499 | 77,083 |
| 42' | 27,630 | 28,800 | 30,105 | 39,600 | 47,655 | 61,247 | 71,836 | 86,528 | 95,972 |
| 48' | 38,250 | 41,400 | 45,090 | 51,183 | 59,085 | 75,337 | 83,952 | 102,030 | 112,286 |

Includes cost of bin foundation, door, ladder, and unloading auger.

**ADD FOR**: Roof Augers **$800 to $1,500** (depends on length—13' to 24')
Fan **$1,700** (5 H.P.) to **$3,100** (25 H.P.)

***(Photographs shown on AH 534.79, page 11)***

**PERFORATED FLOORS**

| 18' | 21' | 24' | 27' | 30' | 36' | 42' | 48' |
|---|---|---|---|---|---|---|---|
| $2,550 | $2,754 | $3,468 | $4,182 | $5,202 | $7,242 | $9,282 | $11,322 |

# MISCELLANEOUS COSTS

## REDWOOD WATER STORAGE TANKS

### 2-INCH REDWOOD WATER STORAGE TANKS

| Gallons | Diameter | Height | Cost |
|---|---|---|---|
| 500 | 5' | 4' | 3,900 |
| 1,000 | 6' | 6' | 4,800 |
| 1,500 | 7' | 6' | 4,950 |
| 2,000 | 8' | 6' | 7,325 |
| 3,000 | 10' | 6' | 9,475 |
| 4,000 | 10' | 8' | 11,300 |
| 5,000 | 11' | 8' | 12,950 |
| 6,000 | 12' | 8' | 15,100 |
| 7,000 | 11' | 10' | 16,700 |
| 8,000 | 12' | 10' | 17,500 |
| 9,000 | 13' | 10' | 18,700 |
| 10,000 | 14' | 10' | 20,775 |
| 12,000 | 15' | 10' | 23,000 |
| 15,000 | 14' | 14' | 25,100 |

Above costs include chime joists, covers, foundation, and all labor, set up, and transportation charges.

| | | |
|---|---|---|
| **ADD FOR:** | Ladders | **$40** per linear foot |
| | Water level registers | **$15** per linear foot of tank height |
| | Cone covers | **$1,000 to $3,000** per tank |

# MISCELLANEOUS COSTS

## REDWOOD WATER STORAGE TANKS

### 3-INCH REDWOOD WATER STORAGE TANKS

| Gallons | Diameter | Height | Cost |
|---|---|---|---|
| 10,000 | 14' | 10' | 23,100 |
| 12,000 | 14' | 12' | 26,550 |
| 15,000 | 16' | 12' | 28,450 |
| 20,000 | 18' | 12' | 36,650 |
| 25,000 | 17' | 16' | 39,700 |
| 30,000 | 20' | 14' | 46,200 |
| 40,000 | 23' | 14' | 58,175 |
| 50,000 | 24' | 16' | 65,300 |
| 60,000 | 26' | 16' | 73,300 |
| 70,000 | 28' | 16' | 77,900 |
| 75,000 | 29' | 16' | 88,400 |
| 80,000 | 30' | 16' | 95,350 |
| 90,000 | 30' | 18' | 100,275 |
| 100,000 | 32' | 18' | 105,850 |
| 150,000 | 37' | 20' | 141,750 |
| 200,000 | 43' | 20' | 168,000 |
| 250,000 | 43' | 25' | 200,000 |

Above costs include typical foundation, chime joists, tank cover, and all labor, set up, and transportation charges.

### CYLINDRICAL 3-INCH REDWOOD WINE TANKS

| Gallons Capacity | |
|---|---|
| 1,000 | 5,900 |
| 1,500 | 7,500 |
| 2,000 | 8,700 |
| 2,500 | 10,400 |
| 3,000 | 12,300 |
| 4,000 | 13,200 |
| 5,000 | 16,100 |
| 7,500 | 19,900 |
| 10,000 | 22,000 |
| 15,000 | 31,000 |
| 20,000 | 40,300 |
| 25,000 | 43,700 |
| 30,000 | 51,800 |

Base price includes 4" x 6" chime joists, 1/2' galvanized hoops, recessed head cover, side door with galvanized T-bolt.

# MISCELLANEOUS COSTS

**STAINLESS STEEL WINE TANKS**

| Gallons Capacity | Cost |
|---|---|
| 1,000 | 9,373 |
| 2,000 | 13,339 |
| 3,000 | 15,141 |
| 4,000 | 16,892 |
| 5,000 | 17,098 |
| 10,000 | 24,910 |
| 20,000 | 39,655 |
| 50,000 | 62,109 |
| 100,000 | 93,305 |
| 200,000 | 170,988 |

Cost includes all valves, temperature controls, vents, and cooling jackets for tanks with a capacity of 20,000 gallons or less. The cost on tanks of 50,000 gallons or more excludes cooling jackets.

**CYLINDRICAL 2 INCH OAK TANKS**

| Gallons Capacity | Cost |
|---|---|
| 500 | 2,480 |
| 750 | 3,640 |
| 1,000 | 4,740 |
| 1,250 | 5,250 |
| 1,500 | 6,700 |
| 2,000 | 9,470 |
| 2,500 | 10,920 |
| 3,000 | 12,470 |
| 4,000 | 16,450 |
| 5,000 | 20,100 |
| 6,000 | 24,250 |

Base price includes 4" x 6" chime joists, galvanized hoops, head supports with stainless steel head bolts, side door with stainless T-bolt, installation in Sonoma County. Foundations not included.

