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STEVE SISOLAK
Governor
JAMES C. DeVoild
Chair, Nevada Tax Commission
SHELLIE HUGHES
Executive Director

In the Matter of:)
Approval of the 2023-2024)
Rural Building Manual)

NOTICE OF DECISION

Appearances

Cheryl Erskine, Coordinator of Assessment Standards, appeared on behalf of the Department of Taxation.

Summary

The matter of the approval of the 2023-2024 Rural Building Costs Manual came before the Nevada Tax Commission (Commission) for hearing in Carson City, Nevada, on March 7, 2022. The Commission reviewed the Rural Building Costs Manual and the report of the Department.

DECISION

The Commission, having considered all evidence and testimony pertaining to the matter, hereby adopts the 2023-2024 Rural Building Costs Manual listing costs as reported by the Department for use by county assessors pursuant to NAC 361.128(2).

BY THE NEVADA TAX COMMISSION THIS 17 DAY OF MARCH, 2022.



Shellie Hughes, Executive Director

cc: County Assessors



NEVADA DEPARTMENT OF TAXATION
Division of Local Government Services

2023-2024
RURAL BUILDING COSTS
MANUAL
(CONTAINING ALTERNATE
COSTS SECTION)

DATE OF VALUATION JANUARY 1, 2022

INSTRUCTIONS FOR USE

The Rural Building Costs Manual is divided into two parts. These sections are intended to be an assessment tool to standardize and streamline improvement valuations for the types of properties identified in each part.

Real estate is defined in NRS 361.035, and includes land, houses, buildings, fences, ditches, structures, erections, railroads, other improvements, and property rights. Real property is further defined in NAC 361.11715 as land, fixtures, improvements; on-site enhancements; and any rights, interests, benefits and privileges belonging or attached to the land.

NAC 361.1127 defines a fixture as an item, other than a trade fixture, that was originally personal property which has been installed or attached to land or an improvement in a permanent manner. By reference, this incorporates Appendix E of the Personal Property Manual into this manual to determine whether fixtures are real or personal property.

Most costs contained in this manual are based on costs extracted from the Marshall and Swift Costing Service Manual. Nevada multipliers have not been added to these costs so the local multiplier for the appropriate area must be applied to the costs of the tables with that indication.

Based on current construction practices, all costs found in the Marshall and Swift Cost Manual are absent of any adjustments for unskilled farm labor. As such, assessors will not adjust values upward by 33 percent as authorized by NAC 361.128 paragraph 3(b). However, to account for the use of unskilled farm labor in the construction of improvements, assessors may make downward adjustments of 25 percent when appropriate.

All photos contained in this manual are to be used as a guide to help determine quality, class and style of buildings. Photos are not to be used as a method for determination of whether a building should be valued using this section.

If Sections A or B of this manual or the Marshall Swift Cost Manuals do not contain costs for a particular kind of structure or improvement, the county assessor may apply to the Executive Director for permission to use alternative recognized cost manuals, cost determinations or subscription services per NAC 361.128(4).

Section A – Rural Building Costs

Section A is intended for use on rural properties and provides a broad listing of structures and improvements which are customarily found in such areas. It includes photos and descriptions which may be useful to assessors when classifying improvement quality or computing segregated costs.

There is an assumption that the installation of some yard improvements on a rural property would be in a much higher quantity than on a residential lot property; therefore, costs contained in this section include the maximum size adjustment allowed. If smaller quantities are being appraised, the appropriate costs from the Marshall and Swift Commercial or Residential Manuals should be used.

Concrete flatwork costs contained in this section are specific to concrete being poured as a concrete floor during construction of farm buildings or other farm improvements and should be used only when additional concrete flatwork was constructed at the same time (i.e., around feed troughs, horse

barns, etc.). For other concrete flatwork, please refer to the Marshall & Swift Commercial Manual (S66P2 – Yard Improvements) or the Marshall & Swift Residential Manual (C-5 – Yard Improvements) for more appropriate costs.

Section B – Alternate Costs

Section B provides improvement valuations for items more typically requested by the assessors because they cannot be found in the Marshall and Swift Costing Service Manuals. The costs provided have been researched and developed utilizing multiple sources.

2023-2024

PART A

RURAL BUILDING COSTS

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PART A

2023-2024 RURAL BUILDING COSTS

Section 1

BASIC FARM BUILDINGS

METAL BARNS



LOW QUALITY



AVERAGE QUALITY



GOOD QUALITY

PHOTOS COURTESY OF CHURCHILL COUNTY ASSESSOR

WOOD BARNS



LOW QUALITY



AVERAGE QUALITY



GOOD QUALITY

PHOTOS COURTESY OF CHURCHILL COUNTY ASSESSOR

GENERAL PURPOSE BARN



LOW QUALITY



AVERAGE QUALITY



GOOD QUALITY

GENERAL PURPOSE BARNs

General purpose barns are multipurpose buildings that may include livestock stalls, grooming areas, hay/grain storage, supply rooms, equipment maintenance or other specialized areas.

COMPONENT	CLASS 1 LOW QUALITY	CLASS 2 AVERAGE QUALITY	CLASS 3 GOOD QUALITY
Foundation	Perimeter concrete and column footings	Perimeter concrete and column footings	Perimeter concrete and column footings
Floor	Dirt	Dirt	Dirt
Wall Structure	Light wood boxed frame or wood posts and beams, 10' eave height	Average 2"x 4", 24" on center, 10' eave height	Concrete block or good 2"x 4", 16" on center or 2"x 6", 24" on center, 10' eave height
Exterior Wall Cover	Light wood siding board and batten or light aluminum siding	Average wood or aluminum siding	Good wood siding painted or standard gauge corrugated iron or aluminum siding
Roof Construction	Medium pitch, 2"x 4" rafters 24" to 36" on center, composition decking	Medium pitch, wood joists, wood or composition decking	Medium pitch, wood joists, wood or composition decking
Roof Cover	Composition shingle, asphalt roll paper or light wood shingles	Good wood shingles, light aluminum or corrugated iron	Standard gauge aluminum, corrugated iron or good wood shingles
Electrical	Minimal per class	Minimal per class	Minimal per class
Plumbing	Minimal per class	Minimal per class	Minimal per class

Includes normal stalls commensurate with quality class.

CLASS	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000	11,000
1	\$ 32.03	26.75	24.59	23.49	22.83	22.39	22.05	21.46	21.07	20.64	20.13
2	46.09	38.15	34.69	33.02	32.03	31.42	30.94	30.08	29.37	28.63	27.99
3	57.80	51.23	47.77	45.92	44.98	44.26	43.81	42.91	42.19	41.43	40.89

ADD Concrete or wood floors, or concrete flatwork per square foot: \$ 5.58

Lofts per square foot of floor area

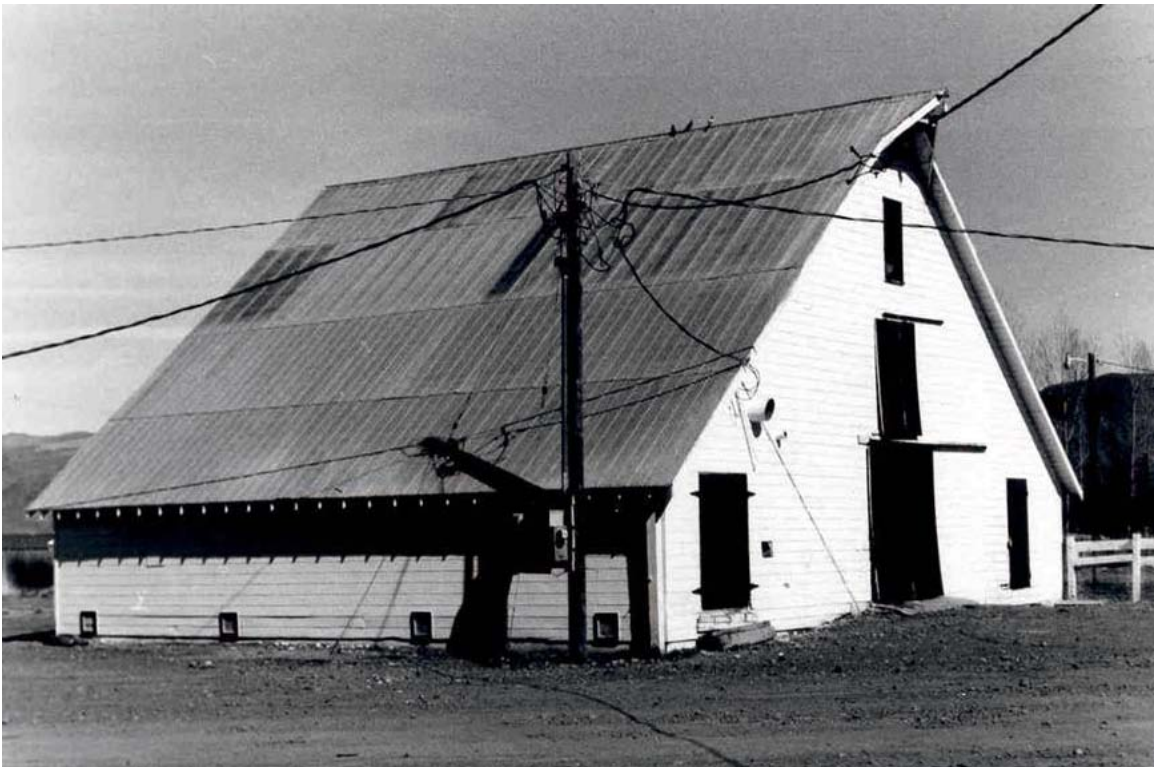
Low Quality: \$ 6.84
Average Quality: 8.97
Good Quality: 11.78

