State of California

Board of Equalization
Property and Special Taxes Department

Memorandum

To: Honorable Betty T. Yee, Chairwoman
Honorable Jerome E. Horton, Vice Chair
Honorable Bill Leonard
Honorable Michelle Steel
Honorable John Chiang

Date: December 4, 2009

From: David J. Gau, Deputy Director
Property and Special Taxes Department

Subject: ***Item P3.B.1.—Deputy Director's Agenda***
Assessors' Handbook Section 534, Rural Building Costs

At the November 19, 2009 Board meeting, staff requested adoption of the January 1, 2010 revision of Assessors' Handbook Section 534, *Rural Building Costs* (AH 534). Board Member Leonard asked that staff reconfirm the cost data contained in AH 534. Staff has reviewed and confirmed the data in AH 534 and requests adoption of the January 1, 2010 revision.

Discussion

Questions expressed during the November Board meeting primarily concerned the comparison of cost data in Assessors' Handbook Section 531, *Residential Building Costs* (AH 531), and cost of data in AH 534. Generally, the 2010 revision of cost data in AH 531 reflects an overall decrease. Generally, the 2010 revision of cost data in AH 534 reflects an overall increase. This anomaly is due to the different methods of deriving the data contained in AH 531 and AH 534.

AH 531

Costs in AH 531 are in compliance with Property Tax Rule 6, *The Reproduction and Replacement Cost Approaches to Value,* and reflect the cost typically incurred in bringing a residential property on a level site in the four-county Sacramento area[1] to a finished state. They include, except for unusually high fees and permits required by some governmental agencies, all necessary costs that are incurred in placing a residential building or component in the hands of the ultimate consumer. For example, the costs include expenses for materials, labor, fees, overhead and profit, utility hook-ups, and entrepreneurial profit.[2] The costs in AH 531 are developed through a combination of gathering and analyzing contractors' and developers' actual costs, which would not include entrepreneurial profit, and sales of residential properties in the four-county base which include all of the elements necessary to place the property in the hands of the ultimate consumer, including entrepreneurial profit.

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[1] Sacramento, Yolo, and the western portions of El Dorado and Placer Counties. AH 531 contains location adjustment factors for counties outside of the four-county base.

[2] Revenue and Taxation Code section 401.6 defines *entrepreneurial profit* as "the difference between the fair market value of a property and the total costs incurred with respect to that property."

AH 531 is used by appraisers for two primary purposes: (1) to corroborate the sales price of residential property; and (2) to determine the assessed value of an addition to an existing property. Appraisers make adjustments to the data contained in AH 531 to accommodate location and condition of the property being appraised. AH 531 is used for residential properties throughout California, whether in urban or rural areas.

AH 534

Costs in AH 534 are in compliance with Property Tax Rule 6. The majority of costs in AH 534 are base costs for pumps, wine trellises, wind machines, septic tanks, corrals, prefabricated sheds and shops, barns, etc. The costs for structures contained in AH 534 (e.g., barns) reflect the cost to build on a level and cleared site in California. The costs include normal expenses incurred in placing an improvement or component in the hands of the ultimate consumer. For example, the costs include expenses for materials, labor, fees, overhead and profit, and utility hook-ups. The costs in AH 534 do not contain a component for entrepreneurial profit as required by Property Tax Rule 6 because market data is not readily available for staff to derive this component. Most frequently, these properties are not bought and sold in the marketplace like single-family residence, but are constructed on rural properties by the owner for a specific use. Appraisers using AH 534 to appraise an improvement such as a barn must add an element for entrepreneurial profit where appropriate.

AH 534 is used by appraisers for two primary purposes: (1) to determine the assessed value of fixtures commonly found on rural properties; and (2) to determine the assessed value of structures (other than residential properties) commonly found on rural properties. Appraisers make adjustments to data contained in AH 534 to accommodate condition of the property being appraised.

Analysis

The overwhelming reason why the costs in AH 531 reflect an overall decrease for 2010 is the decrease in entrepreneurial profit, not necessarily a decrease in the actual base costs of the materials to build a structure. In many instances, the costs for construction components such as lumber, cement, sheetrock, steel, etc., have actually increased. However, because of the current crisis in the housing market, builders have found it necessary to decrease (often dramatically) their entrepreneurial profit margin in order to sell properties. Five years ago, it was not uncommon to find entrepreneurial profits as high as 50 percent or more. This past year, it was not uncommon to find entrepreneurial profits less than 15 percent, often less than 10 percent.

As stated above, since AH 534 has never included a component for entrepreneurial profit, the current trend of reduced entrepreneurial profits does not have an influence on the cost data in AH 534. The costs in AH 534 are developed from analysis of data gathered from:

- Contractors and developers;
- Agricultural appraisers in various California counties;[3]
- *Marshall Valuation Service* for those limited items that *Marshall* also provides data;
- Vendors' Internet sites; and
- Vendors' catalogs.

After again reviewing the data, Staff believes that the costs contained in AH 534 are correct and appropriate for the 2010 lien date.

With your approval, this item will be placed on the Board's December 16, 2009 agenda under Deputy Director's Report, Property and Special Taxes.

DJG:sk

cc: Ms. Diane Olson
Mr. Dean Kinnee

Approved: _____
Ramon J. Hirsig, Executive Director

BOARD APPROVED
At the _____Board Meeting

_____
Diane Olson, Chief
Board Proceedings Division

[3] Colusa, Contra Costa, Fresno, Humboldt, Inyo, Kern, Kings, Los Angeles, Madera, Mariposa, Merced, Mono, Monterey, Placer, Plumas, San Bernardino, San Joaquin, Santa Barbara, Shasta, Siskiyou, Stanislaus, Trinity, Tulare, Ventura, and Yuba Counties.

ASSESSORS' HANDBOOK
SECTION 534

RURAL BUILDING COSTS

JANUARY 2010

CALIFORNIA STATE BOARD OF EQUALIZATION

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BILL LEONARD, ONTARIO/SACRAMENTO	SECOND DISTRICT
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RAMON J. HIRSIG, EXECUTIVE DIRECTOR

FOREWORD

This edition of Assessors' Handbook Section 534 (AH 534), *Rural Building Costs*, updates some costs contained in previous editions and includes new data. In previous years, hard copies of the loose-leaf pages were made available to interested parties. However, due to budget constraints, the 2010 version of AH 534 is only available on the Board's website.

Although diligent efforts have been made to supply accurate and reliable information, it is very important to temper this data with local costs where appropriate since construction costs may vary both within and among counties. Also, costs for permits and fees to construct buildings have changed throughout the state. AH 534 should serve as a guide, but an appraiser must research the market to determine which costs are most applicable for the appraisal assignment and consider 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 and Special Taxes Department.

/s/ David J. Gau

David J. Gau
Deputy Director
Property and Special Taxes Department
California State Board of Equalization
January 2010

RURAL BUILDING COSTS

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AH 534.00: COSTING INFORMATION

STATUTORY 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 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
Chime Joists	Wooden support members that are placed under the bottom of a redwood storage tank.
Free-stall Barn	A building that contains individual stalls where a cow may enter, lie down, or leave without restriction.
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.
Pole Building	A building whose main frame and foundation are treated posts or piles, sunk into the ground with prefabricated trusses and metal siding.
Polycarbonate	A class of resins that are used to produce tough, transparent items, such as roof material and siding of greenhouses.
Quonset Building	A prefabricated metal building with a curved roof that extends to the ground forming the sides of the building.
Ripping	The term used in agriculture to indicate plowing or breaking up of soil. The result is a reduction in compacted soil.
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.
Unloading Auger	A screw-like device that rotates resulting in the horizontal movement of stored material out of a storage bin.
Wind Machines	Elevated fans used to provide frost protection for crops.

AH 534.10: BASIC FARM BUILDINGS

This chapter contains specifications and costs for various basic farm buildings including 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.

PREFABRICATED HORSE BARNS

SPECIFICATIONS

Structure	6" steel purlins on 6' centers; enamel exterior
Foundation	Concrete piers
Floor	Dirt
Door	Sliding stall (inside tract)
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

12' x 12'	$3,900	$3,600
12' x 16'	4,600	4,200

Shed roof overhang per square foot: 8' — **$5.25**
12' — **$5.80**

(Photograph shown on AH 534.10, page 11)

BASIC FARM BUILDINGS

PREFABRICATED HORSE BARNS

GABLE ROOF BARN—STANDARD BREEZEWAY

12' x 12' with 12' breezeway	$9,900	$8,400
12' x 12' with 16' breezeway	10,300	8,700
12' x 16' with 12' breezeway	11,300	9,900
12' x 16' with 16' breezeway	11,700	10,500

GABLE ROOF BARN—RAISED BREEZEWAY

12' x 12' with 12' breezeway	$10,700	$9,270
12' x 12' with 16' breezeway	11,500	9,990
12' x 16' with 12' breezeway	12,200	11,000
12' x 16' with 16' breezeway	12,350	11,800

Roof extension per square foot—**$5.80**
12-foot breezeway doors—**$780** each
16-foot breezeway doors—**$890** each

(Photographs shown on AH 534.10, pages 11 and 12)

ADDITIVES

Concrete floor	$4.60 - $5.00 per square foot
Full footing	$13.00 per linear foot
Portable 5'-4 rail corral panels	$8.25 - $10.30 per linear foot
Portable 5'-5 rail corral panels	$9.25 - $11.30 per linear foot
Portable 6' rail corral panels with metal roof	$5.60 - $6.70 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 **$.60** to **$1.00** per square foot
Cost	**$10.20** to **$11.50** per square foot
Add for vinyl fencing	**$10.20** to **$11.30** per linear foot

(Photographs shown on AH 534.10, page 13)

BASIC FARM BUILDINGS

GENERAL PURPOSE BARNS

BUILDING SPECIFICATIONS

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 14, 15, and 16)

SQUARE-FOOT COSTS

	15.25	11.80	10.90	10.55	10.10	9.90
	20.50	16.70	15.55	14.95	14.60	14.10
	31.25	25.65	23.65	22.80	22.30	21.75

BASIC FARM BUILDINGS

HAY STORAGE BARNS

BUILDING SPECIFICATIONS

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

(Photograph shown on AH 534.10, page 17)

SQUARE-FOOT COSTS

	12.10	10.15	9.20	8.50	8.20	7.80
	13.95	11.50	10.50	9.80	9.30	9.00
	22.80	18.90	17.50	16.00	15.30	14.65

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

BASIC FARM BUILDINGS

FEED BARNS

BUILDING SPECIFICATIONS

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—2" x 4" rafters, 24" to 36" on center, or 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 18)

SQUARE-FOOT COSTS

	8.25	7.40	7.05	6.75	6.90	6.85
	13.05	11.95	11.55	11.35	11.25	11.20
	15.40	14.15	13.80	13.55	13.45	13.40

BASIC FARM BUILDINGS

POLE BUILDINGS

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 19)

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

	7.45	7.30	7.15	7.00	6.90	6.75	6.70	6.60	6.55	6.55
	7.05	6.90	6.70	6.45	6.35	6.25	6.15	6.10	6.05	6.00
	6.60	6.40	6.05	6.00	5.85	5.75	5.70	5.70	5.70	5.70
	6.25	6.05	5.85	5.70	5.50	5.40	5.40	5.40	5.40	5.40
	5.90	5.75	5.50	5.45	5.40	5.40	5.40	5.40	5.40	5.40
	5.90	5.70	5.50	5.45	5.40	5.40	5.40	5.35	5.35	5.35
	5.90	5.70	5.50	5.45	5.40	5.40	5.40	5.35	5.35	5.35

Deduct 15% for light duty, fair quality construction.

Skylights (2' x 10')	**$105.00** each
Vents (14", Rotary)	**$210.00** each
Poles, In-Place	**$168 to $230** each
Covered wall area add	**$3.85** per square foot of wall surface

Reinforced Concrete Floors:

4"	**$5.00** per square foot
6"	**$5.60** per square foot

BASIC FARM BUILDINGS

SHOPS

BUILDING SPECIFICATIONS

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 20)

SQUARE-FOOT COSTS

	18.23	16.70	15.65	14.85	14.15	13.85	13.44	12.75	12.70	12.35
	22.75	20.80	19.60	18.95	18.25	17.40	16.70	16.35	16.00	15.65
	26.30	25.70	24.90	23.85	22.80	22.10	21.40	20.65	19.95	19.20

BASIC FARM BUILDINGS

MACHINERY AND EQUIPMENT SHEDS

BUILDING SPECIFICATIONS

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 21)

SQUARE-FOOT COSTS—TYPE I, ALL SIDES CLOSED

	11.00	9.90	9.20	8.90	8.75	8.65	8.60	8.55	8.45	8.35	8.20
	16.22	14.15	13.40	13.15	12.85	12.75	12.60	12.40	12.35	12.30	11.90
	21.00	18.95	17.60	17.30	16.90	16.80	16.60	16.45	16.35	16.25	16.00

SQUARE-FOOT COSTS—TYPE II, ONE SIDE OPEN

	9.70	8.15	7.65	7.40	7.30	7.15	7.05	7.00	6.95	6.90	6.85
	14.85	12.75	11.75	11.35	11.05	10.95	10.70	10.80	10.65	10.55	10.50
	19.35	18.15	17.50	16.80	16.30	16.10	15.95	15.80	15.75	15.60	15.55

Pole Buildings – Deduct 10 to 15% from above costs.

BASIC FARM BUILDINGS

PREFABRICATED WOOD STORAGE SHEDS

Prefabricated wood storage sheds are normally purchased at lumber yards and home improvement centers.

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, 6 ½' to 7 ½' 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 22)

SQUARE-FOOT COSTS

50 to 74	$26.95
75 to 99	$23.65
100 to 139	$21.45
140 to 199	$20.35
200 and up	$17.60 - $19.80

ADDITIVES

Windows	2' x 2'	**$137.50**
	3' x 2'	**$159.50**
Doors—Double 6' Wide		**$165.00**
Skylight—2' x 2'		**$154.00**
Turbine Vent		**$90**
Shelves—16" wide		**$4.50** per linear foot
Shelves—24" wide		**$5.00** per linear foot
Workbench—24" wide		**$7.00** per linear foot
Steel roll-up door		**$75** per foot (width)
Loft		**$4.40** per square foot
Extra Concrete		**$5.50 - $6.60** per square foot

BASIC FARM BUILDINGS

SMALL SHEDS

BUILDING SPECIFICATIONS

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

	19.03	17.25	15.41	13.17	12.65	11.79	11.39	10.93	10.35	10.01	9.55
	26.80	24.09	21.79	20.07	19.09	18.17	17.37	16.39	15.41	14.95	14.61
	32.89	29.56	28.18	26.34	24.55	22.60	21.33	20.47	19.49	19.09	18.63

SQUARE-FOOT COSTS—TYPE II, ONE SIDE OPEN

	13.32	12.08	10.79	9.22	8.86	8.25	7.97	7.65	7.25	7.00	6.68
	18.76	16.86	15.25	14.05	13.36	12.72	12.16	11.47	10.79	10.47	10.22
	23.02	20.69	19.72	18.43	17.19	15.82	14.93	14.33	13.64	13.36	13.04

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

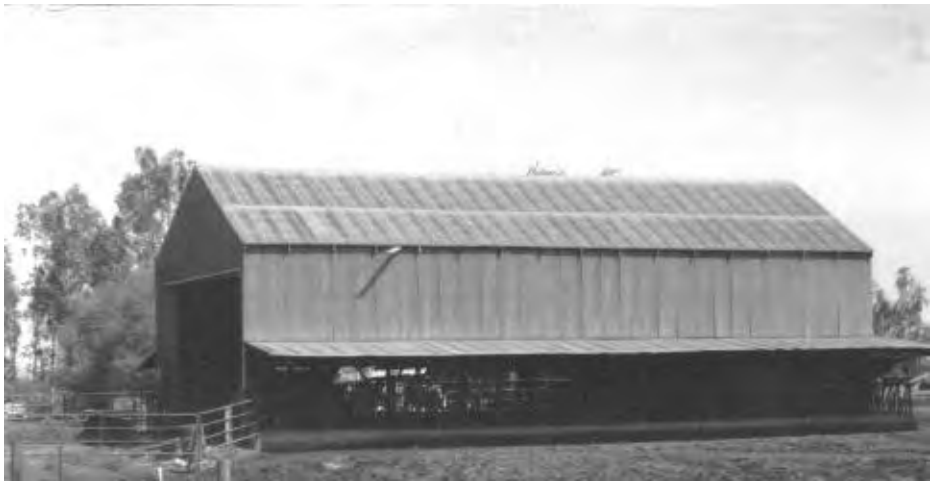
GENERAL PURPOSE BARNS

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, page 14)