# MISCELLANEOUS COSTS

## PREFABRICATED METAL SHADES

**SPECIFICATIONS**

| | |
|---|---|
| Foundation | Metal base plate with tie downs |
| Floor | Dirt |
| Wall/Roof Frame | 2 3/8" galvanized structural tubing (4' on center) 7' to 9' eaves |
| Roofing | 29-gauge steel with baked on enamel (extends 6" to 12" below eaves) |
| Exterior Wall Covering | None |

***(Photograph shown on AH534.79, page 12)***

**COMMON SIZES**

| | | | |
|---|---|---|---|
| 12' x 21' | $1,150 | 20' x 21' | $1,950 |
| 12' x 26' | $1,400 | 20' x 26' | $2,350 |
| 12' x 31' | $1,800 | 20' x 31' | $2,900 |
| 12' x 36' | $2,050 | 20' x 36' | $3,400 |
| 12' x 41' | $2,350 | 20' x 41' | $3,800 |

**RV SHADES**

| | |
|---|---|
| 14' x 30' x 12' | $3,550 |
| 14' x 40' x 12' | $4,700 |

**ADDITIVES**

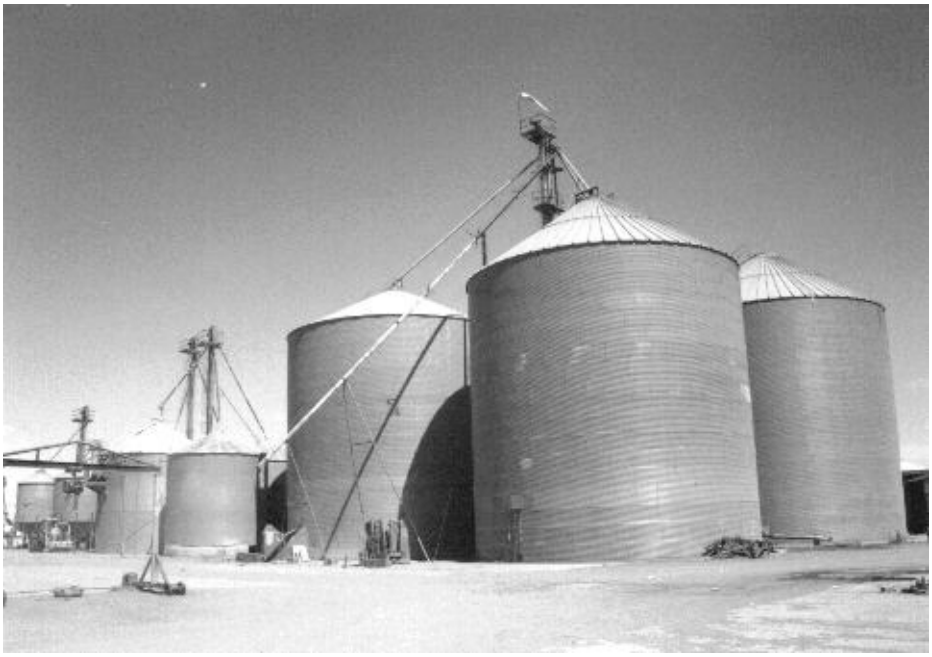
- Add 6 percent to above prices for 26-gauge steel roofing
- 29-gauge metal wall covering—**$1.38** per square foot of wall (standard roofing extends 6" to 12" below eaves)
- Back enclosure kit:
  - 12-foot wide — **$505**
  - 20-foot wide — **$670**
  - 24-foot wide — **$895**
- Front enclosure kit with opening for roll-up door:
  - 12-foot wide — **$390**
  - 20-foot wide — **$445**
- Light duty roll-up doors
  - 8' x 6' — **$335**
  - 9' x 7' — **$390**
  - 10' x 8' — **$445**
  - 10' x 10' — **$505**
- Walk-thru door 32" x 72" —**$225 to $280**
- Add 3 percent for each additional foot of wall height above 8 feet
- Concrete floor—**$4.45 to $5.60** per square foot
- Windows 30" x 30" — **$140**

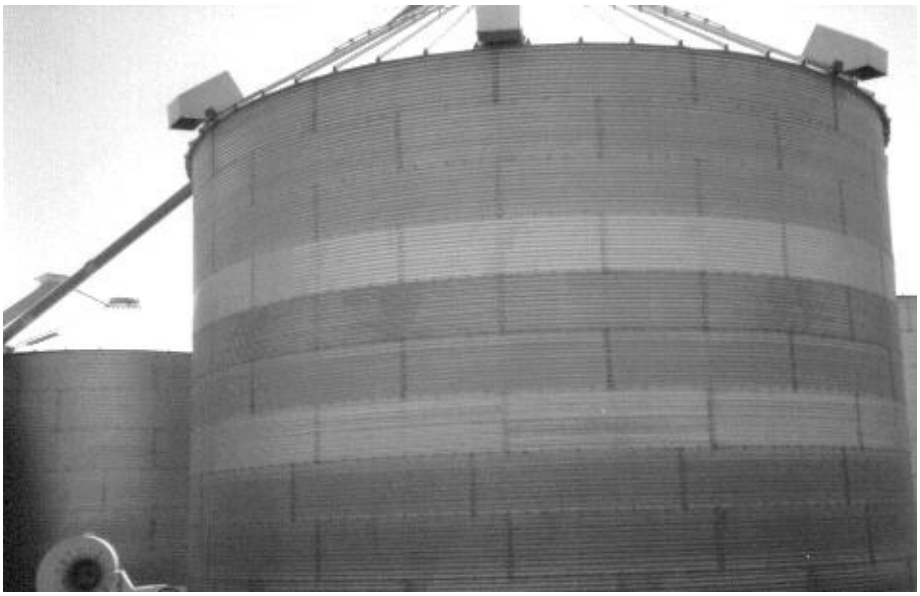
**PIT TYPE MOTOR TRUCK SCALE WITH CONCRETE DECK**

**ABOVE-GROUND FUEL TANK (Steel Tank with Thick Outer Shell of Concrete)**

# MISCELLANEOUS COSTS

## STEEL GRAIN BINS





# MISCELLANEOUS COSTS

## PREFABRICATED METAL SHADES

# AH 534.80: WIND MACHINES

Conventional wind machines have a large fan on top of a tower. These wind machines work with temperature inversions to mix warm air with lower-lying cold air. Tower wind machines are best suited for flat, evenly shaped growing areas.

A newer design called a cold air drain has also been introduced to the market. In this design, rather than being mounted on a tower, the unit is placed at ground level. It operates by drawing in air from the sides of the unit, directing it upwards, displacing lower-lying cold air with warmer surrounding air. These machines are used where conventional tower wind machines are less effective, such as gentle slopes, rolling hills, swales, pockets, canyons, and valleys. These new design units are often used in addition to a conventional wind machine.