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

HAY STORAGE BARNS



AVERAGE QUALITY



GOOD QUALITY

HAY STORAGE BARNs

COMPONENT	CLASS 1 LOW QUALITY	CLASS 2 AVERAGE QUALITY	CLASS 3 GOOD QUALITY
Foundation	Redwood or cedar mudsills	Concrete or masonry piers	Continuous concrete
Floor	Dirt	Dirt	Dirt
Wall Structure	Light wood boxed frame or wood posts and beams, 10' eave height	Average 2"x 4", 24" on center, 10' eave height	Good 2"x 4", 16" on center or 2"x 6", 24" on center, 10' eave height
Exterior Wall Cover	Light wood siding, board and batten or light aluminum siding	Average wood or aluminum siding	Good wood siding painted, standard gauge corrugated iron or aluminum siding
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	Composition shingle, asphalt roll paper or light wood shingles	Good wood shingles, light aluminum or corrugated iron	Standard gauge aluminum, corrugated iron or good wood shingles
Electrical	Minimal per class	Minimal per class	Minimal per class
Plumbing	Minimal per class	Minimal per class	Minimal per class

SQUARE FOOT COSTS

CLASS	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000	11,000
1	\$ 29.72	24.40	22.26	21.14	20.59	20.02	19.77	19.13	18.74	18.31	18.03
2	41.77	33.44	29.60	27.99	26.90	25.62	25.30	24.25	23.41	22.48	22.04
3	57.35	46.33	41.70	38.91	37.87	36.61	35.89	34.54	33.60	32.29	31.49

ADD Concrete or wood floors, or concrete flatwork per square foot: \$ 5.58

Lofts per square foot of floor area

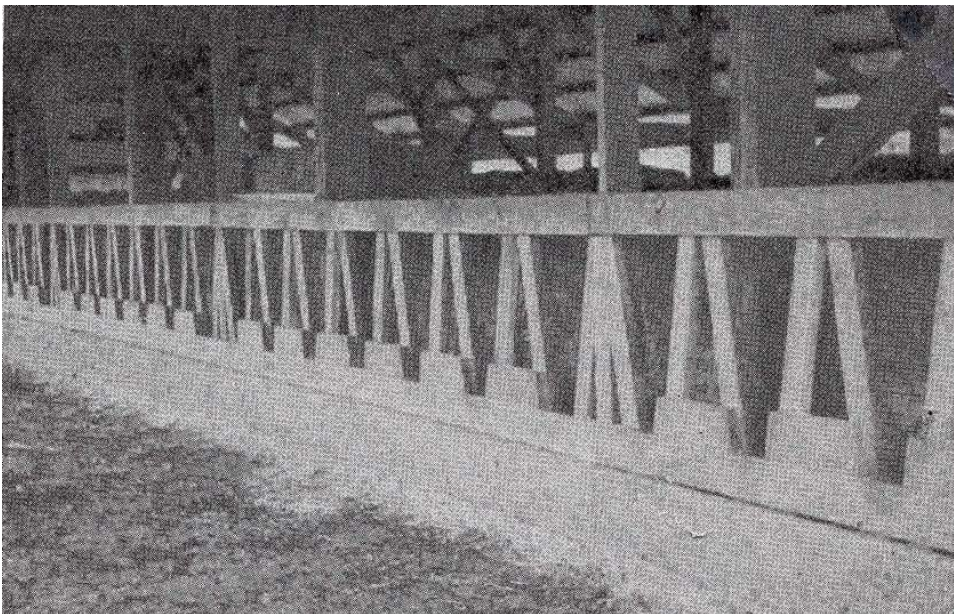
Low Quality: \$ 6.84
Average Quality: 8.97
Good Quality: 11.78

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

FEED BARN



AVERAGE QUALITY



INTERIOR DETAIL



GOOD QUALITY

FEED BARN

COMPONENT	CLASS 1 LOW QUALITY	CLASS 2 AVERAGE QUALITY	CLASS 3 GOOD QUALITY
Foundation	Redwood or cedar mudsills	Concrete or masonry piers	Continuous concrete
Floor	Dirt	Dirt	Dirt
Wall Structure	Light wood frame, 10' eave height	Average wood frame, 10' eave height	Good wood frame, 10' eave height
Exterior Wall Cover	Closed sides and open ends	Partially open sides, standard corrugated iron or average wood siding on ends	Partially open sides, good quality siding
Roof Construction	Medium to low 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 metal or composition shingle	Standard gauge corrugated metal	Wood shingles
Electrical	Minimal per class	Minimal per class	Minimal per class
Plumbing	Minimal per class	Minimal per class	Minimal per class

Includes normal feed stalls commensurate with quality class.

SQUARE FOOT COSTS

CLASS	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000	11,000
1	\$ 20.07	18.60	17.81	17.28	17.08	16.96	16.85	16.76	16.66	16.55	16.53
2	24.41	23.03	22.10	21.36	20.92	20.72	20.56	20.43	20.31	20.21	20.18
3	32.56	31.26	30.18	29.33	28.56	28.11	27.89	27.75	27.66	27.39	27.26

ADD Concrete or wood floors, or concrete flatwork per square foot: \$ 5.58

Lofts per square foot of floor area

Low Quality: \$ 6.84
Average Quality: 8.97
Good Quality: 11.78

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

POLE BARNS



**AVERAGE QUALITY – ALL SIDES OPEN
WOODEN POLES – WOOD FRAME**



**GOOD QUALITY – ALL SIDES OPEN
STEEL POLES, STEEL TRUSS & STEEL FRAME**

POLE BARNS - AVERAGE QUALITY

Structure	Poles 15' to 20' on center
Floor	Dirt - use square foot additive for concrete
Roof	Average wood trusses or average steel trusses, low pitch, corrugated iron or aluminum cover, gable end enclosed, 2' overhang on 2 sides
Walls	18' wall height, average wood frame or average prefabricated steel frame with corrugated iron covering where called for

All costs listed are based on average quality materials. Use multiplier for good quality materials--heavy steel frame and trusses, wide span, heavy gauge roof cover. Use multiplier for low quality materials--light wood poles and frame with light wood or steel trusses and light gauge roof cover.