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

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	**$57.75 to $66.00** per square foot	**$66.00 to $72.60** 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—$38.50 to $48.00** per square foot

Total Building Cost: includes equipment room, milk room, office, bath, supply, milking parlor, and wash and drip area—Average quality **$45.00 to $57.00** per square foot
Good quality **$58.00 to $63.00** per square foot

HOLDING, WASH, AND DRIP AREA EQUIPMENT

Floor or Ramp	Sloping concrete with carborundum finish. **$3.60 - $4.20** per square foot
Walls	Concrete block 5' to 6' high with smooth plaster. **$45.00 to $50.00** per linear foot
Metal Rail Fence	Welded pipe 7'—10' o.c. in concrete. **$12.00 - $14.00** per linear foot
Cable Fence	1 1/4" top rail, 2 7/8" post, 7' o.c. 3 cable—**$9.00 to $9.70** per linear foot 4 cable—**$10.00 to $11.00** per linear foot
Gates	54" high, pipe with bracing. **$15.00** per linear foot of gate width
Sprinkler System	Hooded sprinkler, including pump. **$152 - $185** per sprinkler, or per double 30 barn—60 cows **$19,160 - $21,525**
Roof Structure and Roofing	Average quality: Pipe supports, wood or light steel frame and corrugated iron roofing—**$5.25 to $7.90** per square foot Good quality: Box beam columns, hot-dip galvanized and box beam galvanized rafters and purlins; quality steel roofing with skylights and electric lighting—**$8.60 to $10.10** per square foot
Total Area Cost Including All Components	**$21.50 - $25.90** 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.	$97,600

VACUUM PUMP

Air vacuum pump with 30 HP motor, stand, pulleys, belts, guards, filter assembly, miscellaneous pipe valves, and electrical.	$11,550

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.	$93,900

MILK TRANSFER SYSTEM

Control assembly and miscellaneous equipment.	$4,900

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.	$81,600

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.	$116,300

REFRIGERATION SYSTEM

Freon compressor, air condensers, related hardware, pipes, valves, and electrical. Plate cooler with 100 plates and all hardware.	$52,500

Above costs include tax and labor

DAIRY BARNS

DAIRY EQUIPMENT

HEAT RECOVERY SYSTEM

Heat recovery system and all hardware.	$11,600

HOT WATER SYSTEM

Boiler with insulated 500-gallon storage tank, insulated piping, and electrical.	$16,400

SPRINKLER PEN HARDWARE

Pumps, sprinklers, and all related pipelines and miscellaneous hardware.	$22,100

AIR COMPRESSOR

10 HP air compressor with 120-gallon tank. Includes miscellaneous hardware and electrical.	$8,700

ELECTRIC OR AIR CROWD GATE

30 to 50 foot electric gate with track and control kit, motor, panel, and electrical.	$23,600

Above costs include tax and labor

Total equipment cost for double 30 parallel $540,000 Rounded

EQUIPMENT ONLY (Including tax and labor)

Double 14' Parallel	Total - **$311,000 to $326,400**
Double 16' Parallel	Total - **$342,700 to $357,000**
Double 18' Parallel	Total - **$367,200 to $408,000**
Double 24' Herringbone	Total - **$448,800 to $484,500**
Double 25' Parallel	Total - **$464,100 to $489,600**
Double 30' Parallel	Total - **$510,000 to $555,900**
50-Cow Rotary Barn	Total - **$622,200 to $714,000**
70-Cow Rotary Barn	Total - **$734,400 to $765,000**

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	**$915 to $1,170** per stanchion **or $9.15 to $11.70** per square foot

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

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

Cow water beds – **$153 to $188** 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	**$7.40 to $8.00** per square foot

Hospital barns without small divided pens, with dirt floors, low to average quality: **$5.00 to $6.00** per square foot

(Photograph shown on AH 534.20, page 23)

DAIRY BARNS

CORRALS

Concrete Flatwork Large areas/not reinforced	4" to 4½"—**$2.10 to $2.40** per square foot 6"—**$2.50 to $3.05** per square foot
Rubber Belting	**$1.55 to $2.35** per square foot
Curbs	8" x 16"—**$7.35** per linear foot 8" x 24"—**$8.90** per linear foot
Cable Fence	2 3/8" top rail, 2 7/8" post—10' o.c. 3 cable—**$9.15 to $9.70** per linear foot 4 cable—**$9.75 to $11.00** per linear foot
Concrete Water Tank	**$575 to $630** each
Steel Stanchions Without Stanchion Curb	**$45.15 to $50.40** each hole **$24.60 to $27.80** per linear foot
Steel Self-Locking Stanchions Without Stanchion Curb	**$48.00 to $52.00** each hole **$23.50 to $26.50** per linear foot
12" PVC Flush Line	**$11.55 to $13.10** per foot
Sump Pumps	3 HP **$2,845 to $3,045** 5 HP **$3,830 to $4,040**
Floating Agitator Pump	75 HP **$18,375 to $20,575** 40 HP **$14,175 to $15,225**
Gates	12' to 16'—**$180 to $225** each
Loafing Sheds	Wood—**$4.40 to $5.65** per square foot Steel—**$5.25 to $6.70** per square foot

COMMODITY BARNS

With Dividers	$11.85 - $17.30
Without Dividers	$10.25 - $13.10

(Photograph shown on AH 534.20, page 23)

COMMODITY BARN ADDITIVES

Concrete Dividers—8' high 6" thick	**$121.00** per linear foot or **$15.13** 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	**$3.47 to $4.25** per square foot

(Photograph shown on AH 534.20, page 24)

DAIRY BARNS

MISCELLANEOUS EQUIPMENT

CURBS

8" x 8"	$3.60 to $4.70
8" x 16"	$7.20 to $8.20
8" x 20"	$8.20

CABLE FENCE

2 3/8" top rail with 2 7/8" post 10' o.c.	3 cable—$9.00 to $9.50 4 cable—$9.50 to $10.50 5 cable—$10.00 to 11.00
Cattle guard	$1,287.50 to $1,854.00 each

SOLID RAIL FENCE

(4) 2 3/8" rails with 2 7/8" post 10' o.c.	$12.35 to $13.95

TANKER PAD

6" to 7" rebar reinforced concrete with footings	$2.85 to $3.35

WATER TROUGHS

Concrete water troughs - 2' x 12'	$440 to $460
Concrete water troughs - 2' x 16'	$490 to $595
Mineral troughs - 20'	$165 to $195

CORRAL SHADES

Pipe poles, wood frame, metal cover	$2.20 to $2.45
Pipe poles, steel frame, metal cover	$2.45 to $2.95

WATER LINES

2" Water line	$2.35	per linear foot
3" Water line	$2.60	per linear foot
12" Flush line	$12.60	per linear foot
18" Drain line	$22.00	per linear foot
Flush valves	$1,575	each
Drain boxes	$1,680	each

DAIRY BARNS

SEPTIC TANKS

1,000 – 1,500 gallon with lines	$3,675 to $4,200
Cistern - per gallon	$.65 to $.70

BARN FANS

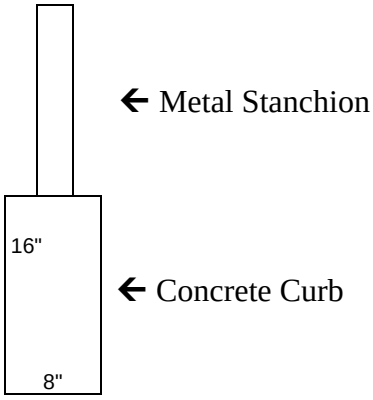
With misters and automatic controls	$735 to $945 each—installed

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 - **$2.50 to $3.05** per sq. ft.
- Walklane 4" concrete - **$2.10 to $2.35** per sq. ft.
- Flush curb 8" x 8" - **$4.00** per linear foot



Cow lane 12' wide with locking stanchions and stanchion curb and 10' feed lane	**$84.00 to $86.00** 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	Price Per Square Foot
75 x 100	$4.80
100 x 200	$4.00
100 x 300	$3.80

Concrete Silage Slab Only
5 ½" to 6" reinforced with footings - **$2.60 to $3.00** with footings
6" rebar reinforced with footings - **$3.10 to $3.50**

(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	$1,980
9 Ton	2,750
10.5 Ton	2,700
13 Ton	3,300
15 Ton	3,900
20 Ton	4,750
25 Ton	5,180
31 Ton	6,260
34 Ton	6,300
40 Ton	7,140
45 Ton	8,190
60 Ton	9,000

(Photographs shown on AH 534.20, page 27)

ADDITIVES AND ACCESSORIES

Feeder lines (Per linear foot)	$7.00
Partition	$3.10
Ladder	$205 to $255
Augar	$305 to $405

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	**$39.00 to $54.00** 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	**$16.50 to $20.90** 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	**$41.00 to $49.60** 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	**$41.00 to $49.00** 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	**$16.00 to $27.00** 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	**$34.50 to $36.75** 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	**$31.50 to $34.50** per square foot

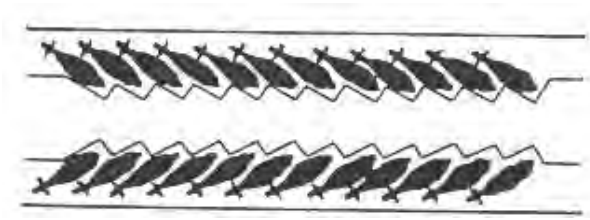
Building costs do not include milking equipment

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

DAIRY BARNS

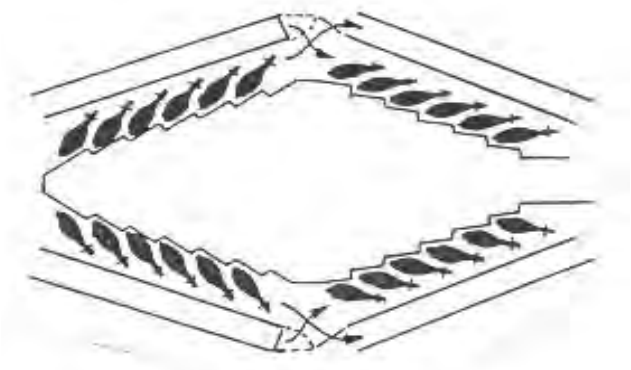
COMMONLY USED MILKING PARLORS

HERRINGBONE (DOUBLE 12)



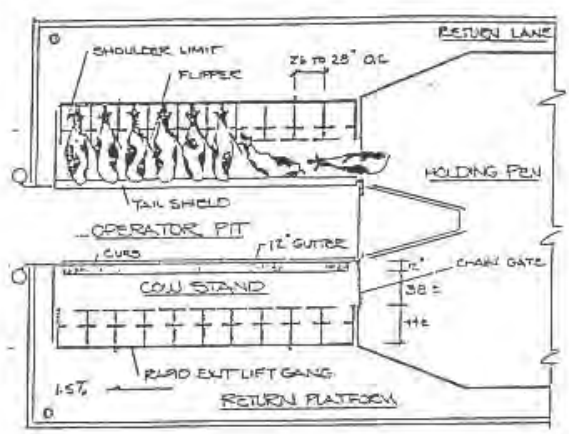
All cows on either side of the pit enter and leave as a group. Newer parlors may have 20 to 30 cows to a side. Some have rapid exit group side release.

POLYGON



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

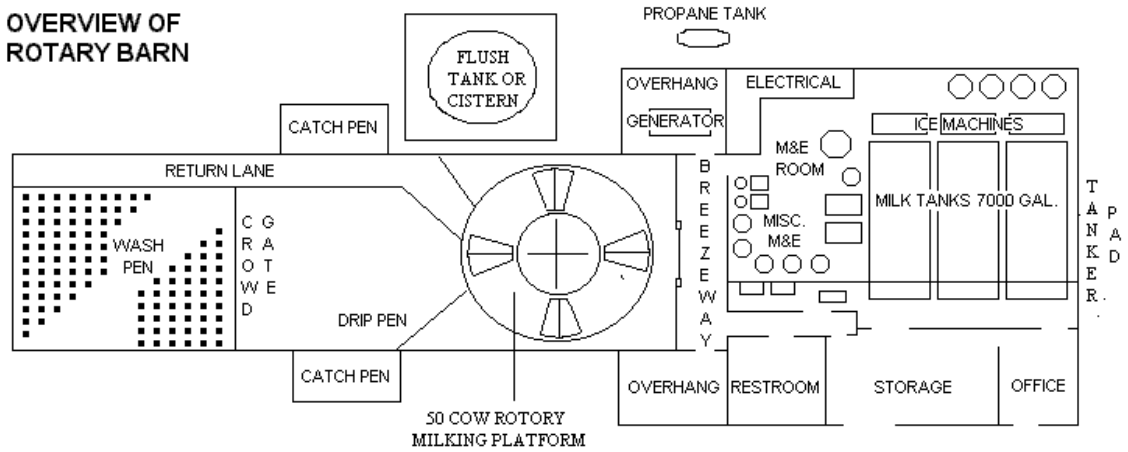
PARALLEL (DOUBLE 10)

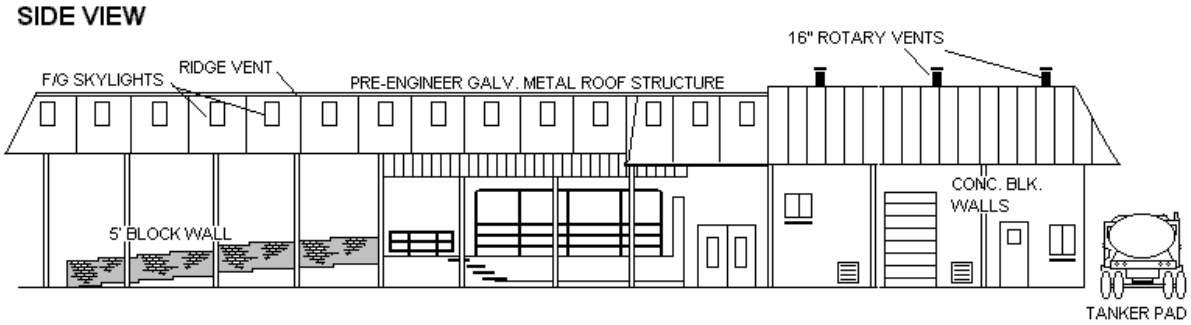


In this design, cows are milked from the rear, rather than the side. Thus, more cows can be milked in a given space than with other designs. Usually a rapid gang exit is present. Typical size is a double 20' to 30'.