Photographs of these wind machines are located at the end of this chapter.

## NEW

New machines have an average physical life of about 30 years. The amount of time that these machines are used varies depending on the climate but typically averages around 100 to 150 hours per year. Each conventional wind machine will service approximately 10 acres.

**CONVENTIONAL WIND MACHINES**

| Model | Cost |
|---|---|
| G.P. 359 Cummins Diesel | 34,500 |
| 130 HP Ford V-10 L.P.G. | 28,250 |
| 130 HP F460 L.P.G. | 23,750 |
| 115 HP John Deere 6068 Diesel | 28,250 |
| 100 HP John Deere 4T | 27,350 |
| Portable Low Crop 115 HP John Deere Diesel | 29,650 |
| Portable Low Crop 115 HP F460 L.P.G. | 26,800 |
| Portable Low Crop 100 HP John Deere Diesel | 28,750 |
| Portable Low Crop 92 HP F300-6 L.P.G. | 24,500 |

Tower height for the above machines is 36 feet.
The prices above include the foundation and installation.

**OPTIONS**

| Item | Cost |
|---|---|
| 41 Foot Tower | 2,000 |
| Auto Thermostat Control | 2,500 |
| Variable Speed Rotation | 1,200 |
| Contour Assembly | 3,000 |
| Replacement fan | 1,200 |

# WIND MACHINES

## USED

The cost of used wind machines can vary widely depending upon the age and condition of the equipment.

### Used Electric Machines

The cost to run an electrical line for a new installation of a wind machine by local utility companies has increased very significantly over the last several years with installation fees nearly equaling those of a new conventional wind machine. Dealers report no demand for these machines currently, and therefore we will be discontinuing the section on used electric wind machines.

**USED PROPANE**

| Engine | Fuel Type /HP | Cost |
|---|---|---|
| 292-V-8 | Propane 86 HP | 2,500 |
| 332-V-8 | Propane 86 HP | 2,500 |
| 300-6 | Propane 92 HP | 4,000 |
| 391-V-8 | Propane 100 HP | 4,000 |
| 391-V-8 | Propane 125 HP | 4,500 |
| 460-V-8 | Propane 125 HP | 4,500 |

**DIESEL MACHINES (REBUILT ENGINES)**

| Engine | Configuration | HP | Cost |
|---|---|---|---|
| 330 Ford * | 6 Cylinder | Diesel - 81 HP | 5,600 |
| 363 Ford * | 6 Cylinder | Diesel - 100 HP | 6,800 |
| 378 Cummins * | V-6 | Diesel - 125 HP | 6,800 |

The above prices include a 550 gallon above-ground fuel tank. Larger tanks are available on request at additional cost.

The cost of used wind machines can vary widely depending upon the age and condition of the equipment.

* No longer manufactured

# WIND MACHINES

## RECONDITIONED

### RECONDITIONED GROUND POWERED TROPIC BREEZE

| Model | | Cost |
|---|---|---|
| F300-6 | Ford, Propane 92HP | 12,500 |
| F391 | Ford, Propane 115 HP 1 | 14,500 |
| F460 | Ford, Propane 130 HP | 17,500 |
| In Line 6 | John Deere, Diesel | 18,500 |
| In Line 6 | Cummins, Diesel | 18,500 |
| V-6 | Cummins, Diesel | 18,500 |

115HP and 130HP machines have new fiberglass fans

### RECONDITIONED EOT

| Model | | Cost |
|---|---|---|
| 391 | Ford, Propane | 12,500 |
| 460 | Ford, Propane | 15,500 |

NOTE: All used costs listed above include the foundation and installation.

### RECONDITIONED GROUND POWERED TROPIC BREEZE

| Model | | Cost |
|---|---|---|
| F300-6 | Ford, Propane 92HP | 12,500 |
| F391 | Ford, Propane 115 HP | 14,500 |
| F460 | Ford, Propane 130 HP | 17,500 |
| In Line 6 | John Deere, Diesel | 18,500 |
| In Line 6 | Cummins, Diesel | 18,500 |
| V-6 | Cummins, Diesel | 18,500 |

115HP and 130HP machines have new fiberglass fans

### RECONDITIONED EOT

| Model | | Cost |
|---|---|---|
| 391 | Ford, Propane | 12,500 |
| 460 | Ford, Propane | 15,500 |

NOTE: All used costs listed above include the foundation and installation.

# WIND MACHINES

## COLD AIR DRAIN

Much newer to the marketplace than conventional wind machines, cold air drain units are becoming more commonly used. The unique design is particularly effective on gentle slopes, rolling hills, swales, pockets, canyons, and valleys where conventional tower wind machines are less effective. These units are often used to supplement conventional wind machines.

| Model | Cost |
|---|---|
| **# 925 Shur Farms Cold Air Drain**<br>PTO-Requires min. 10HP at 540 | 7,995 |
| EM1 Electric Motor, 1ph, 230V | 3,195 |
| EM1/AS Electric Motor, 1ph, 230V with Temperature Controlled Auto-Start | 5,190 |
| H9 Honda Gasoline Power Unit, 9HP Electric Start | 2,995 |
| H15/AS/2.5 Honda Gasoline Power Unit w/ Temperature Controlled Auto -Start | 6,395 |
| **#3510 Shur Farms Cold Air Drain** (10acres)<br>PTO- Requires min. 35HP @ 540 RPM | 16,995 |
| **Power options** | |
| V35-Vanguard Gasoline Power Unit | 5,490 |
| **#1550 Shur Farms Cold Air Drain**<br>PTO-Requires min. 15HP @ 540 RPM | 10,800 |
| **Other Power Options For Shur Farms** | |
| EM3-Electric Motor, 3ph, 230/460V | 3,895 |
| EM3/AS Electric Motor, 3ph, 230/460V Temperature Controlled Auto-Start | 5,490 |
| EM1-10 Electric Motor , 1ph, 230V, 10HP | 3,995 |
| EM1-10/AS Electric Motor , 1ph, 230V, 10HP w/ Temp Controlled Auto-Start | 5,995 |
| H15 Honda Gasoline Power Unit, 15HP w/ Temperature Controlled Auto-Start | 6,395 |
| HVT20 Honda V-Twin Gasoline Power Unit | 4,450 |