SQUARE FOOT COSTS

TYPE "A" (ALL SIDES OPEN)

END WIDTH	SIDE LENGTH									
	34'	51'	68'	85'	102'	119'	136'	153'	170'	187'
20'	\$ 16.49	15.98	15.49	15.06	15.06	14.50	14.50	14.50	14.50	14.50
25'	15.49	15.06	14.50	14.10	13.61	13.61	13.61	13.61	13.61	13.61
30'	14.76	14.46	14.10	13.54	13.14	13.14	13.14	13.14	13.14	13.14
35'	14.50	14.04	13.58	13.11	12.62	12.62	12.62	12.62	12.62	12.62
40'	14.42	14.02	13.47	13.07	12.59	12.59	12.59	12.59	12.59	12.59
45'	14.35	13.84	13.37	12.00	11.96	11.96	11.96	11.96	11.96	11.96
50'	14.31	13.80	13.24	11.88	11.70	10.01	10.01	10.01	10.01	10.01
60'	14.27	13.76	13.03	11.38	11.33	9.82	9.82	9.82	9.82	9.82
70'	14.02	13.54	12.51	10.97	10.74	9.60	9.60	9.60	9.60	9.60
80'	14.02	13.54	12.00	10.74	10.33	9.37	9.37	9.37	9.37	9.37

ADD Concrete or wood floors, or concrete flatwork per square foot : \$ 5.58

QUALITY MULTIPLIERS

Good Quality: 1.27
Low Quality: 0.69

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

POLE BARNS - AVERAGE QUALITY

SQUARE FOOT COSTS

TYPE "B" (ENDS AND ONE SIDE CLOSED - ONE SIDE OPEN)

END WIDTH	SIDE LENGTH									
	34'	51'	68'	85'	102'	119'	136'	153'	170'	187'
20'	\$ 23.91	21.80	20.71	20.15	19.70	19.30	19.08	19.04	19.00	18.74
25'	22.10	20.15	19.00	18.38	18.08	17.37	17.23	16.97	16.83	16.75
30'	21.07	19.04	18.08	17.31	17.01	16.68	16.45	16.16	16.05	15.98
35'	20.37	18.19	17.23	16.49	16.16	16.02	15.57	15.53	15.49	15.42
40'	19.89	17.67	16.71	16.05	15.94	15.49	15.06	15.02	14.95	14.83
45'	19.64	17.27	16.20	15.53	15.13	14.83	14.50	14.46	14.42	14.35
50'	19.41	16.83	16.13	14.98	14.83	14.46	14.16	14.10	13.95	13.88
60'	18.97	16.71	15.42	14.54	14.42	14.10	13.84	13.69	13.50	13.43
70'	18.70	16.34	14.98	14.46	14.16	13.88	13.50	13.43	13.33	13.28
80'	18.19	16.09	14.46	14.25	13.88	13.43	13.24	13.20	13.14	13.03

ADD Concrete or wood floors, or concrete flatwork per square foot : \$ 5.58

QUALITY MULTIPLIERS Good Quality: 1.27
Low Quality: 0.69

SQUARE FOOT COSTS

TYPE "C" (ALL SIDES CLOSED)

END WIDTH	SIDE LENGTH									
	34'	51'	68'	85'	102'	119'	136'	153'	170'	187'
20'	\$ 27.12	25.20	24.13	23.51	23.28	22.91	22.72	22.66	22.61	22.44
25'	24.39	22.61	21.54	20.96	20.58	20.30	20.18	19.85	19.34	19.08
30'	22.91	20.48	19.55	18.82	18.57	18.12	17.93	17.78	17.75	17.63
35'	21.63	19.38	18.82	18.01	17.86	17.35	17.20	17.16	16.86	16.83
40'	20.96	18.93	17.97	17.37	17.23	16.79	16.68	16.34	16.20	16.13
45'	20.30	18.19	17.23	16.79	16.20	16.02	15.79	15.61	15.57	15.53
50'	19.70	17.75	16.53	16.34	16.16	15.57	15.53	15.49	15.32	15.21
60'	19.00	17.16	15.98	15.23	15.09	14.61	14.50	14.31	14.21	14.10
70'	18.57	16.68	15.61	15.02	14.57	14.27	14.02	13.99	13.84	13.80
80'	17.90	16.05	15.02	14.42	14.02	13.61	13.54	13.39	13.28	13.09

ADD Concrete or wood floors, or concrete flatwork per square foot: \$ 5.58

QUALITY MULTIPLIERS Good Quality: 1.27
Low Quality: 0.69

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman.
For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

SIDE SHEDS - AVERAGE QUALITY

Structure	1 row of poles 15' to 20' on center, 1 side ties into adjoining building
Floor	Dirt - Use square foot additive for concrete
Roof	Light wood trusses, low pitch, corrugated iron or aluminum cover, ends enclosed, 2' overhang on 1 side
Walls	14' to 16' wall height, light wood frame with corrugated iron covering

SQUARE FOOT COSTS

WITH OPEN SIDES: \$ 9.71 TO \$ 12.74
 WITH ENCLOSED SIDES: 14.10 TO 18.36

ADD Concrete or wood floors, or concrete flatwork per square foot: \$ 5.58

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

SHOPS



AVERAGE QUALITY



GOOD QUALITY



GOOD QUALITY – CLASS S

SHOPS

COMPONENT	CLASS 1 LOW QUALITY	CLASS 2 AVERAGE QUALITY	CLASS 3 GOOD QUALITY
Foundation	Light concrete	Standard concrete	Standard concrete
Floor	Concrete	Concrete	Concrete
Wall Structure	Light wood frame, 15' eave height	Average wood frame, 15' eave height	Good wood frame 15' eave height
Exterior Wall Cover	Light metal or low-cost boards	Standard gauge corrugated metal or average wood siding	Good wood siding painted or C-block
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	Low to medium pitch, good wood trusses
Roof Cover	Light metal	Standard gauge metal	Wood shingles
Electrical	2 outlets per 1,000 square foot	4 outlets per 1,000 square foot	4 outlets per 1,000 square foot
Plumbing	1 cold water outlet	2 cold water outlets	1 rough fixture plus 2 cold water outlets
Doors	1 light sliding or swinging door per 2,000 square foot	1 average sliding or swinging door per 2,000 square foot	1 drive through door per 1,000 square foot plus 1 walk-through door
Windows	None	None or few low cost	5 percent of wall area
Shape	Square or rectangular length between 1 and 2 times the width	Square or rectangular length between 1 and 2 times the width	Square or rectangular length between 1 and 2 times the width

SQUARE FOOT COSTS

CLASS	500	1,000	1,500	2,000	2,500	3,000	4,000	5,000	6,000	8,000
1	\$ 33.87	31.65	29.63	28.41	27.44	26.76	25.77	24.94	24.46	23.84
2	49.56	43.88	38.57	37.41	35.12	34.00	32.54	31.57	30.60	29.70
3	63.28	52.05	51.23	48.19	46.12	44.39	42.07	40.96	39.52	38.17

ADD

For interior finish -

Class 1: \$ 2.29 per square foot of floor area
 Class 2: 2.82 per square foot of floor area
 Class 3: 3.46 per square foot of floor area

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

MACHINERY & EQUIPMENT SHEDS



AVERAGE QUALITY



AVE. QUALITY – 1 SIDE OPEN



GOOD QUALITY



GOOD QUALITY – 1 SIDE OPEN

MACHINERY AND EQUIPMENT SHEDS

COMPONENT	CLASS 1 LOW QUALITY	CLASS 2 AVERAGE QUALITY	CLASS 3 GOOD QUALITY
Foundation	Light perimeter concrete	Concrete perimeter	Concrete perimeter
Floor	Dirt	Dirt or concrete*	Dirt or concrete*
Wall Structure	Light wood boxed frame or post and beam, 10' eave height	Post and beam construction, 10' eave height	Average 2"x 4", 24" on center, 10' eave height
Exterior Wall Cover	Light wood or metal siding on a wood frame	Average wood or metal siding on wood frame	Good wood or metal siding on wood frame
Roof Construction	Shed type, or low pitch open wood system for metals	Low pitch, open wood system for metals or wood shingles	Medium pitch, open wood system for metals or wood shingles
Roof Cover	Corrugated metal	Corrugated metal or wood shingle	Standard gauge metal or good wood shingles
Electrical	None	2 outlets per 1,000 square foot	4 outlets per 1,000 square feet
Plumbing	None	None	None
Shape	Usually elongated, width between 15 and 30 feet, any length	Usually elongated, width between 15 and 30 feet, any length	Usually elongated, width between 15 and 30 feet, any length

SQUARE FOOT COSTS

TYPE I (ALL SIDES CLOSED)

CLASS	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	6,000
1	\$ 25.57	20.59	18.94	18.12	17.76	16.48	16.42	16.02	15.87	15.72	15.55
2	32.79	26.91	25.17	24.21	23.71	22.15	22.00	21.65	21.42	21.34	21.12
3	46.64	39.42	37.22	36.07	35.55	33.54	33.20	32.91	32.61	32.50	32.09

TYPE II (ONE SIDE OPEN)

CLASS	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	6,000
1	\$ 20.61	16.49	15.14	14.38	13.91	13.11	13.01	12.72	12.52	12.49	12.33
2	27.25	22.55	20.80	19.90	19.41	18.59	18.28	18.05	17.74	17.70	17.47
3	40.49	33.77	31.54	31.22	30.56	29.39	29.01	28.73	28.22	28.07	27.78