DAIRY BARNS

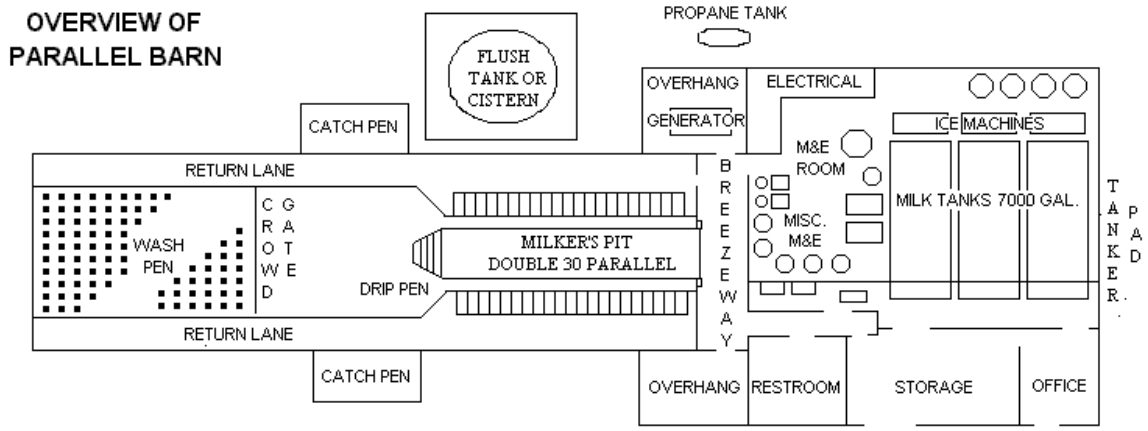
50-COW ROTARY BARN

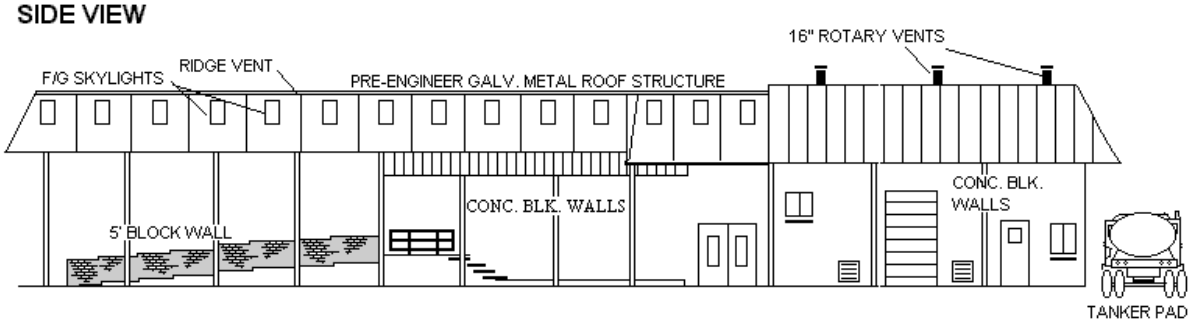




DAIRY BARNS

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

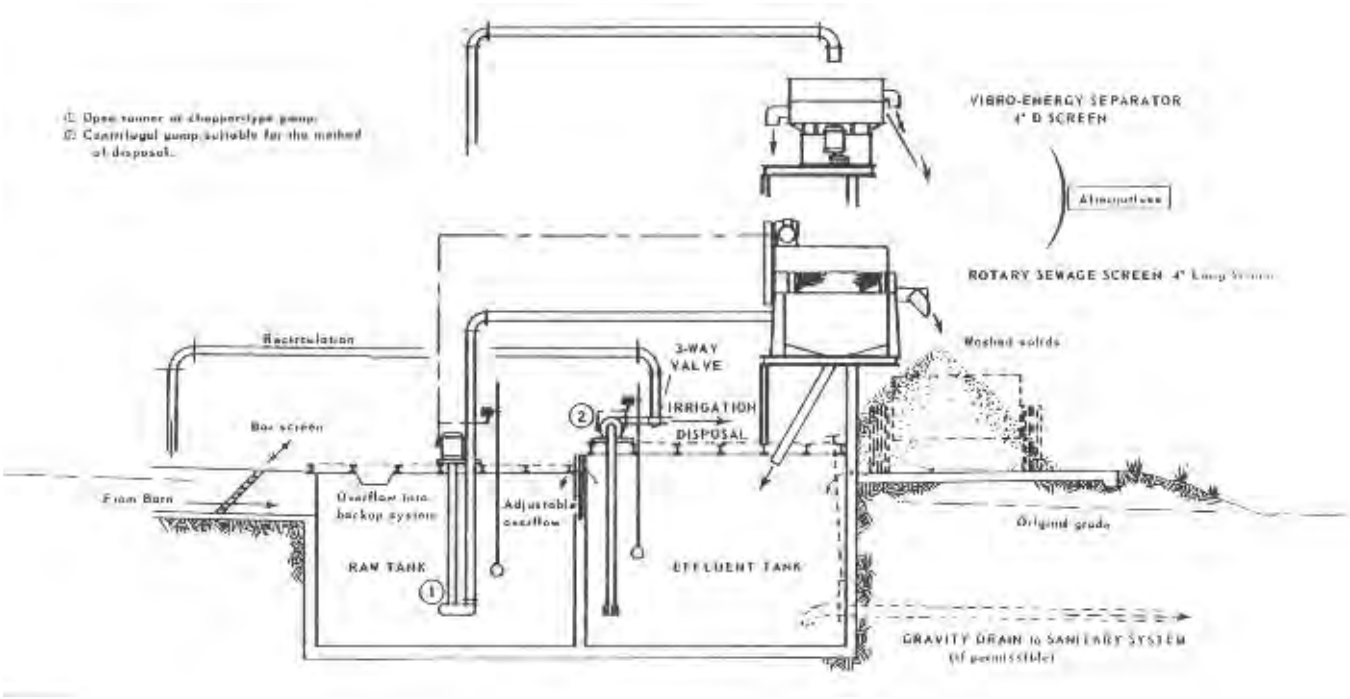
MISCELLANEOUS

Feedlane Stanchions

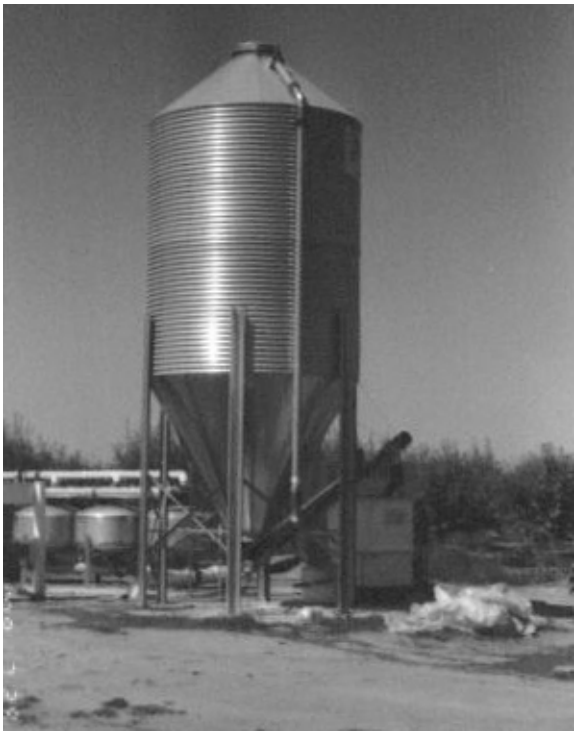
Silage Pits

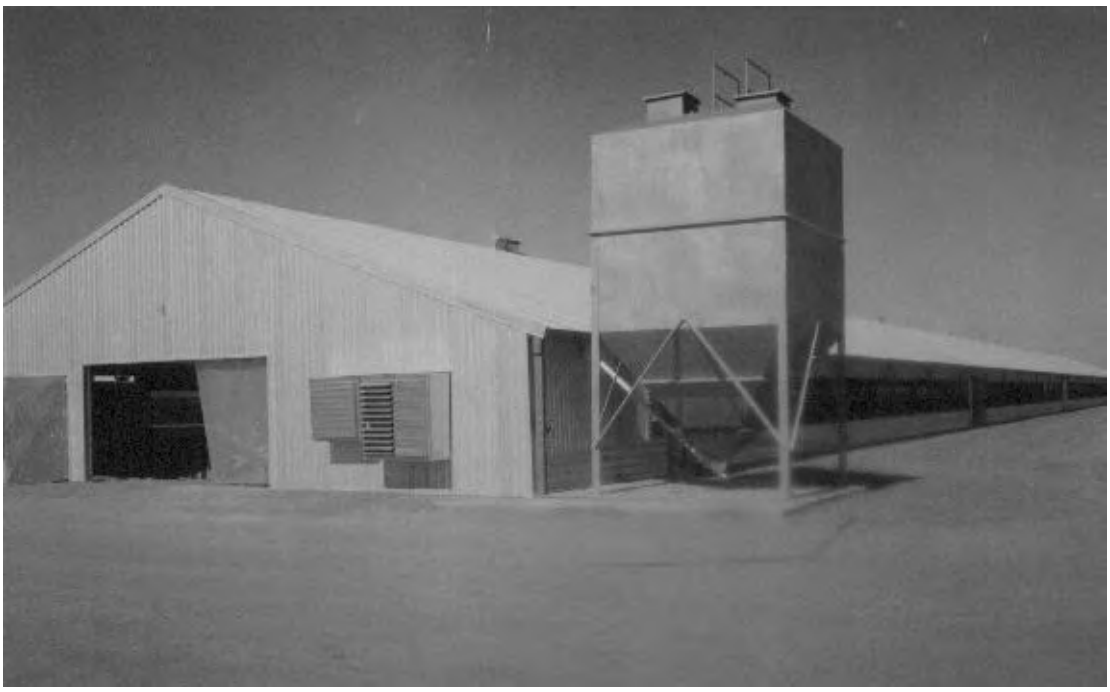
DAIRY BARNS

LIQUID MANURE SYSTEMS (MANURE SEPARATOR)



DAIRY BARNS

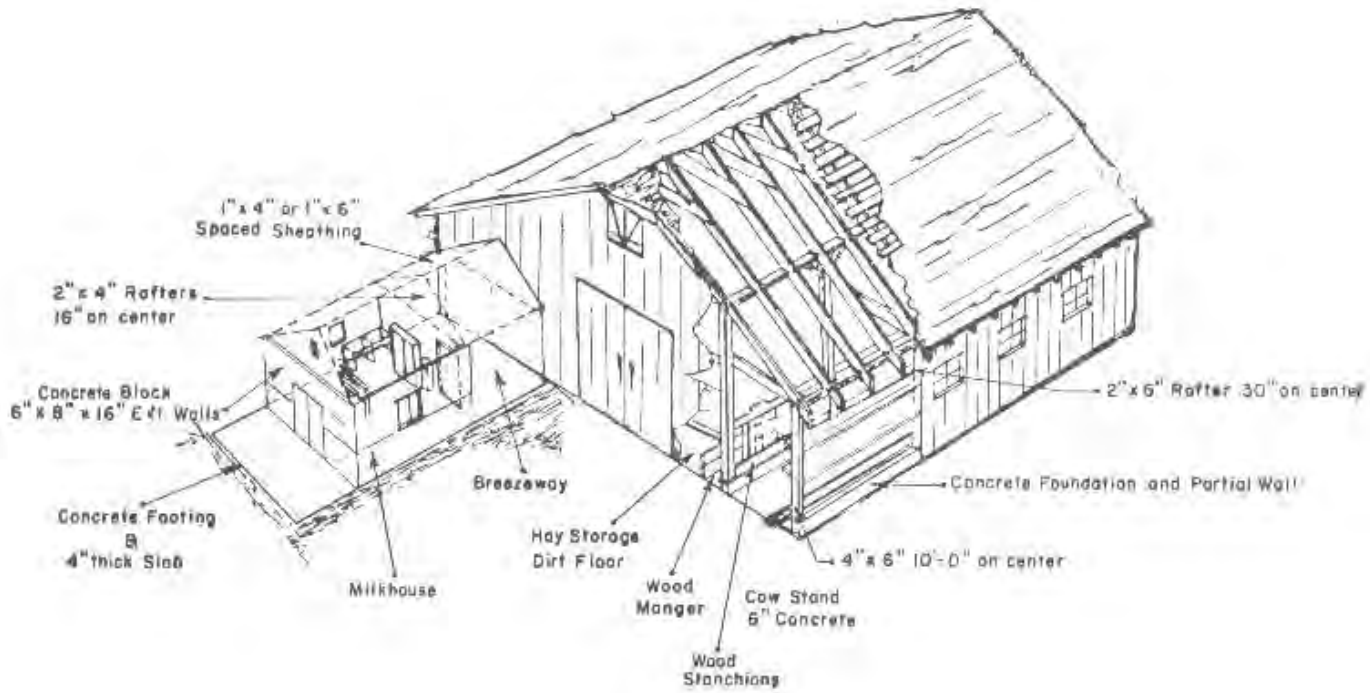




Steel Bulk Feed Tanks on Concrete Pad with Hopper Bottom

DAIRY BARNS

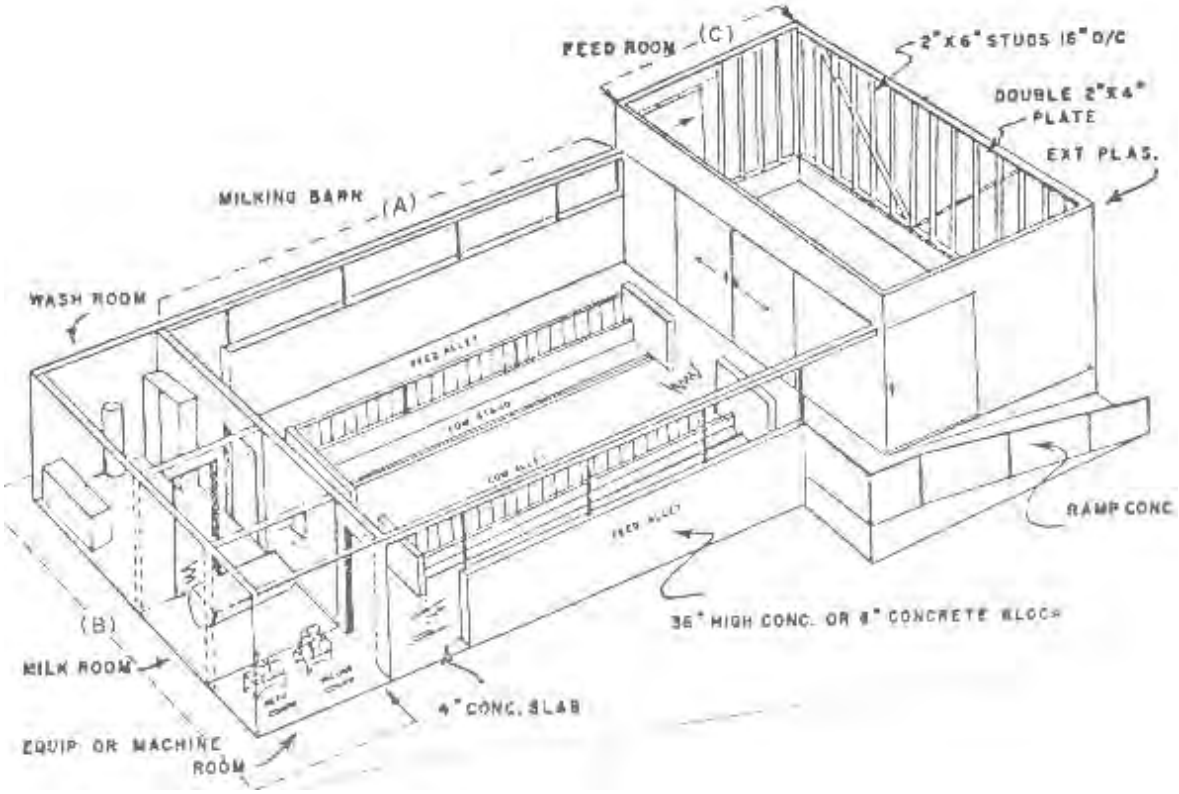
GRADE "B" BARNS



TYPICAL GRADE "B" DAIRY BARN

DAIRY BARNS

STANCHION BARNS



Component Parts of This Dairy

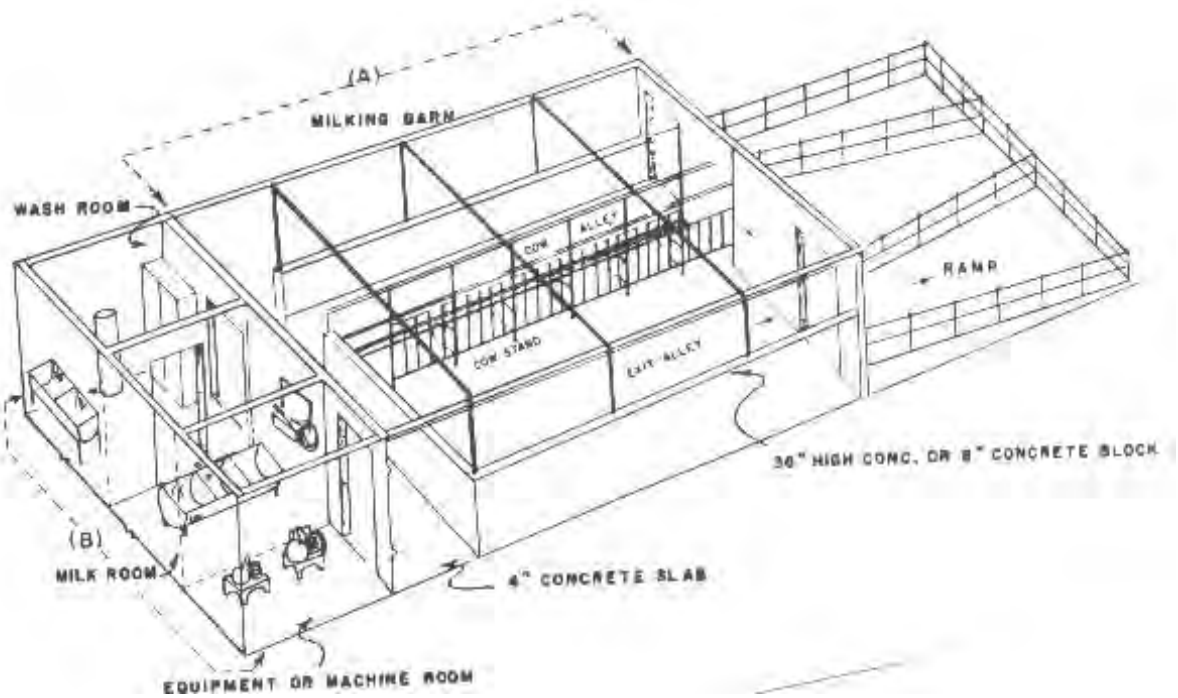
A. Milking Barn
B. Feed Room
C. Milk, Wash, and Equipment Rooms

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

This chapter contains specifications and costs for poultry structures and equipment for modern controlled environment houses. Drawings showing examples of the buildings discussed are located at the end of this chapter.