# WIND MACHINES

## Glossary of Abbreviations

| | |
|---|---|
| GP | Ground Power |
| RT | Rotating Tower |
| TT | Tall Tower |
| ST-ROT | Standard Rotation |
| SP-ROT | Special Rotation |
| LC | Low Crop |
| S | Single |
| D | Dual |
| EOT | Engine on Tower |
| SC | Special Contour |

# WIND MACHINES

## Conventional Design

# WIND MACHINES

## Cold Air Drain

# AH 534.90: DEPRECIATION

## DEFINITIONS

An essential part of the cost approach is the estimation of depreciation, and the usefulness of this approach depends greatly upon the appraiser's ability to make this estimate. This discussion is confined to the application of normal percent good factors to replacement cost new to arrive at replacement cost less normal depreciation. A more detailed discussion of depreciation may be found in Assessors' Handbook Section 501, *Basic Appraisal*.

### PERCENT GOOD TABLES

*Accrued depreciation* is considered to be the difference between replacement cost new and current value.

*Percent good* is the complement of accrued depreciation. If accrued depreciation is 20 percent, percent good is 80 percent. The percent good concept is used because it saves one arithmetic operation in calculating replacement cost new less normal depreciation.

In a mass appraisal program, speed and uniformity in depreciation estimates are accomplished by the use of normal percent good tables. Percent good factors reflect the average loss in value that improvements suffer over time from normal or usual causes. They include normal physical deterioration and normal functional obsolescence, but they do not include value losses caused by unusual physical deterioration, unusual functional obsolescence, or economic obsolescence.

There are two types of normal percent good tables for structures. They are designated as "R" and "OR" tables. "R" tables are generally applicable to residential-type buildings, and "OR" tables are applicable to "other-than-residential" buildings. For each of the two types there are a number of different tables for buildings with various life expectancies.

Individual tables are designated as type "R" or "OR," with a total life expectancy in years. For example, the proper table for an average-quality dairy barn with a 20-year total life expectancy is designated as "R-20."

### AVERAGE LIFE TABLES

Average life tables direct the appraiser to the proper normal percent good table. This selection is based upon the following three factors:

- Use type
- Construction type
- Quality

Use type refers to the use that is currently being made of the improvement. It may or may not be the same as the original design type that the building cost is based upon.

Construction type and quality classification are based upon the same standards as those set forth in the standard classification system for these two building characteristics.

### REMAINING LIFE EXPECTANCY TABLES

Remaining life expectancy tables are also included with the normal depreciation tables. These tables show a remaining life expectancy for an item at each age of its life. These tables are intended as general information for the appraiser and may or may not be applicable in a specific instance.

### EXTENDED LIFE CONCEPT

The percent good tables incorporate an extended life concept. In this concept, percent good and remaining life expectancy are based upon the expectancy at any age of a surviving item of a larger original group. Thus, a given item that has a probable life expectancy of 20 years when new may have some remaining life, and therefore value, when it is 20 years old. This stems from the fact that the 20-year average life for the group is attained by the early retirement of some items and the later retirement of others.

## EFFECTIVE YEAR

Two items must be known in order to select the proper normal percent good of a structure from the table—the average life and the age of the structure. The average life is obtained from the "average-life table," and the age is calculated by subtracting the *effective year* (see next paragraph) from the appraisal year. Normal percent good and remaining life can be found from the table by selecting the age in years from the age column and reading horizontally to the proper average life column.

In most buildings the effective year is the same as the year of construction. Changes in effective year should not be made unless a significant change has been made in the improvement. However, when a building has been remodeled or added to, or is not architecturally representative of its date of original construction, the effective year may differ from the actual year of construction.

The assignment of an effective year is an appraisal estimate rather than a mechanical calculation. Knowledge of architectural and functional characteristics of structures and the changes in these characteristics over time is the key to estimating the effective year of structures. These characteristics cause structures to fall into eras or age groups. Age groups may be identified by the appraiser, and a year that most nearly reflects the effective age of a structure is assigned.

### PHYSICAL CONDITION

While the value of a building may vary considerably with its condition, effective year changes are not generally made as a result of condition. Normal percent good computations are based on the assumption that the building is in average condition for its age.

While the condition of a building does have a significant influence on its value, the effective year is not generally changed for this reason because it is a temporary situation relative to total

building life. Building conditions may vary considerably in a short period of time; for example, a building may be in poor condition one year, completely renovated the next year, and then allowed to deteriorate again. Effective year changes should be reserved for permanent situations.

Value differences due to physical condition should be considered as a step in the appraisal process that is subsequent to the computation of replacement cost new less depreciation (RCNLD).

The estimation of an effective year is dependent upon the appraiser's knowledge and judgment. At best, an average age of construction tends to set the latest year that should be assigned for effective age.

# DEPRECIATION

## AVERAGE LIFE TABLES

### MISCELLANEOUS IMPROVEMENTS

| Use Type of Improvement | Quality/Type | Type of Schedule | Average Life |
|---|---|---|---|
| Barns (General Farm) | Poor | R. | 20 |
| Barns (General Farm) | Fair | R. | 30 |
| Barns (General Farm) | Good | R. | 40 |
| Barns (General Farm) | Excellent | R. | 60 |
| Barns, Dairy | Poor | R. | 20 |
| Barns, Dairy | Average | R. | 20 |
| Barns, Dairy | Good | R. | 25 |
| Cold Storage Food Lockers | Poor | O.R. | 30 |
| Cold Storage Food Lockers | Average | O.R. | 40 |
| Cold Storage Food Lockers | Good | O.R. | 50 |
| Cold Storage Warehouses | Poor | O.R. | 40 |
| Cold Storage Warehouses | Average | O.R. | 50 |
| Cold Storage Warehouses | Good | O.R. | 60 |
| Cotton Gins | | O.R. | 30 |
| Drive-In Theaters | Poor | O.R. | 20 |
| Drive-In Theaters | Good | O.R. | 30 |
| Drying Sheds (Fruits & Nuts) (Wood Frame) | Poor | R. | 10 |
| Drying Sheds (Fruits & Nuts) (Wood Frame) | Fair | R. | 20 |
| Drying Sheds (Fruits & Nuts) (Wood Frame) | Good | R. | 30 |
| Fences, Wood or Wire | Poor | R. | 10 |
| Fences, Wood or Wire | Average | R. | 20 |
| Fences, Wood or Wire | Good | R. | 30 |
| Fences, Chain Link, Residence-Farm | Light | R. | 20 |
| Fences, Chain Link, Industrial-Commercial | Good | R. | 30 |