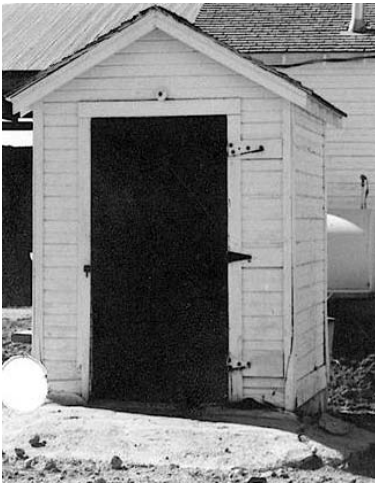
ADD Concrete or wood floors, or concrete flatwork per square foot: \$ 5.58

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

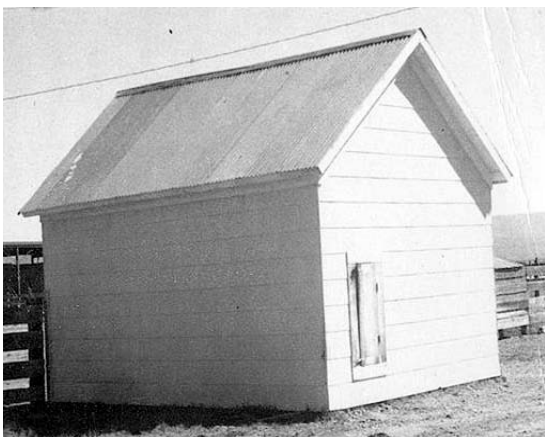
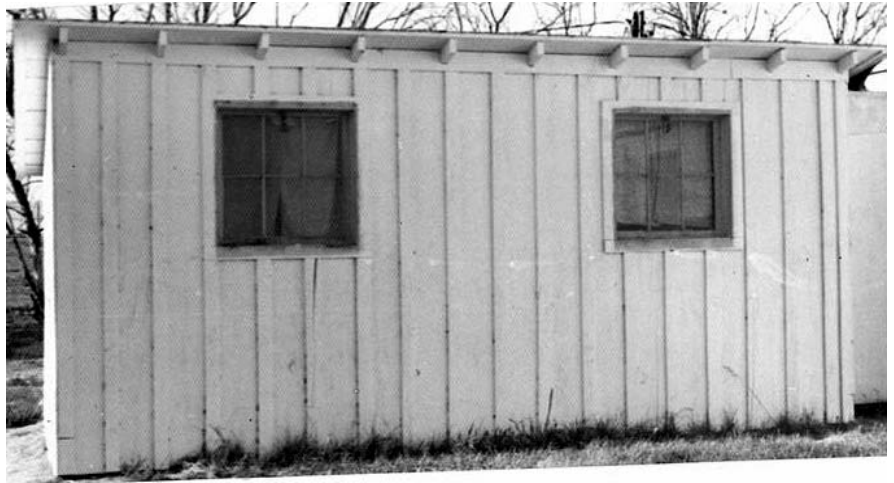
SMALL SHEDS AND PUMP HOUSES



LOW QUALITY



AVERAGE QUALITY



GOOD QUALITY



SMALL SHEDS AND PUMP HOUSES

COMPONENT	CLASS 1 LOW QUALITY	CLASS 2 AVERAGE QUALITY	CLASS 3 GOOD QUALITY
Foundation	Redwood or cedar mudsills	Concrete or masonry piers	Continuous concrete
Floor	Dirt	Dirt*	Dirt*
Wall Structure	Light wood boxed frame or wood posts and beams 8' eave height	Average 2"x 4" on center, 8' eave height	Good 2"x 6", 24" on center, or 2"x 4", 16" on center, 8' eave height
Exterior Wall Cover	Light wood siding, board and batten or light aluminum siding	Average wood or aluminum siding	Good wood siding painted, standard gauge corrugated or aluminum siding
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	Composition shingle asphalt roll paper, light wood shingles or sod	Good shingles light aluminum corrugated iron	Standard gauge, aluminum corrugated iron or good wood shakes
Electrical	None	Minimal	Minimal
Plumbing	None	None	None

NOTE: Type II with 2 sides open; reduce cost by an additional 12 percent.
 Type II with 3 sides open; reduce cost by an additional 25 percent.
 Type II with 4 sides open; reduce cost by an additional 30 percent.

SQUARE FOOT COSTS

TYPE I (ALL SIDES CLOSED)

CLASS	30	50	60	80	100	120	150	200	250	300	400	500
1	\$ 30.45	25.32	24.58	22.06	20.56	19.59	18.57	16.95	16.30	15.62	14.62	14.04
2	40.11	35.79	33.47	30.66	28.97	27.89	26.68	24.96	24.16	23.37	22.28	21.65
3	61.86	50.42	48.59	44.06	39.83	37.70	35.45	32.80	30.43	28.91	26.75	25.38

TYPE II (ONE SIDE OPEN)

CLASS	30	50	60	80	100	120	150	200	250	300	400	500
1	\$ 25.35	20.65	19.11	17.88	17.12	16.20	15.21	14.52	14.04	13.43	12.81	12.26
2	36.17	30.93	29.80	26.34	24.16	22.21	21.46	20.23	19.94	18.39	17.45	16.58
3	47.77	43.06	39.53	35.15	32.47	30.09	29.15	27.75	26.38	24.98	23.86	22.82

ADD

Concrete or wood floors, or concrete flatwork per square foot: \$ 5.58
 Fiberglass Roll or Batt Insulation: 1.05
 Gypsum Board Interior: 2.32

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

GENERAL PURPOSE BUILDINGS

General purpose buildings adapt easily to many different uses, especially as garages, machine repair shops, or storage areas. General purpose buildings may also function as feed storage sheds or livestock shelters.

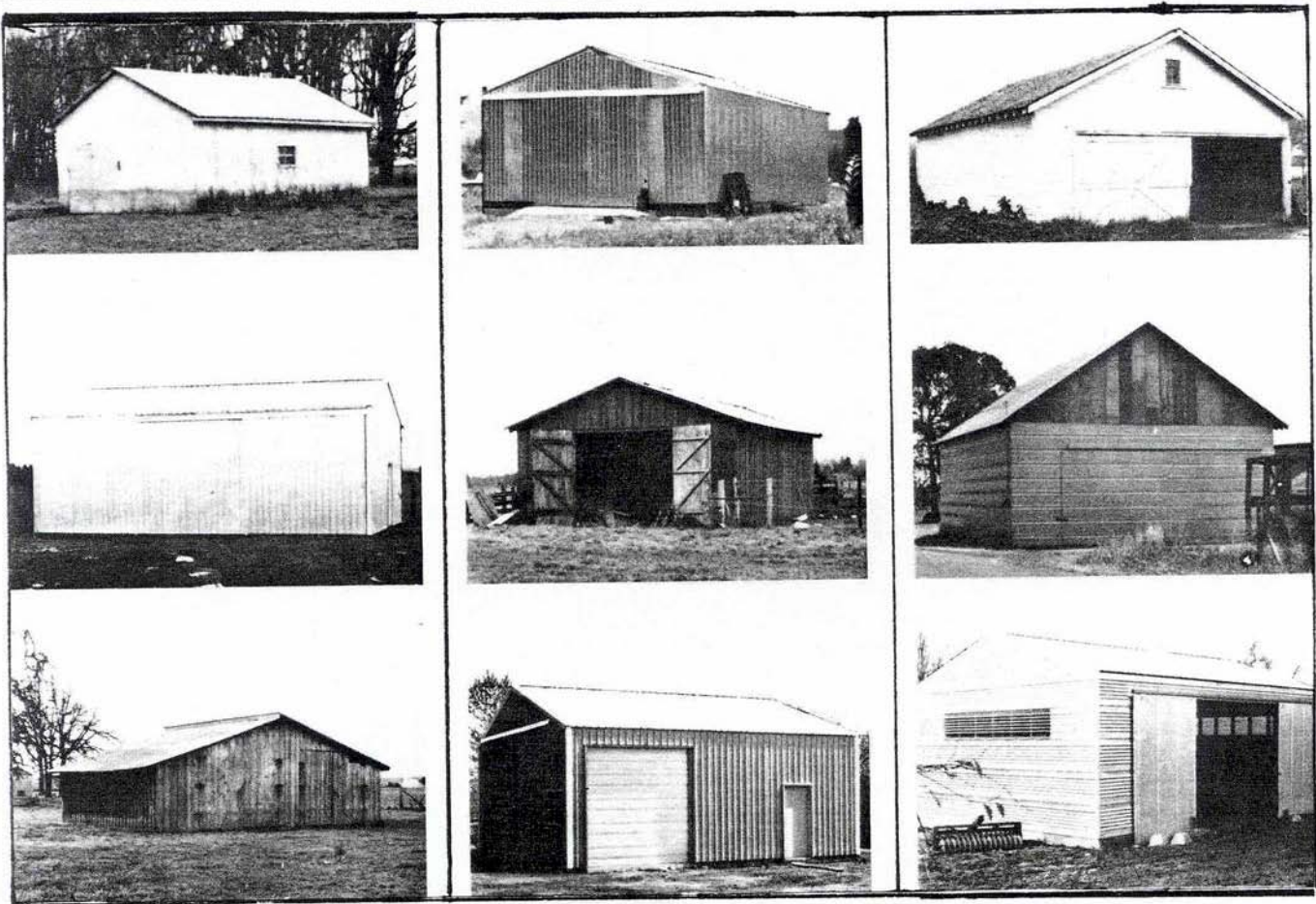
General purpose buildings typically employ simple designs that emphasize maximum utility at minimum cost.