MODERN CONTROLLED ENVIRONMENT HOUSES—GOOD QUALITY

Foundation	Concrete
Floor	Concrete slab
Wall Frame	Heavy steel beam, 20' to 22' to eave
Roof Frame	Steel truss and steel purlins, insulated
Exterior	26-gauge steel panels with R-11 insulation
Lighting	Good quality lighting
Plumbing	Good plumbing
Basic Building Cost	**$26.50 to $28.00** per square foot

Typical Size 80' x 400'

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

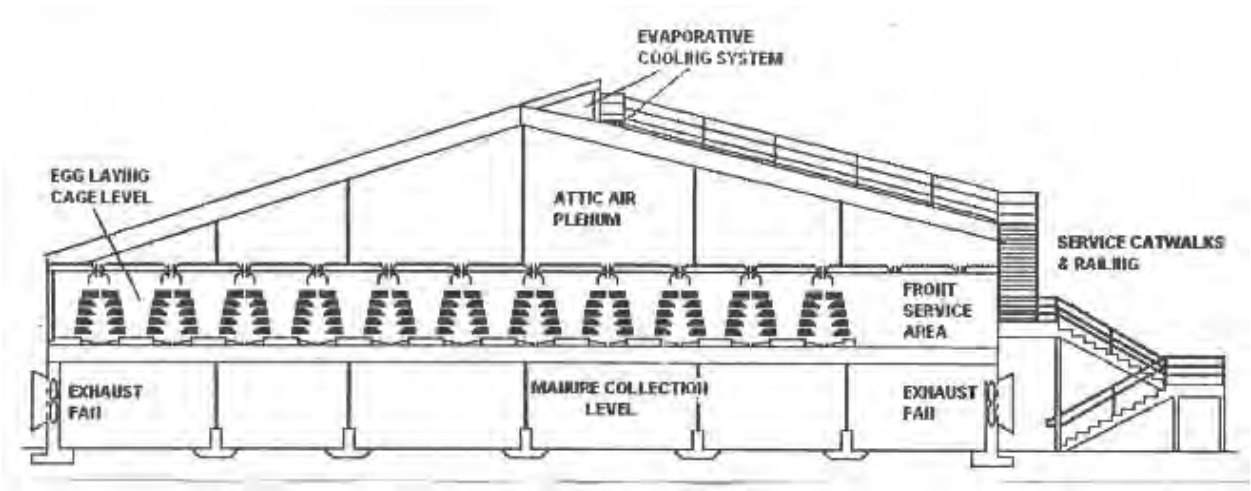
(Drawing shown on AH 534.30, page 2)

EQUIPMENT - MODERN CONTROLLED ENVIRONMENT HOUSES

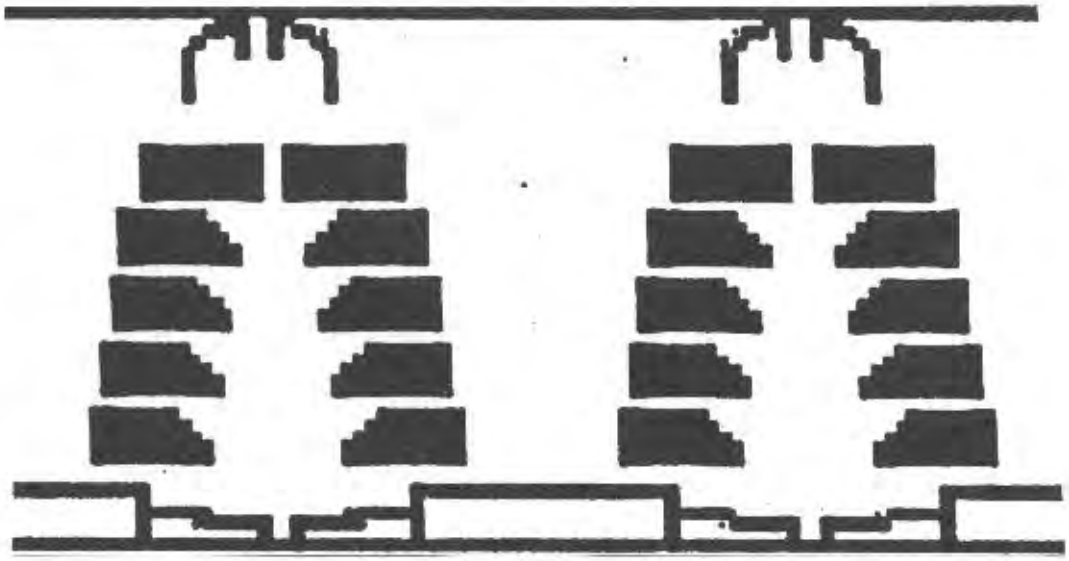
Cages	5 tier
Watering System	Automatic nipple system
Feeding System	Automatic auger system
Egg-Gathering System	Automatic
Cooling	Pad and fan system
Heating	None
Total Cost Per Bird Equipment	**$7.25 to $8.25** per bird

(Drawing shown on AH 534.30, page 2)

POULTRY HOUSES



TYPICAL CROSS SECTION



A-FRAME CAGE SYSTEM

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

8	$7.75	$8.00	$19.65	$20.15
10	8.00	8.50	23.95	24.25
12	8.90	9.00	25.10	26.00
14	9.80	9.75	27.30	28.85
16	10.90	10.90	42.50	43.45
18	11.65	11.60	48.00	48.95
20	14.15	14.15	49.10	51.00
24	21.80	23.30	87.15	88.70
30	54.60	55.05	152.25	155.00
36	70.85		169.05	168.30
42			239.40	239.70
48			338.10	339.65

The above prices are for installations over 700 feet in length. Adjust the above prices for installations less than 700 feet by using an appropriate dollar figure from the next page.

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'	$7.15 per foot
100' to 200'	5.60 per foot
200' to 300'	4.65 per foot
300' to 400'	3.05 per foot
400' to 500'	2.55 per foot
500' to 600'	2.05 per foot
600' to 700'	1.50 per foot

PRESSURE BOXES (Reinforced concrete with capped top)

24"	$365
30"	509
36"	633

STAND PIPE INCLUDING THE BASE

24"	$523	$ 784	$1,045	$1,307
30"	913	1,370	1,827	2,283
36"	1,014	1,522	2,028	2,535
42"	2,066	2,154	2,872	3,591
48"	2,075	3,042	4,057	5,071

VENT PIPE—PLASTIC

2"	$12 per foot
3"	13 per foot
4"	17 per foot

IRRIGATION SYSTEMS

CONCRETE PIPE - INSTALLED

VENT PIPE—STEEL

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)

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—INSTALLED (PER LINEAR FOOT)

6"	$4.30	$5.70
8"	5.50	7.00
10"	8.25	9.70
12"	11.00	12.90
15"	15.40	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

6"	$ 848
8"	1,270
10"	1,695
12"	2,225

VALVE, SADDLE, AND RISER (FOR SURFACE LATERALS)

4"	$ 82	$114
8"	-	197
10"	-	244
12"	-	415
14"	-	500

ALUMINUM PIPE

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

	6"	**8"**	**10"**	**12"**
Ring Lock Type				
40' joints <u>without</u> valve	$4.25	$5.60	$6.50	$7.65
40' joints <u>with</u> valve	4.70	6.60	7.70	9.10
Latch Type	**3"**	**4"**	**6"**	
30' joints <u>without</u> valve	$1.30	$2.20	$3.15	

SPRINKLER LINES

18" Risers—30' lengths 3"—**$1.75** per linear foot 4"—**$2.40** per linear foot

IRRIGATION SYSTEMS

GALVANIZED FITTINGS

4"	$150	6"	$40	6"	$ 76
6"	180	8"	55	8"	100
8"	250	10"	80	10"	140

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

3 x 8	$ 88		
4 x 8	91	8 x 8	$198
5 x 8	99	10 x 10	250
6 x 10	125	12 x 12	300
8 x 12	156	14 x 14	355
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

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

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

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

						$ 85
	$ 650		$1,120	$470		115
	750	$ 750	1,410	730		125
	850	810	1,530	780	$1,250	145
	1,090	970	1,920	1,040		175
	1,750	1,140	2,340	1,250	1,560	205
	2,390	1,300	3,010			225
	2,700	1,450	3,540			250
	3,100	1,970				345

(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

8"	2	2"	$44
8"	3	1"	45
8"	4	1"	51

AIR RELIEF VALVES

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

Manual system	$ 900 to 1,200
Automatic system	1,000 to 1,500
Frost protection system	1,000 to 1,500
Automatic system with frost protection	1,400 to 1,800

PVC underground lines, 12" risers, impulse heads, sand filter

SPRINKLERS—"SOLID SET"—OVER VINES

Manual system	$1,040 to $1,248
Automatic system	$1,040 to $1,350
Frost protection system	$1,870 to $2,600
Automatic system with frost protection	$2,185 to $3,225

PVC underground lines, 6" risers, impulse heads, sand filter

DRIP SYSTEM—ORCHARD

New planting (1 to 4 emitters per tree)	$1,005 to $1,695
Mature orchard (4 emitters per tree)	$1,165 to $1,905

DRIP SYSTEM—VINEYARD

Ratio of cost—70 percent above ground, 30 percent below ground, add	$1,270 to $1,900	
Elaborate sand filters (for dirty water-aqueduct and river water), add	$210 to $320	
Fertilizer application equipment, add		$800 to $950
When proportion pumps are used, add		$1,450 to $2,330

The linear overhead sprinkler system is used on a level parcel usually a one-half section of land. A concrete ditch runs through the parcel as a water supply. This type of irrigation system costs between **$740 to $875** per acre. The linear drive machine costs **$143,000 to $169,000**.

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

IRRIGATION SYSTEMS

PERMANENT IRRIGATION SYSTEM

PULL HOSE SYSTEM

Plus pump and filter	$550 to $700

ELECTRIC CENTER PIVOT SPRINKLER—Including concrete base

160 acres (130 acres net)	$48,000 to $55,000
160 acres (130 acres net) – Used 12-15 years	$20,000 to $28,500

(Photograph 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

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

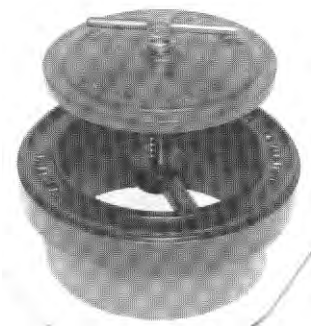
Costs are for one-half to one mile runs. Shorter runs are a little higher.

Bottom	Depth	Cost Per Foot
1'	16"	$8.00
1'	18"	8.25
1'	20"	8.65
1'	22"	9.15
1'	24"	9.45
1'	26"	9.95
1'	28"	10.25
1'	30"	10.80
2'	24"	13.75
2'	27"	14.25
2'	30"	16.00
2'	34"	17.25
2'	36"	17.85
2'	38"	18.45
2'	40"	19.00
2'	42"	19.65
2'	44"	21.00
2'	46"	21.75
2'	48"	23.60

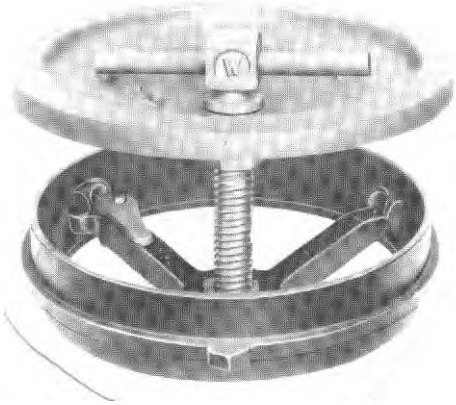
The above costs do not include end gates and turn out gates. They range from **$112 to $143** each (three joints 12" x 14" in diameter). Check gates cost **$375**.

The above prices do include the land shaping.

IRRIGATION SYSTEMS

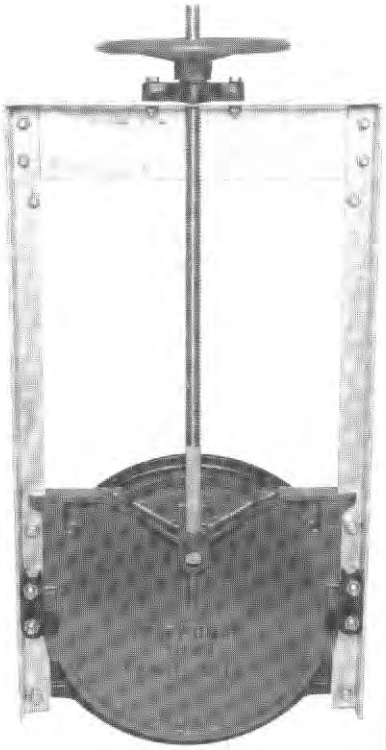


ALFAFA VALVE



YAKIMA VALVE

PRESSURE SLIDE GATE



CANAL GATE

HUB END GATE

IRRIGATION SYSTEMS

IRRIGATION SYSTEMS

IN-LINE OVERHEAD SPRINKLER SYSTEM

IRRIGATION SYSTEMS

PIVOTAL OVERHEAD SPRINKLER

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.

	7,490	7,410	8,430	9,120	10,320							
	7,560	7,560	8,780	9,350	11,200	12,040	13,340	14,280	15,422			
	7,890	8,780	9,810	10,660	11,690	12,200	13,580	14,630	15,650	16,680	18,760	
	8,780	9,630	10,660	11,520	12,400	12,400	13,930	15,050	16,340	17,380	19,780	21,670
	10,670	11,350	11,575	12,750	13,340	13,990	14,630	15,320	16,520	17,840	19,970	21,850
	11,350	11,690	12,740	14,110	14,630	15,130	16,350	17,550	18,760	19,780	20,290	22,360
	12,740	13,420	13,920	14,810	15,490	16,350	17,217	18,070	18,930	19,970	21,520	23,230
	14,100	14,440	14,810	15,650	17,540	18,580	19,624	20,660	21,690	22,360	24,920	26,680
	14,630	16,350	18,070	18,920	19,780	20,665	21,520	22,360	24,940	25,810	29,250	30,970
		18,920	19,780	21,520	22,360	23,245	24,102	24,940	26,670	29,250	32,700	34,420
		21,530	22,360	24,940	25,930	26,690	27,540	29,250	30,970	32,700	37,880	39,580
		22,370	24,940	26,690	29,250	30,980	32,710	34,410	35,280	37,000	39,570	41,310
		26,690	29,250	30,970	32,700	34,420	37,000	38,720	41,570	44,740	48,650	49,850
			30,970	32,340	34,430	37,000	39,580	41,300	43,030	47,320	51,640	53,340
			32,700	33,430	37,880	43,030	44,750	48,190	49,910	53,360	58,520	60,180
						51,640	53,350	55,120	58,520	61,960	63,680	68,850
						60,250	61,970	65,430	68,850	70,570	74,020	75,730
						72,620	73,950	75,730	79,180	80,880	82,620	85,980

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% 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)

75 – 100	$ 9,000 - $12,000
100 – 150	$11,500 - $16,000
150 – 200	$14,500 - $19,000
200 – 250	$19,000 - $23,000
250 – 300	$23,000 - $27,000
300 – 400	$27,000 - $35,000

Reconditioned engines, deduct 20 to 30%

(Photograph shown on AH 534.62, page 10)

GEAR HEADS

100	$2,180	$570	$315	$160	$1,560	$4,780
125	$2,360	$675	$420	$160	$1,560	$5,180
150	$2,900	$675	$420	$160	$1,560	$5,705
200	$3,540	$675	$420	$160	$1,560	$6,345
250	$5,880	$1,040	$520	$160	$1,560	$9,005
300	$6,490	$1,040	$520	$160	$1,560	$9,760
350	$7,600	$1,040	$520	$160	$1,560	$10,875
400	$9,400	$1,150	$520	$160	$1,560	$12,775

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

	$18,080	$21,900				
	$23,400	$27,380	$30,400			
	$25,800	$30,400	$31,900			
		$32,800	$34,680	$37,100		
				$39,400	$41,850	
				$41,000	$43,450	$45,900
						$48,900

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	$1,350
6 x 12	1,620
8 x 12	1,680
8 x 16 1/2	2,100
10 x 20	2,450

COLUMN ASSEMBLY (In 20' lengths)

4"	1 1/2"	1"	$33
6"	2"	1 1/4"	46
8"	2 1/2"	1 1/2"	55
10"	2 1/2"	1 11/16"	67
10"	3"	1 15/16"	73
12"	3"	1 15/16"	81
12"	3 1/2"	2 1/4"	90

Column assembly in 10' lengths—add 10%

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

PUMPS

BOWLS

	$1,400	$1,700	$2,230	$3,280	$4,650
	1,510	2,100	2,750	4,000	5,250
	1,840	2,490	3,540	4,850	8,130
	2,230	3,000	4,100	5,640	8,260
	2,760	3,410	5,000	6,890	10,230
	2,880	4,000	5,510	8,000	11,540
	3,150	4,470	6,170	9,120	13,120
	3,410	4,990	6,890	10,230	14,430
	3,870	5,550	7,740	11,020	16,130
	4,130	5,770	8,260	12,140	17,640
	4,520	6,300	8,980		
	4,980	6,890	9,640		
	5,240	7,400			
	5,510	7,870			
	6,040	8,260			

Reduce the above costs 10% 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

10 HP	$3,050 - $3,480
20 HP	$3,800 - $4,400
30 HP	$4,600 - $4,900
40 HP	$5,200 - $5,650
50 HP	$6,250 - $6,750
60 HP	$7,400 - $7,900
80 HP	$8,300 - $8,750
100 HP	$8,950 - $9,350

PUMPS

TURBINE BOOSTER PUMPS

40 HP	$7,400
50 HP	$8,150
60 HP	$9,500
75 HP	$10,500
100 HP	$11,300
125 HP	$14,400
150 HP	$16,000

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.