# DEPRECIATION

## AVERAGE LIFE TABLES

### MISCELLANEOUS IMPROVEMENTS

| Use Type of Improvement | Quality/Type | Type of Schedule | Average Life |
|---|---|---|---|
| Frost Protection Wind Machines | | R. | 30 |
| Grain Elevators | Concrete and Metal | O.R. | 50 |
| Grain Storage Bins | Metal | O.R. | 40 |
| Grain Storage Bins | Concrete | O.R. | 60 |
| Greenhouses, Commercial | Poor Wood Frame | O.R. | 20 |
| Greenhouses, Commercial | Average | O.R. | 30 |
| Greenhouses, Commercial | Good | O.R. | 40 |
| Greenhouses, Conservatory (Back Yard) | Poor | R. | 10 |
| Greenhouses, Conservatory (Back Yard) | Good | R. | 20 |
| Hog and Sheep Sheds and Corrals | Poor | R. | 10 |
| Hog and Sheep Sheds and Corrals | Fair | R. | 20 |
| Hog and Sheep Sheds and Corrals | Good | R. | 30 |
| Lath Houses | Poor | R. | 10 |
| Lath Houses | Fair | R. | 20 |
| Lath Houses | Good | R. | 30 |
| Motor Truck Scales | Wood Under-structure | O.R. | 30 |
| Motor Truck Scales | Wood Under-structure | O.R. | 40 |
| Poultry Houses | Poor | R. | 10 |
| Poultry Houses | Medium | R. | 20 |
| Poultry Houses | Good | R. | 30 |
| Rice Drying and Storage Plants | Concrete and Metal | O.R. | 50 |

# DEPRECIATION

## AVERAGE LIFE TABLES

### MISCELLANEOUS IMPROVEMENTS

| Use Type of Improvement | Quality/Type | Type of Schedule | Average Life |
|---|---|---|---|
| Service Stations | Poor Wood Frame | O.R. | 20 |
| Service Stations | Good Wood Frame, or Light Steel, or Masonry | O.R. | 25 |
| Service Stations | Good Wood Frame, or Light Steel, or Masonry | O.R. | 30 |
| Silos, Wood | Poor | R. | 20 |
| Silos, Wood | Good | R. | 30 |
| Silos, Masonry - Tile and Basalite | | R. | 40 |
| Silos, Masonry - Concrete | | R. | 50 |
| Steel Building, Quonset or Straight Wall Type (Steel Frame) | Light | O.R. | 40 |
| Steel Building, Quonset or Straight Wall Type (Steel Frame) | Medium | O.R. | 50 |
| Steel Building, Quonset or Straight Wall Type (Steel Frame) | Heavy | O.R. | 60 |
| Storage Sheds (Frame) | Poor | R. | 20 |
| Storage Sheds (Frame) | Fair | R. | 30 |
| Storage Sheds (Frame) | Good | R. | 40 |
| Swimming Pools | Poor | R. | 10 |
| Swimming Pools | Fair | R. | 20 |
| Swimming Pools | Good | R. | 30 |
| Water Tanks, Elevated | Wood Frame and Tank | O.R. | 30 |
| Water Tanks, Elevated | Wood Frame and Tank | O.R. | 60 |

Poor = Poorest grade of materials; not contractor erected.
Fair = Average materials; builder erected.
Good = Good materials; good design; erected by competent builder.