CLASS ILLUSTRATIONS

LOW QUALITY

AVERAGE QUALITY

GOOD QUALITY



GENERAL PURPOSE BUILDINGS

COMPONENT	CLASS 1 LOW QUALITY	CLASS 2 AVERAGE QUALITY	CLASS 3 GOOD QUALITY
Foundation	Wood girder on masonry piers; or holes and backfill for pole frame	Holes and backfill for pole frame; or light perimeter foundation	Continuous concrete poured with floor
Floor	Dirt	Concrete	Concrete
Frame and Exterior Walls	Eave height 8'. Pole or box frame with metal exterior or low-grade sidings	Eave height 8'. Pole or box frame with metal exterior or average grade sidings	Eave height 8'. Conventional wood stud frame with good wood or metal sidings
Interior Walls	Normally unfinished see options	Normally unfinished see options	Normally unfinished see options
Roof Structure	Low pitch wood system for metal or low-cost composition roof	Low to medium pitch wood system for average cost metal or composition roof	Medium pitch wood system with composition or wood sheathing
Roof Cover	Aluminum or steel corrugated or crimped, low quality	Aluminum or steel corrugated or crimped, average quality	Composition shingle, good quality or average quality metal or wood shingles
Electrical	None	Minimal	Minimal
Plumbing	None	None	None

SQUARE FOOT COSTS

CLASS	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500
1	\$ 19.98	17.08	16.30	15.42	15.06	14.51	14.13	13.95	13.81
2	27.74	24.41	23.43	22.35	21.95	21.30	20.85	20.64	20.43
3	35.15	31.18	30.07	29.68	28.36	27.58	27.03	26.76	26.61

ADD For interior finish -

Class 1:	\$ 2.42	per square foot of floor area
Class 2:	2.60	per square foot of floor area
Class 3:	2.78	per square foot of floor area

Height adjustment:

Add 2 percent for each foot of average story height over 8' base height.
 Subtract 2 percent for each foot of average story height under 8' base height.

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman.
 For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

ROOT CELLARS

COMPONENT	CLASS 1 LOW QUALITY	CLASS 2 AVERAGE QUALITY	CLASS 3 GOOD QUALITY
Foundation	Cedar or redwood mudsills or rubble	Concrete or masonry footings	Continuous concrete
Floor	Dirt	Dirt	Concrete
Wall Structure	Post and beams with wood siding	Post and beams with wood siding	Concrete block or poured concrete
Roof Construction	Flat or low to medium pitch gable, poles or light wood	Flat or low to medium pitch gable, lodge pole or heavier wood	Flat reinforced poured concrete
Roof Cover	Sod	Sod, or if above ground corrugated metal with inside insulation	Sod, or if above ground corrugated metal with inside insulation
Electrical	Minimal	Minimal	Minimal
Plumbing	None	None	None

SQUARE FOOT COSTS

CLASS	100	200	300	400	500	600	1,000	1,500	2,000	2,500
1	\$ 25.95	23.61	22.47	21.91	21.50	21.21	20.92	20.63	20.40	20.33
2	36.03	31.50	30.17	29.03	28.42	28.21	26.92	26.22	25.80	25.47
3	88.87	72.44	62.23	56.63	53.46	51.84	45.99	42.44	40.02	38.33

NOTE: Above costs include sod roof covering.

ADD For corrugated metals, light composition or wood shingles;

Class 1: \$ 4.20 per square foot of floor area

Class 2: 5.04 per square foot of floor area

Class 3: 6.05 per square foot of floor area

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

COLD STORAGE WALK-IN BOXES

TYPE	50 sq ft	100'	150'	200'	300'	400'	500'
COOL BOX	21,047	30,119	36,772	42,699	52,618	60,782	68,040
FREEZE BOX	24,023	33,899	41,036	54,251	64,169	72,334	79,592

Wall deduction per linear foot of wall: \$ 166

NOTE: Above costs represent prefabricated metal clad units, including refrigeration equipment. Deduct 10 percent for wood exterior and interior. Add 6 percent for each foot of height over 7.5-foot base height. Where building walls form exterior wall of box, use above wall deduction. For homemade boxes using farm labor for construction, deduct 30 percent.

POTATO STORAGE

TYPE I

Costs represent low quality construction, partly below grade, performed by unskilled farm labor with minimal quality materials. These are designed for relatively short storage periods. They are commonly called "potato cellars."

COMPONENT	LOW QUALITY
Foundation	None
Floor	Dirt
Frame	Wood post and beams
Walls	Minimal walls and supports used in this type of potato storage usually earthen side walls
Roof Frame	Open wood system for the use of corrugated metals, or, wood rafters, joists, and sheathing
Roof Cover	Corrugated metals or composition, roll type
Interior Components	None
Insulation	Minimal, usually vapor barrier, wire netting with straw on nailing strips or equivalent
Electrical	Minimal, service entrance and two light fixtures

LOW QUALITY SQUARE FOOT COSTS

	4,000	5,000	7,000	10,000	15,000	20,000
\$	17.85	17.29	16.39	15.81	14.58	13.42

POTATO STORAGE WAREHOUSE

TYPE II

QUONSET BUILDING: low quality prefabricated galvanized steel building with doors in end walls only, erected on concrete footings without floors, lights or plumbing. TYPE II buildings may have other uses.

SQUARE FOOT COSTS

LENGTH	WIDTH			
	30'	40'	60'	70'
30'	24.60	-	-	-
36'	23.46	-	-	-
48'	21.83	20.05	-	-
60'	20.70	18.87	17.93	-
72'	19.81	17.98	17.24	16.50
84'	19.11	17.39	16.45	15.95

LENGTH	WIDTH			
	30'	40'	60'	70'
96'	18.37	16.79	15.95	15.36
108'	17.88	16.35	15.41	15.02
120'	17.39	15.90	15.06	14.52
160'	16.30	14.82	13.93	13.48
200'	-	13.93	13.19	12.84
240'	-	13.29	12.64	12.35

OPTIONS:

Electrical

Minimal Service, add per square foot of floor area: \$ 0.30

Plumbing

Minimal Service, add per square foot of floor area: 0.22

Insulation

If 2" thick foamglass is sprayed on walls and ceiling (or equivalent),
add per square foot of insulated area: 6.22

Interior Construction

If potato storage area has bins and interior partitions,
add per square foot of floor area: 2.39

Concrete (or concrete flatwork)

Add per square foot of concreted area: 5.58

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

POTATO STORAGE WAREHOUSE

TYPE III

Costs represent construction at grade level using average or good quality materials with proper supervision and skilled labor. Base wall height ordinarily equals 14 feet. Most common building size equals 50 feet by 100 feet (5,000 square feet). The maximum potato storage period depends on the magnitude of temperature and humidity control equipment; however, costs do not include environmental control. Refer to Page 24 for additional environmental control costs. TYPE III buildings may have other uses.