5	3,000 to 3,600	$10.00 to $14.00	8"
7 ½	3,600 to 4,200	$10.00 to $14.00	8"
10	4,000 to 4,500	$10.00 to $14.00	8" to 10"
15	4,600 to 5,400	$12.00 to $16.00	10" to 12"
20	5,600 to 6,300	$12.00 to $18.00	12"
25	5,900 to 6,700	$15.00 to $20.00	12"
30	8,000 to 8,800	$15.00 to $20.00	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.

40	$10,500 +	$340 per stage	$18.55	12"
50	11,500 +	410 per stage	23.20	14"
60	12,400 +	450 per stage	23.20	14"
75	13,200 +	460 per stage	23.20	14"
100	14,200 +	480 per stage	23.20	14"

PUMPS

SUBMERSIBLE PUMPS

TAIL WATER PUMPS

2	$3,400	20	$6,600
3	3,600	25	7,100
5	3,900	30	7,400
7 ½	4,300	40	8,200
10	4,600	50	9,000
15	5,900		

WELLS

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

6" 12 ga.	$32	$43	
6" 10 ga.	37		
8" 12 ga.	43		
8" 10 ga.	47		
8" 3/16 in.	52	50	
10" 10 ga.	55		
10" 3/16 in.	59		
10" 1/4 in.	67	74	
12" 10 ga.	68		
12" 3/16 in.	73		
12" 1/4 in.	81	89	$88
14" 3/16 in.	84		
14" 1/4 in.	92	120	122
14" 5/16 in.	99	132	132
16" 3/16 in.	91		
16" 1/4 in.	104		
16" 5/16 in.	113	154	154
18" 3/16 in.	107		
18" 1/4 in.	127		
18" 5/16 in.	148	176	176
20" 3/16 in.	120		
20" 1/4 in.	145		
20" 5/16 in.	170	200	200

PUMPS

WELLS

6"	$23 - $28
8"	$27 - $28
10"	$31 - $36
12"	$46 - $60
14"	$51 - $65
16"	$61 - $73
18"	$71 - $93

State law requires 20' seal in all well shafts.

6"	$ 500
8"	800
10"	1,000
12"	1,000
14"	1,250
16"	1,250
18"	1,250

WINDMILLS

COST INSTALLED

6'	200	$ 2,500	$1,250	$ 3,800
8'	370	2,850	1,265	4,100
10'	660	4,000	1,450	5,500
12'	1,100	5,700	1,750	7,100
14'	1,700	8,250	2,000	10,200
16'	2,500	10,900	2,400	13,300

TOWER REQUIREMENTS FOR FAN SIZE IN DIAMETER

21'	$1,600	$1,700			
27'	1,850	2,300	$2,650	$2,900	
33'	2,150	2,450	2,900	3,350	$4,500
40'	2,650	2,900	3,400	3,700	5,200
47'	4,050	3,450	4,000	5,200	6,200

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 **$800 to $2,300**.

Example

10' Fan	$5,450
33' Tower	2,450
Force Pump, Cylinder Pipe, Rod and Miscellaneous Costs	1,400
	$9,300

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

PUMPS

WINDMILLS

WATER STORAGE TANKS

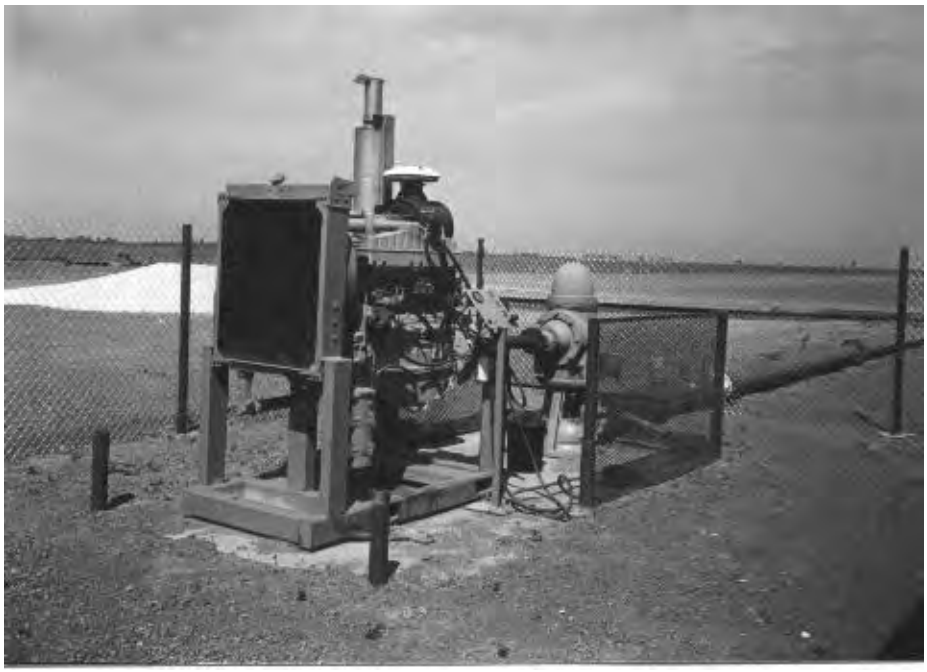
GALVANIZED COVERED STORAGE TANKS

1,044	6' 8"	48"	12	670	$ 1,300
1,504	8' 10"	48"	12	912	1,612
1,900	6' 4"	96"	12	1,014	1,664
2,500	7' 4"	96"	12	1,321	2,080
2,880	7' 10"	96"	12	1,329	2,236
3,200	8' 3"	96"	12	1,423	2,392
3,500	8' 8"	96"	12	1,520	2,568
4,200	9' 5 1/2"	96"	12	1,724	3,172
5,000	10' 4"	96"	12	1,924	3,380
5,500	10' 10"	96"	12	2,080	3,744
6,000	11' 4"	96"	12	2,163	3,900
6,500	11' 10"	96"	12	2,210	4,160
7,500	10' 4"	12'	12	2,553	4,524
8,600	9' 7"	16'	12	2,856	4,992
10,000	9' 9"	18'	12	3,169	5,782
12,000	10' 2"	20'	12	3,667	6,552
15,000	11' 11"	18'	10	5,376	8,632
17,500	11' 2"	24'	10	5,995	9,620
20,000	11' 11"	24'	10	6,480	11,180
25,000	18' 10"	12'	10	7,320	13,520
30,000	20' 9"	12'	10	8,500	15,340

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

11 Gauge		
3' chain link	$7.30	Top Rail: $1.50 per linear foot
4' chain link	8.15	
5' chain link	10.60	Barbed wire, 3 strands:
6' chain link	11.85	$2.25 per linear foot
8' chain link	15.00	
10' chain link	18.40	Barbed coils: $8.00 per
12' chain link	29.90	linear foot
9 Gauge		
3' chain link	$8.25	Barbed wire, 3 strands:
4' chain link	8.85	$2.40 per linear foot on
5' chain link	10.60	10' and 12' fence
6' chain link	12.95	
8' chain link	16.55	
10' chain link	21.10	
12' chain link	24.70	

Fences over 1,000 feet, deduct 10%.

CORRALS AND FENCES

BARBED WIRE FENCING

Barbed wire, 3 strand	$2.10 to $2.55
Barbed wire, 4 strand	$2.30 to $2.75
Barbed wire, 5 strand	$2.50 to $3.00
2 strands barbed, 32" woven wire, steel posts	$3.65 to $4.00

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

2" x 8"	6" x 6"	$6.40	$7.40	$9.50	$12.00
2" x 6"	6" x 4"	4.93	5.37	5.81	7.12
2" x 4"	6" x 4"	4.78	5.06	5.34	6.40
1" x 8"	6" x 4"	4.60	5.20	5.50	6.40
1" x 6"	6" x 4"	4.30	4.70	5.30	6.10
1 ¼" x 6"	6" x 4"	4.43	4.50	5.55	6.60
2" x 6"	4" x 4"	4.50	4.87	5.30	6.40

All posts figured at 8' on center.

WOOD GATES

COST PER GATE

4' 5 Rails	$50	$64	$81	$156	$162	$178	$190
5' 6 Rails	63	75	121	169	182	196	209
6' 7 Rails	75	87	174	185	202	213	230

CORRALS AND FENCES

METAL GATES

(INCLUDING POSTS)—COST PER GATE

4' 1 3/8" Galvanized Tube Galvanized Fabric Including Hardware	$73	$80	$168	$181	$205	$235
5' 1 5/8" Standard Pipe Fabric Including Hardware	129	148	262	302	328	352
6' 1 5/8" Standard Pipe Fabric Including Hardware	140	158	285	341	381	420

5-BAR ADJUSTABLE GATES—5' IN HEIGHT

3' to 4'	$ 82.00
4' to 6'	92.00
6' to 8'	117.00
8' to 10'	132.00
10' to 12'	143.00
12' to 14'	171.00
14' to 16'	203.00
16' to 20'	257.00

6-BAR ADJUSTABLE GATES—5' IN HEIGHT

3' to 4'	$ 90.00
4' to 6'	105.00
6' to 8'	133.00
8' to 10'	150.00
10' to 12'	161.00
12' to 14'	193.00
14' to 16'	204.00
16' to 20'	252.00

CORRALS AND FENCES

METAL PANELS

5-BAR ADJUSTABLE PANEL USED FOR STALLS OR PENS

8' to 10'	$111.00
10' to 12'	129.00
12' to 14'	138.00
14' to 16'	161.00
16' to 18'	180.00
18' to 20'	194.00
20' to 22'	208.00
22' to 24'	213.00
24' to 26'	228.00

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

6-BAR ADJUSTABLE PANEL USED FOR STALLS OR PENS

8' to 10'	$133.00
10' to 12'	148.00
12' to 14'	163.00
14' to 16'	188.00
16' to 18'	203.00
18' to 20'	231.00
20' to 22'	242.00
22' to 24'	260.00
24' to 26'	270.00

3-BAR FENCE PANEL

10'	$ 72.00
12'	85.00
16'	98.00
18'	105.00
20'	117.00
24'	131.00

PORTABLE LOADING CHUTE

30" x 5' High	$1,575

CORRALS AND FENCES

METAL PANELS

5-BAR SOLID PANEL

10'	$106.00
12'	117.00
16'	155.00
18'	166.00
20'	180.00
24'	202.00

6-BAR SOLID PANEL

10'	$ 116.00
12'	131.00
16'	173.00
18'	180.00
20'	200.00
24'	229.00

VINYL/PVC FENCING

White

5" x 5"	1-1/2" x 5-1/2" x 16'	3	$13.72
5" x 5"	1-1/2" x 5-1/2" x 16'	4	$14.43

Prices based on 1,000' +

Height: 60 inches

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

Gates: 12' Metal gates (preferred)—$**650** installed, plus paint

12' PVC gates (have tendency to sag)—$**1,000** installed

Color: Add 10%

(Photograph shown on AH 534.71, page 7)

CORRALS AND FENCES

CATTLE SQUEEZE

Hydraulic Metal	$5,700 to $6,760
Upright Metal	$1,870 to $2,080
Upright Metal Extended	$2,080 to $2,600
Calf Chute or Table	$930 to $1,040

(Photograph shown on AH 534.71, page 8)

CORRALS AND FENCES

VINYL FENCING

CORRALS AND FENCES

CATTLE SQUEEZE

AH 534.75: GREENHOUSES

This chapter contains specifications and costs for greenhouses. Photographs showing examples of buildings discussed are located at the end of the chapter.

Commercial greenhouses are constructed with steel or wood posts and trusses on 10' ± centers. Some of the greenhouses have a polycarbonate, fiberglass cover, glass cover, or a polyethylene plastic cover. The span of the truss is generally 20 to 40 feet.

- Some greenhouses are constructed as a Quonset design with metal ribs and fiberglass cover.
- Wall heights vary from 7 feet to 10 feet on the straight wall construction.

BUILDING SPECIFICATIONS

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)

SQUARE-FOOT COSTS

	3.65	3.25	3.15	3.00	2.65	2.45
	15.25	14.25	12.00	11.50	11.00	10.50
	20.30	18.90	16.50	15.50	14.50	14.25

ADDITIVES

Additional concrete walk	**$3.00 to $3.40** per square foot
Benching	**$2.70 to $3.25** per square foot—average quality
Gravel floor	**$.30 - $.35** per square foot

GREENHOUSES

SHADE CLOTH HOUSES

FAIR TO LOW COST

Wood or steel post construction, no walls. Overhead cable support with wire, covered by a flat shade fabric normally 7' to 9' high. The following costs are with a dirt floor.

Under 10,000	$1.40 to $1.50
10,000 – 20,000	$1.10 to $1.25
20,000 – 40,000	$1.00 to $1.10
40,000 Up	$0.95 to $1.05

(Photographs shown on AH 534.75, page 4)

ADDITIVE

Gravel Floor **$.30 to $.45** per square foot

GREENHOUSES

CLIMATE CONTROL

GREENHOUSES

SHADE CLOTH HOUSES

AH 534.76: LAND DEVELOPMENT AND DRAINAGE

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 COST

Native Land	$367.50 to $735.00
Ripping and Relieving	$420.00 to $682.50
Touch-Up Leveling—Laser	$115.50 to $147.00
Rescaping	$73.50 to $94.50

EARTH MOVING

Per cubic yard	$.74 to $.95

RIPPING

Clay 5' deep	$420 to $498
Clay 6' deep	$420 to $630
Loamy or sandy soil	$262 to $420
Hard pan 4' - 6' deep	$420 to $682

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. Typically takes ten hours to rip seven acres on four-foot centers.

LAND DEVELOPMENT AND DRAINAGE

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	$473 to $682 per acre
Rocky soils	$682 to $1,050 per acre

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

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

AH 534.77: VINEYARD STAKE AND TRELLIS SYSTEMS

This chapter contains costs for various stake and trellis systems used in the production of grapes for 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

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.