# DEPRECIATION

## NORMAL PERCENT GOOD TABLES - RESIDENTIAL BUILDINGS

| | 20 Years Avg Life | | 25 Years Avg Life | | 30 Years Avg Life | | 40 Years Avg Life | |
|---|---|---|---|---|---|---|---|---|
| Age Years | Rem Life Years | Percent Good | Rem Life Years | Percent Good | Rem Life Years | Percent Good | Rem Life Years | Percent Good |
| 0 | 20 | 100 | 25 | 100 | 30 | 100 | 40 | 100 |
| 1 | 19 | 94 | 24 | 95 | 29 | 96 | 39 | 98 |
| 2 | 18 | 88 | 23 | 90 | 28 | 93 | 38 | 96 |
| 3 | 17 | 81 | 22 | 86 | 27 | 89 | 37 | 94 |
| 4 | 16 | 75 | 21 | 81 | 26 | 86 | 36 | 92 |
| 5 | 15 | 69 | 20 | 77 | 25 | 82 | 35 | 90 |
| 6 | 14 | 63 | 19 | 72 | 24 | 79 | 34 | 87 |
| 7 | 13 | 59 | 18 | 68 | 23 | 75 | 33 | 84 |
| 8 | 12 | 57 | 17 | 63 | 22 | 71 | 32 | 82 |
| 9 | 11 | 55 | 16 | 60 | 21 | 67 | 31 | 80 |
| 10 | 11 | 53 | 16 | 58 | 20 | 64 | 30 | 77 |
| 11 | 10 | 50 | 15 | 56 | 19 | 60 | 29 | 74 |
| 12 | 9 | 48 | 14 | 54 | 19 | 59 | 28 | 72 |
| 13 | 8 | 46 | 13 | 53 | 18 | 57 | 27 | 70 |
| 14 | 7 | 44 | 12 | 51 | 17 | 56 | 27 | 67 |
| 15 | 7 | 42 | 11 | 49 | 16 | 54 | 26 | 65 |
| 16 | 6 | 40 | 11 | 48 | 15 | 53 | 25 | 62 |
| 17 | 5 | 38 | 10 | 46 | 14 | 52 | 24 | 60 |
| 18 | 5 | 36 | 9 | 44 | 13 | 50 | 23 | 59 |
| 19 | 4 | 33 | 8 | 43 | 13 | 49 | 22 | 58 |
| 20 | 4 | 31 | 7 | 41 | 12 | 47 | 21 | 56 |
| 21 | 3 | 29 | 7 | 39 | 11 | 46 | 21 | 55 |
| 22 | 3 | 27 | 6 | 37 | 11 | 44 | 20 | 54 |
| 23 | 3 | 25 | 6 | 35 | 10 | 43 | 19 | 53 |
| 24 | 3 | 23 | 5 | 34 | 9 | 42 | 18 | 52 |
| 25 | 2 | 21 | 5 | 32 | 9 | 40 | 17 | 51 |
| 26 | 2 | 19 | 4 | 30 | 8 | 39 | 17 | 50 |
| 27 | 2 | 16 | 4 | 29 | 7 | 37 | 16 | 49 |
| 28 | 2 | 14 | 4 | 27 | 7 | 36 | 15 | 48 |
| 29 | 2 | 12 | 3 | 25 | 6 | 34 | 14 | 47 |
| 30 | 1 | 10 | 3 | 24 | 6 | 33 | 14 | 46 |
| 31 | | | 3 | 22 | 5 | 31 | 13 | 45 |
| 32 | | | 3 | 20 | 5 | 30 | 12 | 44 |
| 33 | | | 2 | 18 | 5 | 29 | 12 | 43 |
| 34 | | | 2 | 17 | 4 | 17 | 11 | 42 |
| 35 | | | 2 | 15 | 4 | 26 | 11 | 41 |
| 36 | | | 2 | 13 | 4 | 24 | 10 | 40 |
| 38 | | | 1 | 10 | 3 | 21 | 9 | 38 |
| 40 | | | | | 2 | 19 | 7 | 35 |
| 42 | | | | | 2 | 16 | 6 | 33 |
| 46 | | | | | 1 | 10 | 5 | 29 |
| 50 | | | | | | | 4 | 25 |
| 55 | | | | | | | 3 | 20 |
| 60 | | | | | | | 2 | 14 |
| 64 | | | | | | | 1 | 10 |

# DEPRECIATION

## NORMAL PERCENT GOOD TABLES - RESIDENTIAL BUILDINGS

| | 45 Years Avg Life | | 50 Years Avg Life | | 55 Years Avg Life | | 60 Years Avg Life | |
|---|---|---|---|---|---|---|---|---|
| Age Years | Rem Life Years | Percent Good | Rem Life Years | Percent Good | Rem Life Years | Percent Good | Rem Life Years | Percent Good |
| 0 | 45 | 100 | 50 | 100 | 55 | 100 | 60 | 100 |
| 2 | 43 | 97 | 48 | 97 | 53 | 98 | 58 | 98 |
| 4 | 41 | 93 | 46 | 94 | 51 | 96 | 56 | 96 |
| 6 | 39 | 89 | 44 | 91 | 49 | 94 | 54 | 94 |
| 8 | 37 | 85 | 42 | 88 | 47 | 91 | 52 | 92 |
| 10 | 35 | 81 | 40 | 85 | 45 | 88 | 50 | 90 |
| 12 | 33 | 77 | 38 | 82 | 43 | 85 | 48 | 88 |
| 14 | 32 | 73 | 36 | 78 | 41 | 82 | 46 | 86 |
| 16 | 30 | 69 | 35 | 74 | 40 | 79 | 45 | 83 |
| 18 | 28 | 65 | 33 | 70 | 38 | 76 | 43 | 80 |
| 20 | 26 | 60 | 31 | 67 | 36 | 73 | 41 | 77 |
| 22 | 24 | 58 | 29 | 63 | 34 | 69 | 39 | 74 |
| 24 | 23 | 56 | 28 | 60 | 32 | 65 | 37 | 71 |
| 26 | 22 | 54 | 26 | 58 | 31 | 62 | 35 | 68 |
| 28 | 20 | 52 | 24 | 56 | 29 | 60 | 34 | 65 |
| 30 | 18 | 50 | 23 | 54 | 27 | 58 | 32 | 63 |
| 32 | 17 | 48 | 21 | 53 | 26 | 56 | 30 | 60 |
| 34 | 15 | 47 | 20 | 51 | 24 | 55 | 29 | 58 |
| 36 | 14 | 45 | 18 | 49 | 23 | 53 | 27 | 57 |
| 38 | 12 | 43 | 17 | 47 | 21 | 51 | 26 | 55 |
| 40 | 11 | 41 | 16 | 45 | 20 | 50 | 24 | 54 |
| 42 | 10 | 39 | 14 | 44 | 19 | 48 | 23 | 52 |
| 44 | 9 | 37 | 13 | 42 | 17 | 46 | 21 | 51 |
| 46 | 8 | 35 | 12 | 40 | 16 | 45 | 20 | 49 |
| 48 | 7 | 33 | 11 | 38 | 15 | 43 | 19 | 47 |
| 50 | 6 | 31 | 10 | 37 | 14 | 41 | 18 | 46 |
| 52 | 5 | 29 | 9 | 35 | 12 | 40 | 16 | 44 |
| 54 | 5 | 28 | 8 | 33 | 11 | 38 | 15 | 43 |
| 56 | 4 | 26 | 7 | 31 | 10 | 36 | 14 | 41 |
| 58 | 4 | 24 | 6 | 30 | 9 | 35 | 13 | 40 |
| 60 | 3 | 22 | 5 | 28 | 8 | 33 | 12 | 38 |
| 62 | 3 | 20 | 4 | 26 | 7 | 31 | 11 | 37 |
| 64 | 3 | 18 | 4 | 24 | 6 | 30 | 10 | 35 |
| 66 | 2 | 16 | 3 | 22 | 5 | 28 | 9 | 33 |
| 68 | 2 | 14 | 3 | 21 | 5 | 27 | 8 | 32 |
| 70 | 2 | 12 | 3 | 19 | 4 | 25 | 7 | 30 |
| 72 | 1 | 10 | 2 | 17 | 4 | 23 | 6 | 29 |
| 76 | | | 2 | 14 | 3 | 20 | 5 | 26 |
| 80 | | | 1 | 10 | 2 | 17 | 4 | 23 |
| 84 | | | | | 1 | 10 | 2 | 16 |
| 96 | | | | | | | 1 | 10 |