COMPONENT	AVERAGE QUALITY	GOOD QUALITY
Foundation	Continuous concrete	Continuous concrete
Floor	Dirt	Dirt
Frame	Heavy timber post and beam. Basic height 14 feet.	Steel frame. Basic height 14 feet.
Exterior Wall	Wood siding painted, 1 or 2 large end doors, one walk-in door.	Aluminum or steel, corrugated metal cover, unpainted. 2 large end doors. 1 or 2 walk-in doors.
Interior Construction	See options	See options
Ceiling	Open	Open
Plumbing	Entry service, 2 hose bibs	Entry service, 2 hose bibs
Electrical	Entry service, 3 outlets	Entry service, 3 outlets
Insulation	2-inch thick cellulose sprayed walls and ceiling or equivalent	2-inch thick cellulose sprayed walls and ceiling or equivalent
Roof Frame	Wood rafters, joists, sheathing	Open steel and frame for corrugated metals
Roof Cover	Asphalt or wood shingle	Galvanized metal

SQUARE FOOT COSTS

	5,000	7,000	10,000	15,000	20,000	25,000	30,000	40,000
AVG	\$ 32.88	31.33	29.79	27.45	25.58	24.69	23.80	22.69
GOOD	44.90	42.48	39.38	35.56	32.87	31.16	29.91	28.56

OPTIONS:

Interior Construction

If potato storage area has bins and interior partitions,	
add for average quality per square foot:	\$ 6.52
add for good quality per square foot:	12.70

Exterior Construction

Painted metal exterior walls, add per square foot:	\$ 0.97
Concrete or concrete flatwork per square foot:	5.58

NOTE: Above costs for potato storage warehouse assume skilled labor and include contractor fees. For construction performed by ranch or farm labor without contractor supervision, deduct 15 percent to 25 percent depending on the quality of the finished building. See the following page for other additional features.

POTATO STORAGE WAREHOUSE OPTIONS

TEMPERATURE AND HUMIDITY CONTROL

Air humidity control only, including fan room, louver system, humidifiers, perforated air pipe, and control panel.

SQUARE FOOT COSTS

	5,000	7,000	10,000	15,000	20,000	25,000	30,000	40,000
\$	5.03	4.87	4.67	4.47	4.31	4.19	4.11	3.95

AIR CONDITIONING

Includes complete refrigeration unit and controls in addition to the air and humidity system listed above.

SQUARE FOOT COSTS

	5,000	7,000	10,000	15,000	20,000	25,000	30,000	40,000
\$	10.94	10.59	10.16	9.72	9.38	9.12	8.94	8.60

STEEL BUILDINGS – FARM & RANCH



METAL HORSE BARN



METAL SHOP– SLANT WALL



QUONSET BUILDING

QUONSET BUILDINGS

Costs per square foot of floor area represent Average Quality prefabricated galvanized steel buildings with doors in end walls only and minimum additional features, erected on concrete footings without floors, lights, or heat. Adjust low quality buildings down 30 percent and good quality buildings up 25 percent based on the quality of the finished building and extra additives. Base height equals 20 feet at the center of the arch. Add or deduct 5 percent for each foot of deviation from base.

SQUARE FOOT COSTS

LENGTH	WIDTH			
	30'	40'	60'	70'
30'	35.14	-	-	-
36'	33.52	-	-	-
48'	31.19	28.65	-	-
60'	29.56	26.95	25.61	-
72'	28.29	25.68	24.63	23.57
84'	27.31	24.84	23.50	22.79

LENGTH	WIDTH			
	30'	40'	60'	70'
96'	26.25	23.99	22.79	21.94
108'	25.54	23.36	22.01	21.45
120'	24.84	22.72	21.52	20.74
160'	23.28	21.17	19.90	19.26
200'	-	19.90	18.84	18.35
240'	-	18.98	18.06	17.64

PRE-ENGINEERED STEEL BUILDINGS

Costs per square foot of floor area represent Average Quality prefabricated galvanized steel buildings, with minimum doors, windows, and additional features erected on concrete footings without floors, lights, or heat. Multipliers appear below for other types of skin coverings. Adjust low quality buildings down 25 percent and good quality buildings upwards 25 percent based on the quality of the finished building and extra additives.

AVERAGE QUALITY

EAVE		LENGTH TO WIDTH RATIO					
WIDTH	HEIGHT	1.0	1.5	2.0	3.0	4.0	5.0
20'	10'	\$ 32.50	30.76	29.59	28.01	26.88	26.08
30'	12'	27.89	26.62	25.97	24.53	23.78	23.21
40'	14'	28.32	26.53	25.40	23.83	22.72	21.94
50'	14'	25.10	24.16	23.52	22.65	22.04	21.59
60'	14'	22.88	22.13	21.64	20.98	20.53	20.32
80'	16'	23.40	22.58	22.01	21.26	20.51	20.16
100'	16'	22.88	21.94	21.26	20.39	19.85	19.33
140'	16'	20.32	19.71	19.17	18.60	18.11	17.83
160'	18'	20.11	19.52	19.10	18.49	18.09	17.78
200'	18'	18.91	18.42	18.09	17.64	17.29	17.05

See following pages for additional features.

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

PRE-ENGINEERED STEEL BUILDINGS

ADDITIONAL FEATURES

HEIGHT: add or deduct 2 percent for each foot of deviation from base.

ALUMINUM: multiply base costs by 1.05.

ENAMELED STEEL: multiply base costs by 1.05.

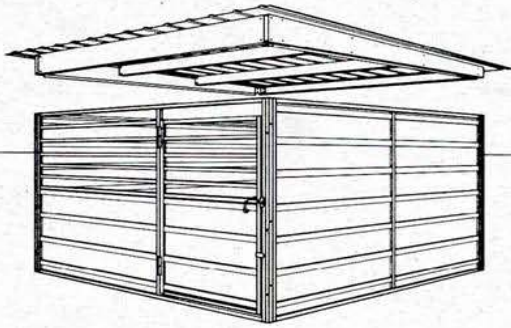
SLANT WALL BUILDINGS: deduct 5 percent to 15 percent.

Costs based on square foot of floor area, unless otherwise noted.

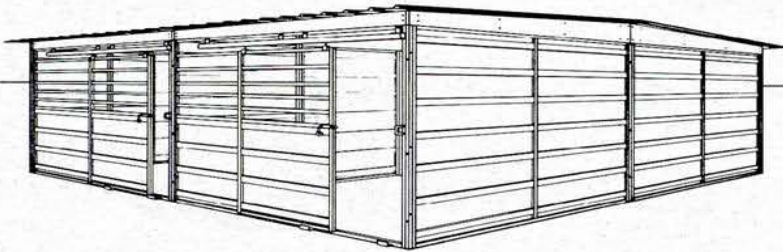
COSTS PER SQUARE FOOT	LOW	AVG	GOOD
FLOOR:			
Asphalt:	\$ 2.80	\$ 3.54	\$ 4.47
Concrete:	4.60	5.58	6.80
LIGHTING:			
	0.33	0.92	1.79
INSULATION: (per square foot of insulated wall area)			
Wall:	\$ 0.97	\$ 1.20	\$ 1.44
Roof:	1.26	1.96	2.97
PLUMBING:			
	0.29	0.81	1.64
HEATING: (suspended space heaters):			
	1.40	1.89	2.59

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

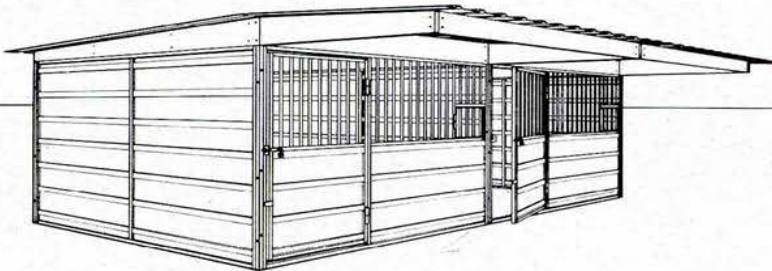
PREFABRICATED METAL HORSE STABLES



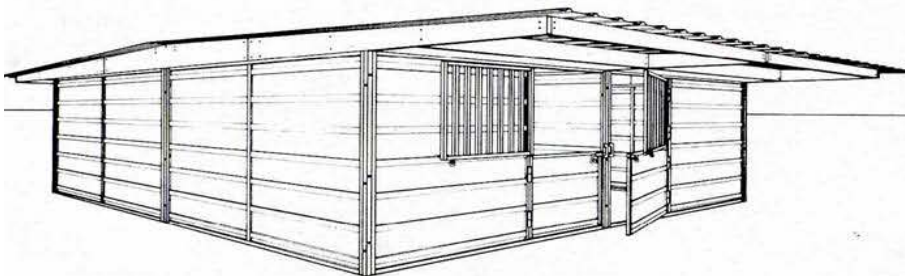
**AVERAGE QUALITY
SINGLE STALL**



**AVERAGE QUALITY
QUADRUPLE STALL**



**AVERAGE QUALITY
DOUBLE STALL
WITH PATIO ROOF
OR OVERHANG**



**AVERAGE QUALITY
QUADRUPLE STALL
WITH PATIO ROOF
OR OVERHANG**

PREFABRICATED METAL HORSE STABLES

COMPONENT	CLASS 1 LOW QUALITY	CLASS 2 AVERAGE QUALITY	CLASS 3 GOOD QUALITY
Foundation	Light perimeter concrete foundation	Average perimeter concrete foundation	Good perimeter concrete foundation
Floor	Dirt	Dirt	Dirt
Wall Structure	Prefabricated light metal frame	Prefabricated average weight metal frame	Prefabricated heavy-duty metal frame
Exterior Wall Cover	Metal cover light weight	Metal cover average weight	Metal cover heavy duty
Roof Construction	Light open steel system for metal	Average open steel system for metal	Heavy duty open steel system for metal
Roof Cover	Low pitch light metal cover	Low pitch average metal cover	Low pitch heavy duty metal cover