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)

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

(Photograph shown on AH 534.77, page 17)

VINEYARD STAKE AND TRELLIS SYSTEMS

TABLE GRAPES

SINGLE CROSS-ARM

10 FOOT ROWS

Post and cross-arm assembly	$5.85		
Every 15 feet	$5.85	290	$1,697
Every 18 feet	$5.85	242	$1,416
Every 21 feet	$5.85	207	$1,211
Every 24 feet	$5.85	182	$1,065
Four wires			$427
End post with anchor (installed)	$37.00	14	$518
End post without anchor (installed)	$29.00	14	$406

11 FOOT ROWS

Post and cross-arm assembly	$5.85		
Every 15 feet	$5.85	264	$1,544
Every 18 feet	$5.85	220	$1,287
Every 21 feet	$5.85	188	$1,100
Every 24 feet	$5.85	165	$965
Four wires			$395
End post with anchor (installed)	$37.00	13	$481
End post without anchor (installed)	$29.00	13	$377

12 FOOT ROWS

Post and cross-arm assembly	$5.85		
Every 15 feet	$5.85	242	$1,416
Every 18 feet	$5.85	201	$1,176
Every 21 feet	$5.85	172	$1,006
Every 24 feet	$5.85	151	$883
Four wires			$348
End post with anchor (installed)	$37.00	12	$444
End post without anchor (installed)	$29.00	12	$348

Based on 600 foot rows

(Photographs shown on AH 534.77, page 18)

VINEYARD STAKE AND TRELLIS SYSTEMS

TABLE GRAPES

DOUBLE CROSS-ARM

10 FOOT ROWS

Post and cross-arm assembly	$6.60		
Every 15 feet	$6.60	290	$1,914
Every 18 feet	$6.60	242	$1,597
Every 21 feet	$6.60	207	$1,366
Every 24 feet	$6.60	182	$1,201
Six wires			$640
End post with anchor (installed)	$37.00	14	$518
End post without anchor (installed)	$29.00	14	$406

11 FOOT ROWS

Post and cross-arm assembly	$6.60		
Every 15 feet	$6.60	264	$1,742
Every 18 feet	$6.60	220	$1,452
Every 21 feet	$6.60	188	$1,241
Every 24 feet	$6.60	165	$1,089
Six wires			$580
End post with anchor (installed)	$37.00	13	$481
End post without anchor (installed)	$29.00	13	$377

12 FOOT ROWS

Post and cross-arm assembly	$6.60		
Every 15 feet	$6.60	242	$1,597
Every 18 feet	$6.60	201	$1,327
Every 21 feet	$6.60	172	$1,135
Every 24 feet	$6.60	151	$997
Six wires			$534
End post with anchor (installed)	$37.00	12	$444
End post without anchor (installed)	$29.00	12	$348

Based on 600 foot rows

(Photographs shown on AH 534.77, page 19)

VINEYARD STAKE AND TRELLIS SYSTEMS

TABLE GRAPES/RAISINS

OPEN GABLE TRELLIS

10 FOOT ROWS

Post and cross-arm assembly	$14.00		
Every 18 feet	$14.00	242	$3,388
Every 21 feet	$14.00	207	$2,898
Every 24 feet	$14.00	182	$2,548
Six wires			$640
Eight wires			$853
End post with anchor (installed)	$37.00	14	$518

11 FOOT ROWS

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			$582
Eight wires			$774
End post with anchor (installed)	$37.00	13	$481

12 FOOT ROWS

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			$534
Eight wires			$711
End post with anchor (installed)	$37.00	12	$444

Based on 600 foot rows

(Photographs shown on AH 534.77, page 20)

VINEYARD STAKE AND TRELLIS SYSTEMS

RAISIN GRAPES

TRELLIS

10 FOOT ROWS

Light 7' stake and 24" cross-arm	$4.98				
Every 5 feet	$4.98	871	$4,338		
Every 6 feet	$4.98	726		$3,615	
Every 7 feet	$4.98	622			$3,098
Two wires			$217	$217	$217
End post	$29.00	14	$406	$406	$406
Light 7' stake with no cross-arm	$3.75		$3,092	$2,577	$2,208
One wire			$108	$108	$108

11 FOOT ROWS

Light 7' stake and 24" cross-arm	$4.98				
Every 5 feet	$4.98	792	$3,944		
Every 6 feet	$4.98	660		$3,287	
Every 7 feet	$4.98	566			$2,819
Two wires			$197	$197	$197
End post	$29.00	13	$377	$377	$377
Light 7' stake with no cross-arm	$3.75		$2,970	$2,475	$2,122
One wire			$98	$98	$98

12 FOOT ROWS

Light 7' stake and 24" cross-arm	$4.98				
Every 5 feet	$4.98	726	$3,615		
Every 6 feet	$4.98	605		$3,013	
Every 7 feet	$4.98	518			$2,580
Two wires			$165	$165	$165
End post	$29.00	12	$348	$348	$348
Light 7' stake with no cross-arm	$3.75		$2,504	$2,087	$1,787
One wire			$82	$82	$82

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

VINEYARD STAKE 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:
$4,700 to $5,100 on 6' x 12' spacing
$5,100 to $5,600 on 10' and 11' rows
$5,600 to $6,600 on 8' and 9' rows

(Drawing and photograph shown on AH 534.77, page 22)

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: **$2,500 to $3,100** for 7' x 12' spacing.

(Photographs shown on AH 534.77, page 23)

VINEYARD STAKE AND TRELLIS SYSTEMS

WINE GRAPES

TRELLIS

6 FOOT ROWS

22 end posts per acre with anchor	$37	$814	$814	$814
22 end posts per acre without anchor	$29	$638	$638	$638
7' Light T-post (Add 30% for heavy T-post)				
Every vine	$3.50	$6,353	$5,082	$4,235
Every other vine	$1.75	$3,176	$2,541	$2,118
Every third vine	$1.17	$2,124	$1,699	$1,416
Every fourth vine	$.88	$1,597	$1,278	$1,065
8' Vertical line post (13 ga.)				
Every vine	$8.48	$15,391	$12,313	$10,261
Every other vine	$4.24	$7,696	$6,156	$5,130
Every third vine	$2.83	$5,136	$4,109	$3,424
Every fourth vine	$2.12	$3,848	$3,078	$2,565
4' Rebar or pencil rod at each vine (between T-post or vertical line)	$.64			
One rebar between posts	$.32	$581	$465	$387
Two rebars between posts	$.42	$775	$621	$517
Three rebars between posts	$.48	$871	$697	$581
24" cross-arm (Add 25% for 30" cross-arm)				
Every vine	$1.48	$2,686	$2,149	$1,791
Every other vine	$.74	$1,343	$1,074	$895
Every third vine	$.49	$889	$711	$593
Every fourth vine	$.37	$672	$537	$448
Two wires		$340	$340	$340
Three wires		$511	$511	$511
Four wires		$680	$680	$680
Five wires		$851	$851	$851
Six wires		$1,022	$1,022	$1,022
Seven wires		$1,192	$1,192	$1,192
Eight wires		$1,362	$1,362	$1,362

VINEYARD STAKE AND TRELLIS SYSTEMS

WINE GRAPES

TRELLIS

7 FOOT ROWS

20 end posts per acre with anchor	$37	$740	$740	$740	$740
20 end posts per acre without anchor	$29	$580	$580	$580	$580
7' Light T-post (Add 30% for heavy T-post)					
Every vine	$3.50	$5,443	$4,358	$3,630	$3,112
Every other vine	$1.75	$2,721	$2,179	$1,815	$1,556
Every third vine	$1.17	$1,819	$1,457	$1,213	$1,040
Every fourth vine	$.88	$1,368	$1,096	$913	$782
8' Vertical line post (13 ga.)					
Every vine	$8.48	$13,186	$10,558	$8,794	$7,539
Every other vine	$4.24	$6,593	$5,479	$4,397	$3,769
Every third vine	$2.83	$4,401	$3,523	$2,935	$2,516
Every fourth vine	$2.12	$3,297	$2,639	$2,198	$1,885
4' Rebar or pencil rod at each vine (between T-post or vertical line)	$.64				
One rebar between posts	$.32	$498	$398	$332	$284
Two rebars between posts	$.42	$653	$523	$436	$373
Three rebars between posts	$.48	$746	$598	$498	$427
24" cross-arm (Add 25% for 30" cross-arm)					
Every vine	$1.48	$2,301	$1,843	$1,535	$1,316
Every other vine	$.74	$1,151	$921	$767	$658
Every third vine	$.49	$762	$610	$508	$436
Every fourth vine	$.37	$575	$461	$384	$329
Two wires		$289	$289	$289	$289
Three wires		$438	$438	$438	$438
Four wires		$584	$584	$584	$584
Five wires		$730	$730	$730	$730
Six wires		$875	$875	$875	$875
Seven wires		$1,021	$1,021	$1,021	$1,021
Eight wires		$1,156	$1,156	$1,156	$1,156

VINEYARD STAKE AND TRELLIS SYSTEMS

WINE GRAPES

TRELLIS

8 FOOT ROWS

18 end posts per acre with anchor	$37	$666	$666	$666	$666
18 end posts per acre without anchor	$29	$522	$522	$522	$522
7' Light T-post (Add 30% for heavy T-post)					
Every vine	$3.50	$3,812	$3,175	$2,723	$2,384
Every other vine	$1.75	$1,906	$1,587	$1,362	$1,192
Every third vine	$1.17	$1,274	$1,061	$910	$797
Every fourth vine	$.88	$958	$798	$685	$599
8' Vertical line post (13 ga.)					
Every vine	$8.48	$9,235	$7,691	$6,597	$5,775
Every other vine	$4.24	$4,617	$3,846	$3,299	$2,887
Every third vine	$2.83	$3,082	$2,567	$2,202	$1,927
Every fourth vine	$2.12	$2,309	$1,923	$1,649	$1,444
4' Rebar or pencil rod at each vine (between T-post or vertical line)	$.64				
One rebar between posts	$.32	$348	$290	$249	$218
Two rebars between posts	$.42	$457	$381	$327	$286
Three rebars between posts	$.48	$523	$435	$373	$327
24" cross-arm (Add 25% for 30" cross-arm)					
Every vine	$1.48	$1,612	$1,342	$1,151	$1,008
Every other vine	$.74	$806	$671	$576	$504
Every third vine	$.49	$534	$444	$381	$334
Every fourth vine	$.37	$403	$336	$288	$252
Two wires		$257	$257	$257	$257
Three wires		$385	$385	$385	$385
Four wires		$511	$511	$511	$511
Five wires		$639	$639	$639	$639
Six wires		$769	$769	$769	$769
Seven wires		$897	$897	$897	$897
Eight wires		$1,023	$1,023	$1,023	$1,023

VINEYARD STAKE AND TRELLIS SYSTEMS

WINE GRAPES

TRELLIS

9 FOOT ROWS

16 end posts per acre with anchor	$37	$592	$592	$592	$592
16 end posts per acre without anchor	$29	$464	$464	$464	$464
7' Light T-post (Add 30% for heavy T-post)					
Every vine	$3.50	$3,388	$2,825	$2,419	$2,118
Every other vine	$1.75	$1,694	$1,412	$1,209	$1,059
Every third vine	$1.17	$1,133	$944	$808	$708
Every fourth vine	$.88	$852	$710	$608	$532
8' Vertical line post (13 ga.)					
Every vine	$8.48	$8,209	$6,843	$5,860	$5,130
Every other vine	$4.24	$4,104	$3,422	$2,930	$2,565
Every third vine	$2.83	$2,739	$2,284	$1,956	$1,712
Every fourth vine	$2.12	$2,052	$1,711	$1,465	$1,283
4' Rebar or pencil rod at each vine (between T-post or vertical line)	$.64				
One rebar between posts	$.32	$310	$258	$221	$194
Two rebars between posts	$.42	$407	$339	$290	$254
Three rebars between posts	$.48	$465	$387	$332	$290
24" cross-arm (Add 25% for 30" cross-arm)					
Every vine	$1.48	$1,433	$1,194	$1,023	$895
Every other vine	$.74	$716	$597	$511	$448
Every third vine	$.49	$474	$395	$339	$296
Every fourth vine	$.37	$358	$299	$256	$224
Two wires		$242	$242	$242	$242
Three wires		$362	$362	$362	$362
Four wires		$484	$484	$484	$484
Five wires		$605	$605	$605	$605
Six wires		$726	$726	$726	$726
Seven wires		$848	$848	$848	$848
Eight wires		$1,032	$1,032	$1,032	$1,032

VINEYARD STAKE AND TRELLIS SYSTEMS

WINE GRAPES

TRELLIS

10 FOOT ROWS

14 end posts per acre with anchor	$37	$518	$518	$518	$518
14 end posts per acre without anchor	$29	$406	$406	$406	$406
7' Light T-post (Add 30% for heavy T-post)					
Every vine	$3.50	$3,049	$2,541	$2,177	$1,904
Every other vine	$1.75	$1,524	$1,271	$1,089	$952
Every third vine	$1.17	$1,019	$849	$728	$636
Every fourth vine	$.88	$766	$639	$547	$479
8' Vertical line post (13 ga.)					
Every vine	$8.48	$7,386	$6,156	$5,275	$4,613
Every other vine	$4.24	$3,693	$3,078	$2,637	$2,307
Every third vine	$2.83	$2,465	$2,055	$1,760	$1,540
Every fourth vine	$2.12	$1,847	$1,539	$1,319	$1,153
4' Rebar or pencil rod at each vine (between T-post or vertical line)	$.64				
One rebar between posts	$.32	$279	$232	$199	$174
Two rebars between posts	$.42	$366	$305	$261	$228
Three rebars between posts	$.48	$418	$348	$299	$261
24" cross-arm (Add 25% for 30" cross-arm)					
Every vine	$1.48	$1,289	$1,074	$921	$805
Every other vine	$.74	$645	$537	$460	$403
Every third vine	$.49	$427	$356	$305	$267
Every fourth vine	$.37	$322	$269	$230	$201
Two wires		$217	$217	$217	$217
Three wires		$326	$326	$326	$326
Four wires		$436	$436	$436	$411
Five wires		$521	$521	$521	$521
Six wires		$653	$653	$653	$653
Seven wires		$762	$762	$762	$762
Eight wires		$870	$870	$870	$870

VINEYARD STAKE AND TRELLIS SYSTEMS

WINE GRAPES

TRELLIS

11 FOOT ROWS

13 end posts per acre with anchor	$37	$481	$481	$481	$481
13 end posts per acre without anchor	$29	$377	$377	$377	$377
7' Light T-post (Add 30% for heavy T-post)					
Every vine	$3.50	$2,772	$2,310	$1,981	$1,733
Every other vine	$1.75	$1,386	$1,155	$991	$866
Every third vine	$1.17	$927	$772	$662	$579
Every fourth vine	$.88	$697	$581	$498	$436
8' Vertical line post (13 ga.)					
Every vine	$8.48	$6,716	$5,597	$4,800	$4,198
Every other vine	$4.24	$3,358	$2,798	$2,400	$2,099
Every third vine	$2.83	$2,241	$1,868	$1,602	$1,401
Every fourth vine	$2.12	$1,679	$1,399	$1,200	$1,049
4' Rebar or pencil rod at each vine (between T-post or vertical line)	$.64				
One rebar between posts	$.32	$253	$211	$181	$158
Two rebars between posts	$.42	$333	$277	$238	$288
Three rebars between posts	$.48	$380	$317	$272	$238
24" cross-arm (Add 25% for 30" cross-arm)					
Every vine	$1.48	$1,172	$977	$838	$733
Every other vine	$.74	$586	$488	$419	$366
Every third vine	$.49	$388	$323	$277	$243
Every fourth vine	$.37	$293	$244	$209	$183
Two wires		$197	$197	$197	$197
Three wires		$297	$297	$297	$297
Four wires		$394	$394	$394	$394
Five wires		$492	$492	$492	$492
Six wires		$594	$594	$594	$594
Seven wires		$692	$692	$692	$692
Eight wires		$790	$790	$790	$790

(Photographs shown on AH 534.77, page 24 and 25)

VINEYARD STAKE AND TRELLIS SYSTEMS

WINE GRAPES

LYRE SYSTEM

11 FOOT ROWS

13 end posts per acre with anchor	$37	$481	$481	$481	$481
13 end posts per acre without anchor	$29	$377	$377	$377	$377
Heavy steel stake with open lyre cross-arm					
Every vine	$15.90				
Every other vine	$7.95	$6,296	$5,247	$4,500	$3,935
Every third vine	$5.30	$4,198	$3,498	$3,000	$2,624
Every fourth vine	$3.98	$3,152	$2,627	$2,253	$1,970
4' Rebar or pencil rod at each vine (between lyre cross-arm)	$.64				
One rebar between lyres	$.32	$253	$211	$181	$158
Two rebars between lyres	$.42	$333	$277	$238	$208
Three rebars between lyres	$.48	$380	$317	$272	$238
Six wires		$594	$594	$594	$594
Seven wires		$692	$692	$692	$692
Eight wires		$790	$790	$790	$790
Nine wires		$887	$887	$887	$887
Ten wires		$986	$986	$986	$986