# DEPRECIATION

## NORMAL PERCENT GOOD TABLES - OTHER THAN RESIDENTIAL BUILDINGS

| | 20 Years Avg Life | | 25 Years Avg Life | | 30 Years Avg Life | | 35 Years Avg Life | |
|---|---|---|---|---|---|---|---|---|
| Age Years | Rem Life Years | Percent Good | Rem Life Years | Percent Good | Rem Life Years | Percent Good | Rem Life Years | Percent Good |
| 0 | 20 | 100 | 25 | 100 | 30 | 100 | 35 | 100 |
| 1 | 19 | 95 | 24 | 97 | 29 | 98 | 34 | 99 |
| 2 | 18 | 90 | 23 | 93 | 28 | 96 | 33 | 97 |
| 3 | 17 | 85 | 22 | 90 | 27 | 93 | 32 | 95 |
| 4 | 16 | 79 | 21 | 86 | 26 | 90 | 31 | 93 |
| 5 | 15 | 73 | 20 | 82 | 25 | 88 | 30 | 91 |
| 6 | 14 | 67 | 19 | 78 | 24 | 85 | 29 | 89 |
| 7 | 13 | 61 | 18 | 74 | 23 | 82 | 28 | 87 |
| 8 | 12 | 56 | 17 | 70 | 22 | 79 | 27 | 85 |
| 9 | 11 | 51 | 16 | 65 | 21 | 75 | 26 | 83 |
| 10 | 10 | 49 | 15 | 60 | 20 | 72 | 25 | 80 |
| 11 | 9 | 48 | 14 | 56 | 19 | 68 | 24 | 78 |
| 12 | 9 | 46 | 13 | 52 | 18 | 65 | 23 | 75 |
| 13 | 8 | 44 | 12 | 50 | 17 | 61 | 22 | 72 |
| 14 | 7 | 43 | 11 | 48 | 16 | 58 | 21 | 69 |
| 15 | 6 | 43 | 10 | 47 | 15 | 54 | 20 | 66 |
| 16 | 6 | 41 | 9 | 46 | 14 | 50 | 19 | 63 |
| 17 | 5 | 39 | 8 | 45 | 13 | 49 | 18 | 60 |
| 18 | 5 | 38 | 8 | 44 | 12 | 48 | 17 | 57 |
| 19 | 5 | 37 | 7 | 43 | 12 | 47 | 16 | 54 |
| 20 | 4 | 35 | 7 | 42 | 11 | 47 | 15 | 51 |
| 21 | 4 | 34 | 6 | 41 | 11 | 46 | 14 | 50 |
| 22 | 4 | 33 | 6 | 40 | 10 | 45 | 13 | 49 |
| 23 | 3 | 32 | 5 | 39 | 10 | 44 | 13 | 48 |
| 24 | 3 | 30 | 5 | 38 | 9 | 43 | 12 | 47 |
| 25 | 3 | 29 | 5 | 37 | 9 | 43 | 12 | 47 |
| 26 | 3 | 28 | 4 | 36 | 8 | 42 | 11 | 46 |
| 27 | 2 | 27 | 4 | 35 | 8 | 41 | 11 | 45 |
| 28 | 2 | 25 | 4 | 34 | 7 | 40 | 10 | 44 |
| 29 | 2 | 24 | 4 | 33 | 7 | 39 | 10 | 43 |
| 30 | 2 | 22 | 3 | 32 | 6 | 38 | 9 | 43 |
| 31 | 2 | 21 | 3 | 31 | 6 | 37 | 9 | 42 |
| 32 | 1 | 20 | 3 | 30 | 5 | 36 | 8 | 42 |
| 33 | | | 3 | 29 | 5 | 35 | 8 | 41 |
| 34 | | | 3 | 28 | 5 | 35 | 7 | 40 |
| 35 | | | 2 | 27 | 5 | 34 | 7 | 39 |
| 36 | | | 2 | 26 | 4 | 33 | 6 | 38 |
| 38 | | | 2 | 24 | 4 | 32 | 6 | 37 |
| 40 | | | 2 | 22 | 3 | 30 | 5 | 36 |
| 42 | | | 1 | 20 | 3 | 28 | 5 | 34 |
| 45 | | | | | 2 | 26 | 4 | 32 |
| 48 | | | | | 2 | 23 | 3 | 30 |
| 52 | | | | | 1 | 20 | 3 | 27 |
| 56 | | | | | | | 2 | 24 |
| 62 | | | | | | | 1 | 20 |