SQUARE FOOT COSTS

CLASS	ONE STABLE 144 SF	TWO STABLES 288 SF	FOUR STABLES 576 SF
1	\$ 26.79	\$ 24.56	\$ 22.50
2	35.63	32.74	30.09
3	47.55	43.81	40.40

ADD per square foot of patio roof or overhang:

LOW	AVG	GOOD
\$ 6.11	\$ 8.51	\$ 12.00

ADD Concrete or concrete flatwork per square foot: \$ 5.58

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

PART A
2023-2024 RURAL BUILDING COSTS

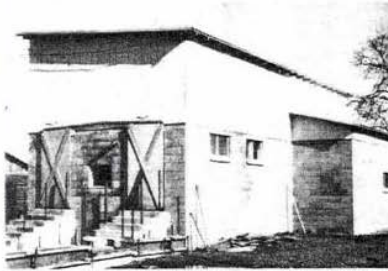
Section 2

DAIRY BARNS



PHOTOS COURTESY OF CHURCHILL COUNTY ASSESSOR

LOW QUALITY



AVERAGE QUALITY



GOOD QUALITY

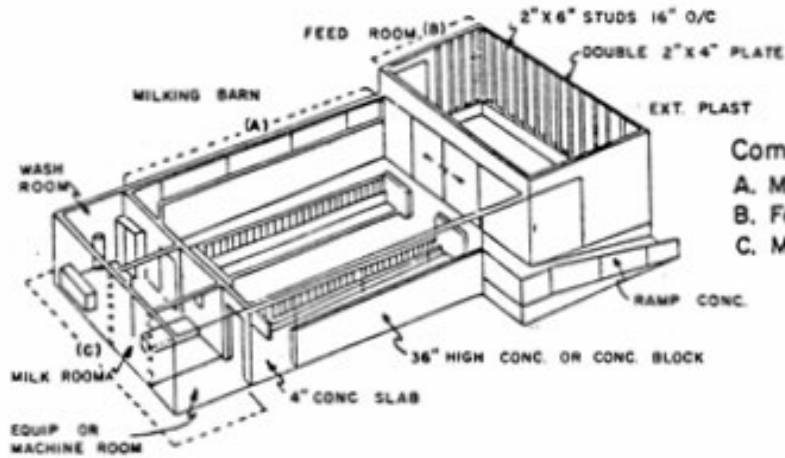


VERY GOOD QUALITY



DAIRY BARNS

Stanchion Barn

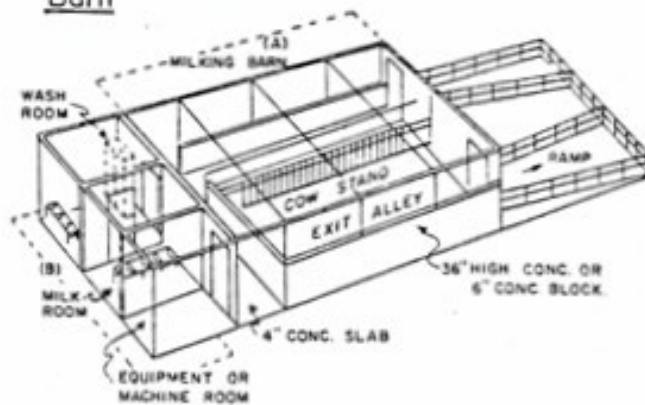


Component Parts of This Dairy
 A. Milking Barn
 B. Feed Room
 C. Milk, Wash, and Equipment Rooms

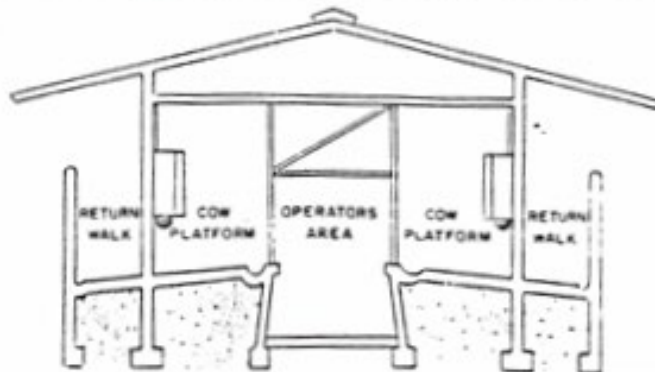
Typical Walk-Through Barn

Component Parts of This Dairy

- A. Milking Barn
- B. Milk, Wash, and Equipment Rooms



Cross Section Modern Herrington-Type Dairy Barn



Section 2

MILKING PARLORS

SITE PREPARATION	Basically, level terrain, no excavation, minimum fill.
FOUNDATION	Reinforced concrete for one story height. Foundation and footings formed and poured monolithically with floor slab.
FLOORS	Concrete well-formed gutters, elevated slab.
CEILING	Open unfinished, paint only, bottom of roof.
INTERIOR	Type found in dairies and milking parlors, smooth plaster or epoxy paints. Minimum cow stanchions and stalls conforming to the quality of the building. Neither equipment nor machinery is included.
PLUMBING	Basic plumbing required for building, usual floor drains and hose bibs. Does not include milk piping, pumps or storage.
HEATING - COOLING	Minimum, space heaters and evaporative coolers.
ELECTRICAL LIGHTING	Basic electrical service required for dairies. Does not include machinery or equipment.
EXTERIOR WALLS	8" concrete block, bearing walls or reinforced concrete 36-inch high with 2" x 6" stud framing – 16" on center above.
ROOF STRUCTURE AND COVER	Wood joists, wood or composition deck. Asphalt shingles to 290 pounds.
COST RANGE RATING	Based on cost per square foot of floor area.

SQUARE FOOT COST

QUALITY			
LOW	AVERAGE	GOOD	VERY GOOD
\$ 79.05	\$ 98.13	\$ 123.33	\$ 156.38

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

MILKING PARLORS ADDITIONAL FEATURES

COST RANGE RATING Based on cost per square foot of floor area unless otherwise noted.*

FEATURE	QUALITY			
	LOW	AVERAGE	GOOD	VERY GOOD
CEILING (Gypsum board - taped and painted):	\$ 2.73	3.02	3.34	3.70
INSULATION				
Walls:	\$ 0.93	1.15	1.38	1.68
Roof:	1.21	1.87	2.84	4.26
WALL ORNAMENTATION (*apply only to ornamented area):				
	LOW	AVERAGE	GOOD	VERY GOOD
CERAMIC TILE (*cost based on square foot of area covered):				
	18.36	22.61	26.86	31.11
ROOF COVER (Wood shingle):	6.89	8.57	10.66	13.28
AUTOMATIC GATES (*based on cost per stall):	\$ 1,692	\$ 1,801	\$ 1,912	\$ 2,022
AUTOMATIC FEED EQUIPMENT (*based on cost per stall):	\$ 1,222	1,335	1,447	1,559
			FOR AUGER ADD: \$	1,222

FEED STORAGE BINS (see pages 3 & 4, section 6)

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

MILK STORAGE, WASH, AND EQUIPMENT ROOMS

SITE PREPARATION	Basically, level terrain, no excavation, minimum fill.
FOUNDATION	Reinforced concrete for one story height. Foundation and footings formed and poured monolithically with floor slab.
FLOORS	Concrete at grade level, may include some gutters and drains.
CEILING	Gypsum board, taped and painted.
INTERIOR	Type found in dairies and milking parlors, smooth plaster or epoxy paints. No equipment or machinery is included.
PLUMBING	Basic plumbing required for building, washbasins, water closet, and lavatory. Does not include milk piping, pumps or storage.
HEATING - COOLING	Minimum, space heaters and evaporative coolers.
ELECTRICAL LIGHTING	Basic electrical lighting service required for building.
EXTERIOR WALLS	8" concrete block, bearing walls for good and very good quality, plywood, boards, or wood siding on wood frame, interior sheathing finished for low and average quality.
ROOF STRUCTURE AND COVER	Wood joists and sheathing, asphalt shingle cover.
COST RANGE RATING	Based on cost per square foot of floor area.