(Drawing and photograph shown on AH 534.77, page 26)

VINEYARD STAKE AND TRELLIS SYSTEMS

WINE GRAPES

LYRE SYSTEM

12 FOOT ROWS

12 end posts per acre with anchor	$37	$444	$444	$444	$444
12 end posts per acre without anchor	$29	$348	$348	$348	$348
Heavy steel stake with open lyre cross-arm					
Every vine	$16.00				
Every other vine	$8.00	$5,772	$4,810	$4,118	$3,609
Every third vine	$5.33	$3,848	$3,206	$2,745	$2,406
Every fourth vine	$4.00	$2,886	$2,405	$2,060	$1,804
4' Rebar or pencil rod at each vine (between lyre cross-arm)	$.65				
One rebar between lyres	$.32	$232	$194	$166	$145
Two rebars between lyres	$.43	$305	$254	$218	$191
Three rebars between lyres	$.49	$348	$290	$249	$218
Six wires		$543	$543	$543	$543
Seven wires		$636	$636	$636	$636
Eight wires		$726	$726	$726	$726
Nine wires		$816	$816	$816	$816
Ten wires		$901	$901	$901	$901

VINEYARD STAKE AND TRELLIS SYSTEMS

MISCELLANEOUS

COMPONENT COSTS TO CALCULATE COSTS PER ACRE

WIRE PRICE PER ACRE

2 wire	$213
3 wire	$320
4 wire	$427
5 wire	$534
6 wire	$640

METAL STAKES AND CROSS-ARMS

7'	.95 lbs/ft	$3.43	6"	$.73
7'	1.25 lbs/ft	$4.26	12"	$.83
6'	.95 lbs/ft	$2.93	18"	$1.14
6'	1.25 lbs/ft	$3.64	24"	$1.46
5'	.95 lbs/ft	$2.44	30" to 34"	$2.08
4'	Rebar Training Stake	$.62	36"	$2.18
4'	¼" Steel Training Stake	$.52	48"	$2.91

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

WOOD STAKES AND CROSS-ARMS

5'	1 ¾" sq	$1.30	12"	$.45	12"	$.45 - $.55
6'	1 ¾" sq	$1.60	24"	$.60	24"	$.75 - $.90
7'	1 ¾" sq	$1.90	30"	$.70	30"	$.85 - $.95
8'	3" to 4"	$3.50 – $4.50	36"	$.85	36"	$.95 - $1.05

Price varies with quality

4' Pencil rod and rebar **$.60 to $.68** each

T-post with J.R. wire clips
7' heavy T-post: **$4.55** installed
7' light T-post: **$3.50** installed

Vertical line post with wire slots
8' Vertical line post (13 ga): **$8.48** installed
J.R. clips: **$.20** each

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

Screw-in earth anchor
6" x 48" : **$7.00** 6" x 36" : **$6.25**
$4.50 install

(Photographs shown on AH 534.77, page 27, 28, and 29)

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: **$4.40** to **$5.75** per linear foot

(Photographs shown on AH 534.77, page 30)

VINEYARD STAKE 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

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 STAKE AND TRELLIS SYSTEMS

Sun Maid Southside Dry on Vine Trellis

VINEYARD STAKE AND TRELLIS SYSTEMS

TABLE GRAPES

SINGLE CROSS-ARM

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

VINEYARD STAKE 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 STAKE AND TRELLIS SYSTEMS

TABLE GRAPES/RAISINS

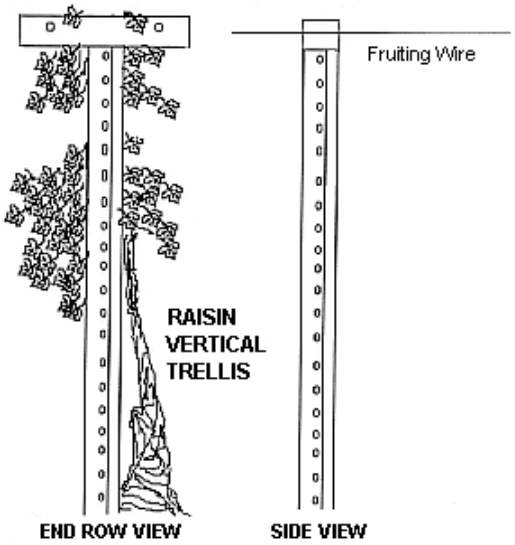
OPEN GABLE TRELLISES

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 STAKE AND TRELLIS SYSTEMS

RAISIN GRAPES

VERTICAL TRELLIS



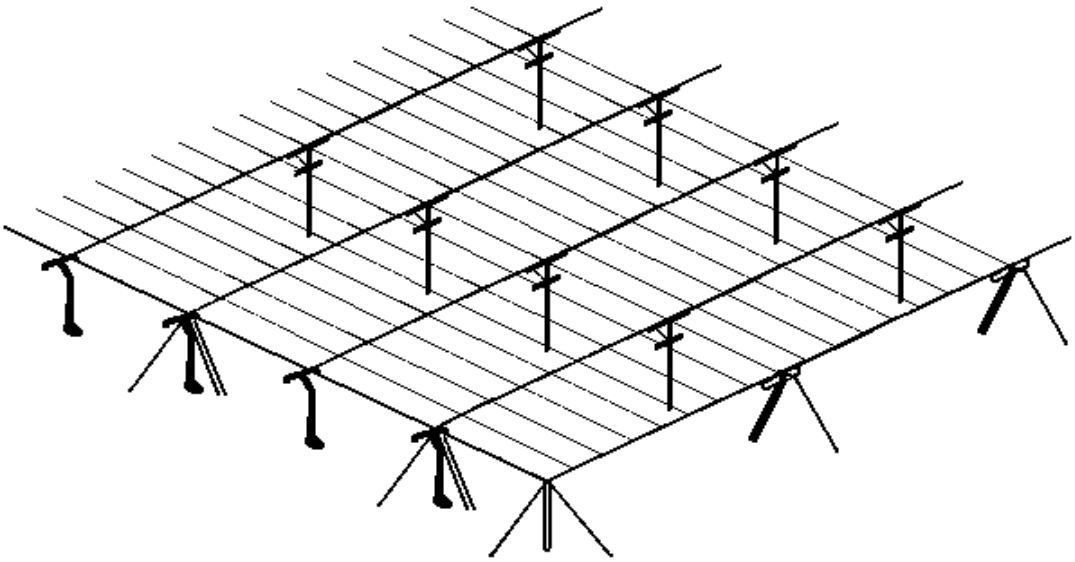
Commonly used for raisins with 12' spacing.

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 STAKE 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 STAKE 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 STAKE AND TRELLIS SYSTEMS

WINE GRAPES

TRELLIS

T-post with cross-arm every vine

T-post and V cross-arm

VINEYARD STAKE AND TRELLIS SYSTEMS

WINE GRAPES

TRELLIS

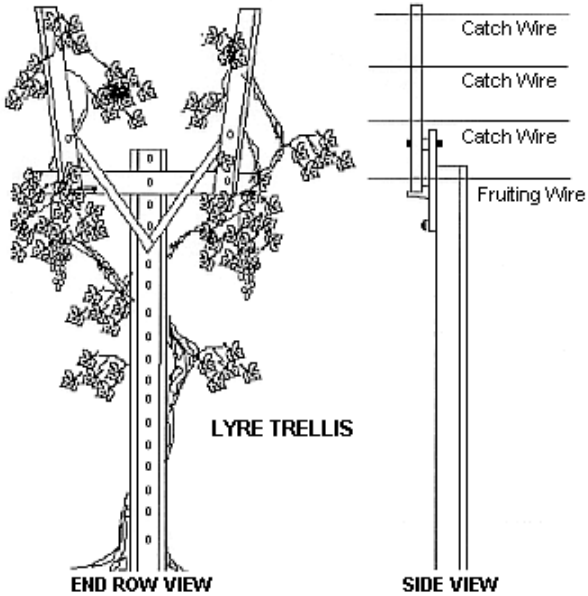
8' vertical line post with 4' T-posts in between

8' vertical line post with light grape stakes in between

VINEYARD STAKE AND TRELLIS SYSTEMS

WINE GRAPES

LYRE TRELLIS

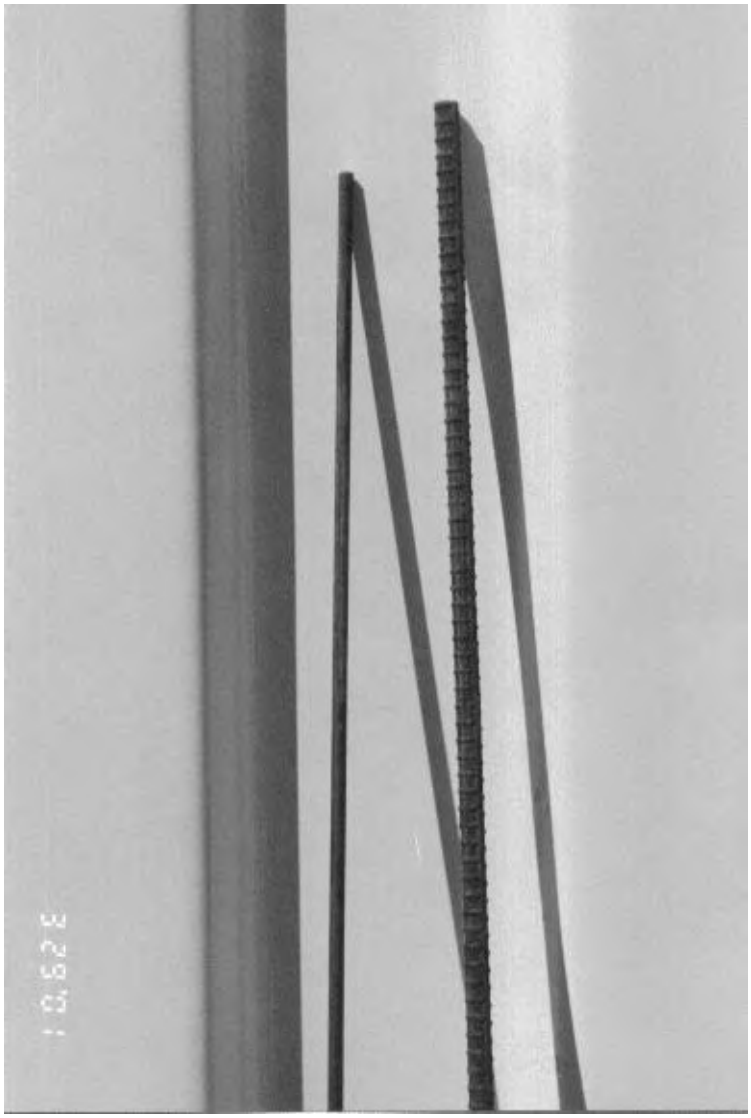


Commonly used in wide row of 11' to 12'.

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 STAKE AND TRELLIS SYSTEMS

MISCELLANEOUS



4' Pencil rod and rebar

VINEYARD STAKE 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 STAKE AND TRELLIS SYSTEMS

MISCELLANEOUS

Steel end post with spade

Screw-in earth anchor

VINEYARD STAKE 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 serves a variety of functions for the farmer/rancher with its most common use being either storage space for farm machinery or storage of feeds and grains. The typical building as described in this section reflects the cost of a basic building.

In addition, there are instances where the building cost is modified for wall height, partitions, and extra electrical circuits within the structure.

BASIC BUILDING COST

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

1. Foundation as required for normal soil conditions.
2. Concrete slab floor, 4 inches to 6 inches thick with wire mesh.
3. A steel building made up of these components:
    - Steel frame or bents, 20, 25, or 30 feet on center.
    - Steel roof purlin, 4 1/2 to 5 1/2 feet on center.
    - Steel wall grits 6 to 7 feet on center.
    - Twenty-six gauge galvanized steel on walls and roof.
    - Window area equal to 2 percent of floor area.
    - Minimal light fixtures—including wiring.
    - One rotary vent per bay.
    - Two walk-in doors.
    - Two overhead or sliding doors.
    - Fourteen-foot eave height.

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.

ADDITIVE COSTS

Additive costs are the in-place cost components not included in the basic square-foot cost but are those costs found as part of steel buildings. They are added to the basic building cost to arrive at a total building cost.

STEEL BUILDINGS

COST PER SQUARE FOOT

	30.51											
	29.59	29.04										
	28.52	28.30	27.76									
	27.49	27.10	26.48	25.90								
	26.45	25.80	25.19	24.75	23.70							
	25.45	24.75	24.35	23.92	22.90	22.79	22.45					
	24.80	23.95	23.25	22.95	22.49	22.21	21.92	21.80				
	24.53	23.60	23.11	22.55	22.14	21.80	21.51	21.19				
	24.04	23.19	22.60	22.10	21.80	21.35	21.05	20.63	20.15	19.60	19.05	18.79
	23.45	22.46	21.92	21.60	21.21	20.85	20.45	20.15	19.70	19.20	18.60	18.20
	22.46	22.03	21.55	20.95	20.70	20.45	19.99	19.60	19.20	18.45	17.95	17.60
		21.65	20.85	20.10	19.75	19.52	19.20	19.03	18.62	18.05	17.50	17.25
				19.50	19.01	18.70	18.41	18.30	18.05	17.80	17.30	17.03
				18.98	18.68	18.45	18.20	18.02	17.80	17.40	17.05	16.75
					18.45	18.22	18.03	17.80	17.45	17.04	16.75	16.56
						18.02	17.80	17.45	17.00	16.80	16.60	16.40
							17.45	17.05	16.80	16.55	16.45	16.25

ALTERNATE COSTS

Dirt Floor: Due to increased size of footings/foundation, no adjustment for dirt floor.

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

Missing Wall Cover: Deduct **$2.00** for each square foot of missing wall area.

Electrical Power: Deduct **$1.60 - $2.10** per square foot for lack of power.

The above costs are for 26 gauge steel cover.

STEEL BUILDINGS

ADDITIVE COSTS

The cost of additives, such as doors and windows, that replace a portion of the exterior skin of the building, reflects 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 OPENERS

	$940	$1,000	$1,090	$1,210	
	970	1,050	1,165	1,365	$1,563
	1,060	1,160	1,312	1,501	1,700
	1,300	1,370	1,564	1,701	2,079
	1,430	1,570	1,795	2,100	2,331
	1,730	1,870	2,100	2,331	

WALK-IN DOORS

Flush 3' x 7'	$500 to $600
Half Glass	$550 to $650

ROTARY VENTS

20"	$265

RIDGE VENTS

9" x 10'	$433
12" x 10'	$459

GUTTERS AND DOWNSPOUTS

Per linear foot	$4.59 to $6.65

SKYLIGHTS

3' x 10'	$82 to $102

WINDOWS

3' x 3'	$148
3' x 6'	174
4' x 6'	235
4' x 8'	286

STEEL BUILDINGS

ADDITIVE COSTS

HEATING

75,000 BTU	$1,365
100,000 BTU	1,627
200,000 BTU	2,205
300,000 BTU	2,625

RESTROOMS

Cost includes 2 fixtures, electrical service, and all partitions. Add for septic tank.	$6,600 - $8,175

OFFICE AREAS

Cost includes partitioning, interior finish, trim, and doors	

PARTITIONS

Drywall on wood frame	$3.57
Plaster on wood frame	$5.10
Paneling (average quality)	$4.05 - $5.10

INSULATION

R-13	$.66 - $.77
R-6	$.50 - $.55

STEEL BUILDINGS

AH 534.79: MISCELLANEOUS COSTS

PIT TYPE MOTOR TRUCK SCALES WITH CONCRETE DECK

20	25' x 10'	$ 11,000	25' x 10'	$ 11,000	900
30	25' x 10'	11,800	40' x 10'	14,400	1,000
50	40' x 10'	18,300	50' x 10'	16,000	1,100
50	50' x 10'	19,300	60' x 10'	17,850	1,300
60	60' x 10'	21,630	70' x 10'	18,480	1,500
60	70' x 10'	25,935	80' x 10'	19,950	2,100
60	80' x 10'	29,295	90' x 10'	21,735	
80	80' x 10'	35,700	90' x 10'	23,612	
100	90' x 10'	39,585	100' x 10'	25,725	