# DEPRECIATION

## NORMAL PERCENT GOOD TABLES - OTHER THAN RESIDENTIAL BUILDINGS

| | 40 Years Avg Life | | 45 Years Avg Life | | 50 Years Avg Life | | 55 Years Avg Life | |
|---|---|---|---|---|---|---|---|---|
| Age Years | Rem Life Years | Percent Good | Rem Life Years | Percent Good | Rem Life Years | Percent Good | Rem Life Years | Percent Good |
| 0 | 40 | 100 | 45 | 100 | 50 | 100 | 55 | 100 |
| 2 | 38 | 98 | 43 | 99 | 48 | 99 | 53 | 99 |
| 4 | 36 | 96 | 41 | 97 | 46 | 98 | 51 | 98 |
| 6 | 34 | 93 | 39 | 95 | 44 | 97 | 49 | 97 |
| 8 | 32 | 90 | 37 | 93 | 42 | 95 | 47 | 96 |
| 10 | 30 | 86 | 35 | 90 | 40 | 93 | 45 | 95 |
| 12 | 28 | 82 | 33 | 87 | 38 | 91 | 43 | 94 |
| 14 | 26 | 78 | 31 | 84 | 36 | 88 | 41 | 92 |
| 16 | 24 | 73 | 29 | 81 | 34 | 85 | 39 | 90 |
| 18 | 22 | 68 | 27 | 77 | 32 | 82 | 37 | 88 |
| 20 | 20 | 63 | 25 | 73 | 30 | 80 | 35 | 86 |
| 22 | 18 | 58 | 23 | 69 | 28 | 77 | 33 | 83 |
| 24 | 17 | 53 | 21 | 65 | 26 | 73 | 31 | 80 |
| 26 | 15 | 50 | 20 | 60 | 24 | 69 | 29 | 77 |
| 28 | 14 | 48 | 18 | 55 | 23 | 65 | 27 | 74 |
| 30 | 13 | 47 | 17 | 50 | 21 | 61 | 26 | 71 |
| 32 | 11 | 45 | 15 | 49 | 20 | 57 | 24 | 67 |
| 34 | 10 | 44 | 14 | 48 | 18 | 53 | 22 | 63 |
| 36 | 9 | 43 | 13 | 47 | 17 | 50 | 21 | 59 |
| 38 | 8 | 42 | 12 | 46 | 16 | 48 | 19 | 55 |
| 40 | 8 | 40 | 11 | 44 | 14 | 47 | 18 | 52 |
| 42 | 7 | 39 | 10 | 43 | 13 | 46 | 17 | 50 |
| 44 | 6 | 38 | 9 | 42 | 12 | 45 | 16 | 49 |
| 46 | 6 | 36 | 8 | 41 | 11 | 44 | 15 | 48 |
| 48 | 5 | 35 | 7 | 40 | 10 | 43 | 14 | 47 |
| 50 | 5 | 34 | 7 | 38 | 10 | 42 | 13 | 45 |
| 52 | 4 | 32 | 6 | 37 | 9 | 41 | 12 | 44 |
| 54 | 4 | 31 | 6 | 36 | 8 | 40 | 11 | 43 |
| 56 | 3 | 30 | 5 | 35 | 8 | 39 | 10 | 42 |
| 58 | 3 | 29 | 5 | 34 | 7 | 38 | 9 | 41 |
| 60 | 3 | 27 | 4 | 32 | 7 | 37 | 9 | 40 |
| 62 | 2 | 26 | 4 | 31 | 6 | 36 | 8 | 39 |
| 64 | 2 | 25 | 4 | 30 | 6 | 35 | 8 | 38 |
| 66 | 2 | 24 | 3 | 29 | 5 | 34 | 7 | 37 |
| 68 | 2 | 22 | 3 | 28 | 5 | 33 | 7 | 36 |
| 70 | 2 | 21 | 3 | 27 | 4 | 32 | 6 | 36 |
| 72 | 1 | 20 | 3 | 25 | 4 | 31 | 6 | 35 |
| 74 | | | 2 | 24 | 5 | 30 | 5 | 34 |
| 76 | | | 2 | 23 | 3 | 28 | 5 | 32 |
| 82 | | | 1 | 20 | 3 | 26 | 4 | 30 |
| 84 | | | | | 2 | 24 | 4 | 29 |
| 88 | | | | | 2 | 22 | 3 | 27 |
| 92 | | | | | 1 | 20 | 2 | 25 |
| 96 | | | | | | | 2 | 23 |
| 102 | | | | | | | 1 | 20 |

# DEPRECIATION

## NORMAL PERCENT GOOD TABLES - OTHER THAN RESIDENTIAL BUILDINGS

| | 60 Years Average Life | | 70 Years Average Life | |
|---|---|---|---|---|
| Age Years | Remaining Life Years | Percent Good | Remaining Life Years | Percent Good |
| 0 | 60 | 100 | 70 | 100 |
| 2 | 58 | 99 | 68 | 99 |
| 4 | 56 | 99 | 66 | 99 |
| 6 | 54 | 98 | 64 | 99 |
| 8 | 52 | 97 | 62 | 98 |
| 10 | 50 | 96 | 60 | 98 |
| 12 | 48 | 95 | 58 | 97 |
| 14 | 46 | 94 | 56 | 96 |
| 16 | 44 | 93 | 54 | 96 |
| 18 | 42 | 92 | 52 | 95 |
| 20 | 40 | 89` | 50 | 94 |
| 22 | 38 | 87 | 48 | 93 |
| 24 | 36 | 85 | 46 | 92 |
| 26 | 34 | 83 | 45 | 91 |
| 28 | 32 | 81 | 42 | 89 |
| 30 | 30 | 78 | 40 | 87 |
| 32 | 29 | 75 | 39 | 85 |
| 34 | 27 | 72 | 37 | 83 |
| 36 | 25 | 69 | 35 | 81 |
| 38 | 24 | 66 | 33 | 79 |
| 40 | 22 | 63 | 31 | 76 |
| 42 | 21 | 60 | 30 | 73 |
| 44 | 20 | 56 | `29 | 70 |
| 46 | 18 | 52 | 27 | 67 |
| 48 | 17 | 49 | 26 | 64 |
| 50 | 16 | 48 | 25 | 61 |
| 52 | 15 | 47 | 23 | 58 |
| 54 | 14 | 46 | 22 | 56 |
| 56 | 13 | 46 | 21 | 54 |
| 58 | 12 | 45 | 20 | 52 |
| 60 | 11 | 44 | 19 | 50 |
| 64 | 10 | 42 | 17 | 48 |
| 68 | 9 | 40 | 15 | 46 |
| 72 | 8 | 38 | 13 | 44 |
| 76 | 7 | 36 | 12 | 43 |
| 80 | 6 | 35 | 11 | 41 |
| 86 | 5 | 32 | 9 | 39 |
| 92 | 4 | 29 | 8 | 36 |
| 100 | 3 | 25 | 6 | 33 |
| 108 | 2 | 22 | 4 | 29 |
| 112 | 1 | 20 | 3 | 27 |
| 122 | | | 2 | 24 |
| 130 | | | 1 | 20 |