Pitless above-ground scales, deduct 25% from above prices

Used scales, deduct 25 to 40%

ADD FOR WEIGHT RECORDING EQUIPMENT

Electronic indicator	$1,060
Ticket printer	$1,060

EXAMPLE OF MOTOR TRUCK SCALE COST

Scales:	80 ton capacity, 80' x 10' platform	$34,000
Scale Pit:	90' x 10' size, standard	19,000
Electric weight recording equipment and printer		2,000
	Total	$55,000

(Photograph shown on AH534.79, page 10)

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

80 Tons	$11,752
100 Tons	14,872
130 Tons	17,472
160 Tons	20,072
200 Tons	24,024
235 Tons	26,624
300 Tons	34,112
350 Tons	42,120
400 Tons	47,008

MISCELLANEOUS COSTS

CONCRETE HORIZONTAL OR FLAT STORAGE

28,000	$4.15
42,000	3.99
56,000	3.83
85,000	3.65
110,000	3.50
140,000	3.38
200,000	3.28
400,000	2.86
600,000	2.73

ABOVE-GROUND FUEL TANKS & CONTAINMENT SYSTEMS

PREFABRICATED CONCRETE FUEL CONTAINMENT TUBS

400 gallon capacity containment	$892
500 gallon capacity containment	$1,155
1,000 gallon capacity containment	$1,680

CONTAINMENT WITH TANK AND ELECTRIC PUMPS

500 gallon – diesel	$4,200
1,000 gallon – diesel	$5,722
500 gallon – gasoline	$5,040
1,000 gallon – gasoline	$6,615

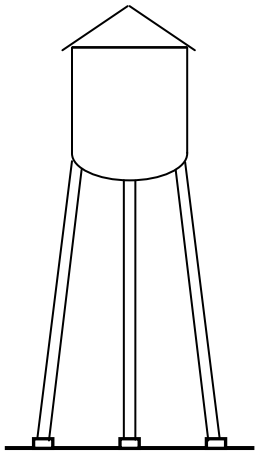
ABOVE-GROUND FUEL TANKS (Steel Tanks with Thick Outer Shell of Concrete)

500, with electric pump	$ 7,590 to $ 8,630
1,000, with electric pump	$10,400 to $11,960
2,000, with electric pump	$15,435 to $17,368
Double unit—(1) 1,000 gallon, (1) 500 gallon with 2 electric pumps	$11,440 to $12,480

(Photographs shown on AH 534.79, page 10)

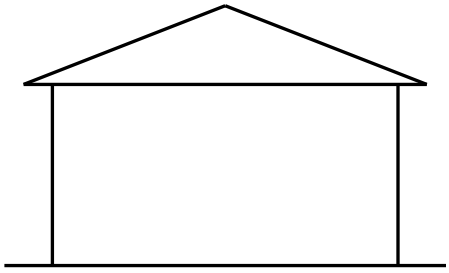
MISCELLANEOUS COSTS

ELEVATED STEEL WATER STORAGE TANKS



Gallon Capacity	Total Cost of 75' Tower and Tank	Total Cost of 100' Tower and Tank
25,000	$237,000	$273,000
30,000	254,000	291,000
40,000	267,000	299,000
50,000	276,000	314,000
60,000	288,000	328,000
75,000	306,800	346,000
100,000	354,640	374,000
150,000	450,320	480,480
200,000	557,440	589,680
300,000	693,680	747,760
500,000	931,840	996,320
1,000,000	1,546,480	1,707,680

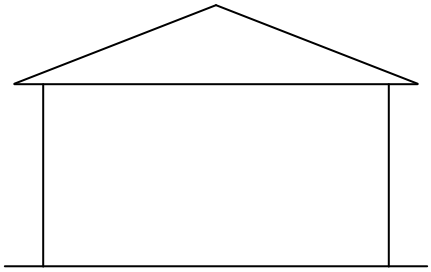
WELDED STEEL WATER STORAGE TANKS ON GROUND WITH FOUNDATION



Gallon Capacity	Total Cost of Tank on Ground
25,000	$46,500
30,000	52,500
40,000	60,000
50,000	72,000
60,000	81,120
75,000	96,720
100,000	110,080
150,000	138,320
200,000	157,040
300,000	196,560
500,000	278,200
1,000,000	431,600

MISCELLANEOUS COSTS

BOLTED STEEL WATER TANKS



Gallon Capacity	Total Cost of Tank on Ground
10,000	$15,500
20,000	22,500
30,000	28,000
50,000	36,000
75,000	43,000
100,000	49,350
125,000	58,275
150,000	70,875
200,000	84,000

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	$ 980
2,000	1,800
3,000	2,750
4,000	3,500
5,000	4,488
6,000	5,202
8,000	6,732
10,000	8,058

Add **$4.00** per square foot for concrete base

Polyethylene water only tanks, deduct 20% 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

	17,580	18,500	19,400	22,496	27,348	31,588
	20,050	20,800	21,750	26,028	32,076	35,748
	22,900	23,750	25,000	30,078	36,936	40,932
	27,600	28,500	30,100	36,288	44,982	47,790
	30,750	32,050	33,850	39,906	49,140	54,540
	40,700	42,600	44,500	52,488	62,424	70,848
	50,250	51,900	53,650	68,040	78,192	91,260
	64,450	68,350	72,400	84,024	95,634	99,846

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

GRAIN STORAGE BINS

	10,350	10,500	11,650	13,800	18,000	22,631	26,129		
	11,750	12,200	13,400	16,100	21,000	25,864	30,422		
	14,250	14,900	15,550	19,100	23,950	30,157	35,192	41,976	46,640
	16,250	17,600	19,750	23,350	30,450	35,881	43,513	52,364	57,770
	18,300	19,600	22,450	25,300	33,050	40,174	47,700	59,731	67,151
	24,500	25,900	28,700	32,900	42,000	51,940	62,434	77,221	85,648
	30,700	32,000	33,450	44,000	52,950	68,052	79,818	96,142	106,636
	42,500	46,000	50,100	56,870	65,650	83,708	93,280	113,367	124,762

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

$2,550	$2,754	$3,468	$4,182	$5,202	$7,242	$9,282	$11,322

MISCELLANEOUS COSTS

2-INCH REDWOOD WATER STORAGE TANKS

500	5'	4'	$2,950
1,000	6'	6'	3,700
1,500	7'	6'	4,500
2,000	8'	6'	5,575
3,000	10'	6'	7,150
4,000	10'	8'	8,600
5,000	11'	8'	9,800
6,000	12'	8'	11,500
7,000	11'	10'	12,600
8,000	12'	10'	13,250
9,000	13'	10'	14,200
10,000	14'	10'	15,650
12,000	15'	10'	17,450
15,000	14'	14'	19,300

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 $2,800** per tank

MISCELLANEOUS COSTS

3-INCH REDWOOD WATER STORAGE TANKS

10,000	14'	10'	$22,000
12,000	14'	12'	25,300
15,000	16'	12'	27,100
20,000	18'	12'	34,900
25,000	17'	16'	37,800
30,000	20'	14'	44,000
40,000	23'	14'	55,400
50,000	24'	16'	62,200
60,000	26'	16'	69,800
70,000	28'	16'	74,200
75,000	29'	16'	84,200
80,000	30'	16'	90,800
90,000	30'	18'	95,500
100,000	32'	18'	100,800
150,000	37'	20'	135,000
200,000	43'	20'	160,000

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

CYLINDRICAL 3-INCH REDWOOD WINE TANKS

1,000	$5,100
1,500	6,500
2,000	7,600
2,500	9,000
3,000	10,700
4,000	11,500
5,000	14,000
7,500	17,300
10,000	19,100
15,000	26,600
20,000	35,000
25,000	38,000
30,000	45,000

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

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

500	$2,257
750	3,307
1,000	4,305
1,250	5,250
1,500	6,090
2,000	8,610
2,500	9,922
3,000	11,340
4,000	15,225
5,000	18,270
6,000	22,050

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 11)

COMMON SIZES

12' x 21'	$1,200	20' x 21'	$2,050
12' x 26'	1,450	20' x 26'	2,450
12' x 31'	1,900	20' x 31'	3,050
12' x 36'	2,150	20' x 36'	3,600
12' x 41'	2,450	20' x 41'	4,000

RV SHADES

14' x 30' x 12'	$3,744
14' x 40' x 12'	4,940

ADDITIVES

- Add 6% to above prices for 26-gauge steel roofing
- 29-gauge metal wall covering—**$1.25** per square foot of wall (standard roofing extends 6" to 12" below eaves)
- Back enclosure kit:
  - 12-foot wide — **$468**
  - 20-foot wide — **$624**
  - 24-foot wide — **$832**
- Front enclosure kit with opening for roll-up door:
  - 12-foot wide — **$364**
  - 20-foot wide — **$416**
- Light duty roll-up doors
  - 8' x 6' — **$312**
  - 9' x 7' — **$364**
  - 10' x 8' — **$416**
  - 10' x 10' — **$468**
- Walk-thru door 32" x 72" —**$208 to $260**
- Add 3% for each additional foot of wall height above 8 feet
- Concrete floor—**$4.16 to $5.20** per square foot
- Windows 30" x 30" — **$130**

MISCELLANEOUS COSTS

PIT TYPE MOTOR TRUCK 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

NEW

New machines will average a physical life of 30 years. Typical usage will average 100 - 150 hours per year. Each wind machine will service approximately 10 acres.

WIND MACHINES

G.P. 359 Cummins Diesel	$22,500
130 HP Ford V-10 L.P.G.	$20,250
130 HP Ford 460 L.P.G.	$17,900
115 HP John Deere 6068 Diesel	$22,300
100 HP Electric	$16,100
75 HP Electric	$15,600
Portable Low Crop 115 HP John Deere	$21,800
Portable Low Crop V-10 Ford L.P.G.	$21,300

Tower height for above machines is 36 feet.

OPTIONS

41 Foot Tower	$850
Auto Thermostat Control	$3,000
Variable Speed Rotation	$1,500
Contour Assembly	$3,800

Above prices include foundation and installation.

USED

USED GAS & *PROPANE MACHINES

223-6	Gasoline 68 HP	$4,080
240-6	Gasoline 68 HP	$4,590
292-V-8	Gasoline 86 HP	$5,610
332-V-8	Gasoline 86 HP	$5,610
300-6	Gasoline 92 HP	$6,120
391-V-8	Gasoline 100 HP	$7,140
391-V-8	Gasoline 125 HP	$7,650
460-V-8	Gasoline 125 HP	$9,180

***** All the above machines can be converted to propane if desired. Cost will be **$600** additional for each motor.

WIND MACHINES

USED

USED ELECTRIC MACHINES

12 1/2*	Frostmaster	$1,500
12 1/2*	Tropic Breeze	$1,500
25*	Frostmaster (Wood Fan)	$2,500
25*	Frostmaster (Metal Fan)	$2,500
25*	Tropic Breeze	$2,500
35*	Frostmaster	$2,700
40*	Tropic Breeze 900 RPM	$3,500
40*	Tropic Breeze Teeter Hub Fan	$3,500
50*	Tropic Breeze 900 RPM	$4,000
50*	Tropic Breeze Teeter Hub Fan	$4,000
60*	Tropic Breeze 900 RPM	$4,500
60*	Tropic Breeze Teeter Hub Fan	$4,500
75	Tropic Breeze 900 RPM	$4,500
75	Tropic Breeze Teeter Hub Fan	$4,500
100	Tropic Breeze 900 RPM	$5,250
100	Tropic Breeze Teeter Hub Fan	$5,250
125	Tropic Breeze 900 RPM	$6,700
125	Tropic Breeze Teeter Hub Fan	$7,000

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

DIESEL MACHINES (REBUILT ENGINES)

330 Ford *	6 Cylinder	Diesel - 81 HP	$8,160
363 Ford *	6 Cylinder	Diesel - 100 HP	$9,180
378 Cummins *	V-6	Diesel - 125 HP	$9,180

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

* No longer manufactured

WIND MACHINES

RECONDITIONED

RECONDITIONED ELECTRIC MACHINES

100 HP	Phoenix	$5,985
100 HP	Tropic Breeze PODS	$5,985
75 HP	Tropic Breeze PODS	$5,250
75 HP	Tropic Breeze D. Flange	$5,250
50 HP	900 RPM	$5,250

RECONDITIONED GROUND POWERED TROPIC BREEZE

292 HP	Ford, Propane	$7,350
332 HP	Ford, Propane	$7,035
300 HP	Ford, Propane	$8,400
391 HP	Ford, Propane	$9,450
460 HP	Ford, Propane	$10,500
In Line 6	John Deere, Diesel	$13,125
In Line 6	Cummins, Diesel	$12,600
V-6	Cummins, Diesel	$11,025

RECONDITIONED EOT

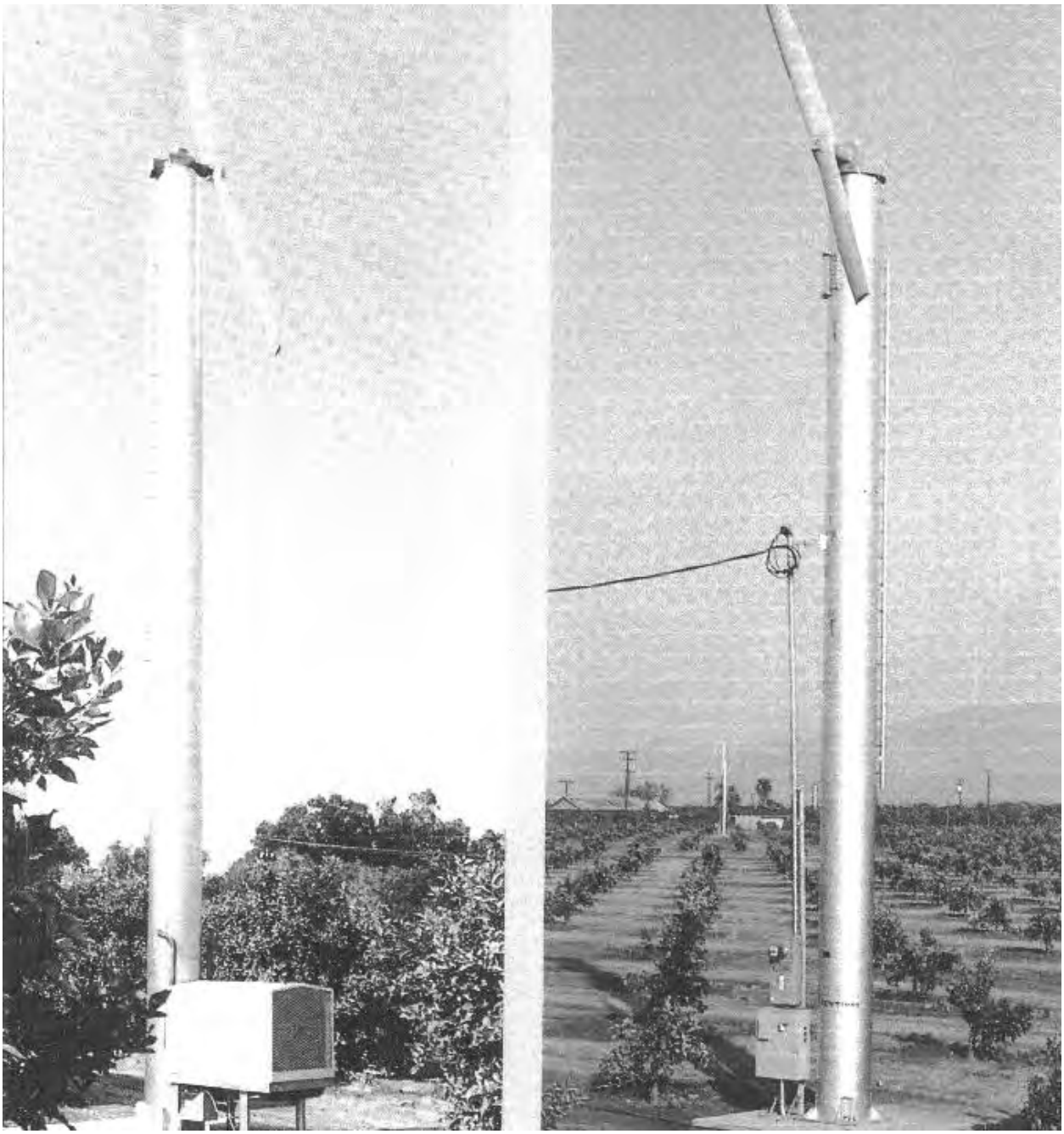
223 HP	Ford, Gas	$4,200
292 HP	Ford, Propane	$5,250
391 HP	Ford, Propane	$8,400
460 HP	Ford, Propane	$9,712

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

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



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

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

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

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	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

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

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