SQUARE FOOT COSTS

QUALITY

LOW	AVERAGE	GOOD	VERY GOOD
\$ 36.56	\$ 50.54	\$ 89.90	\$ 117.80

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

MILKING STORAGE, WASH AND EQUIPMENT ROOMS

ADDITIONAL FEATURES

COST RANGE RATING Based on cost per square foot of floor area.

FEATURE	QUALITY			
	LOW	AVERAGE	GOOD	VERY GOOD
INSULATION				
Walls:	0.93	1.15	1.38	1.68
Roof:	1.21	1.87	2.84	4.26
WALL ORNAMENTATION (*apply only to ornamented area):				
CERAMIC TILE (*cost based on square foot of area covered):				
	18.36	22.61	26.86	31.11
ROOF COVER				
(Wood shingle):	6.89	8.57	10.66	13.28

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.



FEEDER FENCE w HEADLOCK

WASH PEN AND HOLDING AREA

FLOOR OR RAMP	Sloping concrete slab rough finish 6" thick.
WALLS	Concrete block 8" - height 5'.
FENCING	Welded-iron pipe, post 10' on center set in concrete, pipe top rail with 3 cable strands, or, no pipe top rail with 5 cable strands, or, iron rods. Cable size 5/8" or 3/4".
GATES	Metal gates (2 usually) 12 linear feet each, 5-rail.
SPRINKLER	Hooded rainbird type or equivalent including piping and pump.
COST RANGE RATING	Based on cost per square foot of floor area.

WASH PEN AND HOLDING AREA

QUALITY			
LOW	AVERAGE	GOOD	VERY GOOD
\$ 25.19	\$ 28.95	\$ 32.58	\$ 36.32

ROOF COVERING: Wood or pipe post and beam, steel trusses, light metal roof cover;

QUALITY			
LOW	AVERAGE	GOOD	VERY GOOD
\$ 9.96	\$ 12.73	\$ 16.43	\$ 21.17

METAL RAIL FENCE WELDED IRON RAILS

Iron pipe post 2-1/2" to 4" in diameter - 7' to 10' on center in concrete:
\$ 22.73 per linear foot.

CABLE FENCE

Iron pipe post 2-1/2" to 4" in diameter - 7' to 10' on center in concrete -
iron pipe top rail;
3-Cable: \$ 17.97 per linear foot.
4-Cable: \$ 20.35 per linear foot.

METAL GATES

54" to 64" high - welded iron rails or pipe with bracing:
27.09 per linear foot of gate width.

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

DAIRY EQUIPMENT
STAINLESS STEEL REFRIGERATED HOLDING TANKS

SIZE GALLONS	TANK ONLY	COMPLETE SYSTEM
500	\$ 11,762	\$ 19,115
1,000	22,109	27,312
1,250	25,866	31,356
1,500	28,916	34,071
2,000	35,723	41,554
2,500	41,114	50,495
3,000	45,090	59,439
4,000	54,457	73,738
5,000	60,992	87,393

VACUUM PUMP SYSTEMS

8-20 STALLS WITH 3 PHASE ELECTRIC MOTORS
 PER COW STALL: \$ 800

REFRIGERATION COMPRESSORS

HORSE POWER	COST
3.0	\$ 10,740
4.0	15,683
5.0	20,625
7.5	25,568
10.0	30,511
15.0	35,453

FEED FENCING w HEADLOCKS

TYPE	COST
STEEL	\$ 37.59 per LF
LOCKABLE STEEL	56.43 per LF
SELF-LOCKING STEEL	95.22 EACH

NOTE: See following page for listing of additional equipment.

**DAIRY EQUIPMENT
PLATE COOLERS**

NUMBER OF STALLS

	6	8	12	20	24
\$	6,112	9,078	12,043	15,009	17,974

HERRINGBONE STALLS

SIZE	STALLS	COST
DOUBLE 3	6	\$ 15,165
DOUBLE 4	8	18,106
DOUBLE 6	12	27,159
DOUBLE 10	20	45,265
DOUBLE 12	24	47,974

NOTE: Above costs include manually operated gates.
Larger or other sizes, use a combination of above.

MILK TRANSFER LINES

TYPE	SIZE	COST PER LF
STAINLESS STEEL	18 GAUGE - 1.5"	\$ 9.08
STAINLESS STEEL	18 GAUGE - 2.0"	11.52
STAINLESS STEEL	16 GAUGE - 2.0"	15.01
STAINLESS STEEL	16 GAUGE - 2.5"	20.84
STAINLESS STEEL	16 GAUGE - 3.0"	25.18
GLASS PIPE	1.5"	70.18
GLASS PIPE	2.0"	86.94

NOTE: Flushing systems require twice the amount of pipe.

Electric pulsator or hydropulsator;

Manual on & off: \$ 614 to \$ 984
Automatic off, add: \$ 1,027 to \$ 3,073 EACH

PART A

2022-2023 RURAL BUILDING COSTS

Section 3

BUNK HOUSES



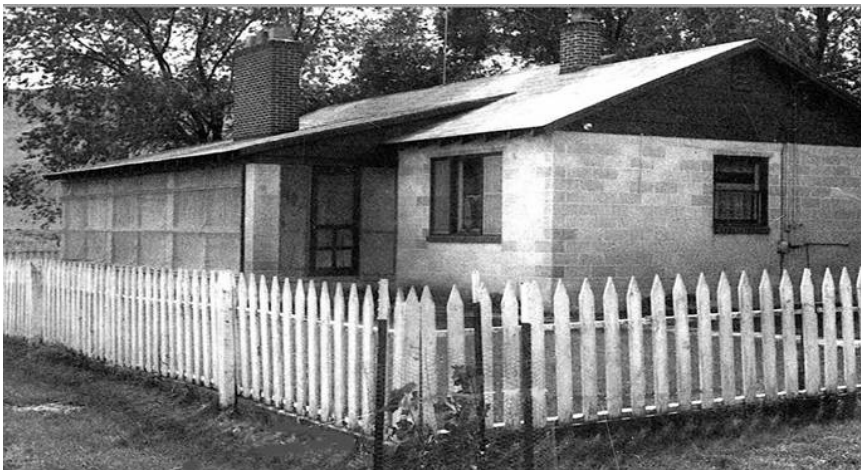
**CLASS I
LOW QUALITY**



**CLASS 2
AVERAGE QUALITY**



**CLASS 3
GOOD QUALITY**



**CLASS 4
VERY GOOD QUALITY**

COMPONENT	CLASS 1 LOW QUALITY	CLASS 2 AVERAGE QUALITY	CLASS 3 GOOD QUALITY	CLASS 4 VERY GOOD QUALITY
Foundation	Thickened slab around perimeter	Thickened slab around perimeter	Thickened slab around perimeter	Spread footing around perimeter and thickened slab at partitions
Floor	4" concrete slab	4" concrete slab	4" concrete slab	4" concrete slab
Walls	Box construction 2"x4" at 48" on center	Box construction 4"x4" at 48" on center	2"x4" studs at 24" on center, 2"x4" stud partitions at 24" on center	Masonry exterior walls wood frame interior partitions and ceiling
Exterior Cover	Cheap grade redwood or Douglas fir vertical or horizontal	Average grade of redwood, Douglas fir, B and B or horizontal board	Average or better grade of redwood B and B or horizontal siding or stucco finish	Natural blocks
Interior Finish	None	Gypsum board or plywood partitions painted	Gypsum board or plywood partitions painted	Sheet rock finished
Roof Framing	Rafters and tie at plate line	Very simple truss	Rafters, collar beams and ceiling joists or good trusses	Rafters, collar beams and ceiling joists or good trusses
Roofing	Composition or used metal sheeting	Composition or metal sheeting	Aluminum or corrugated iron or light wood shingles	Good grade composition shingles or wood shingles
Doors	Two or three cheap doors	Three or four average doors	One average door each room	One good door each room
Windows	Few and small	One window each room	One steel or aluminum window in each room	One steel sash or aluminum window in each room
Electrical	Minimum outlets	Minimum outlets	Average or better outlets	Average or better outlets adequate amount
Heating & Cooling	None	None	None	None

SQUARE FEET

CLASS	400	600	800	1,000	1,200	1,500	2,000	2,500	3,000
1	\$ 32.36	30.58	29.69	28.71	28.35	27.49	26.87	26.33	26.09
2	43.33	41.02	39.98	38.70	38.22	37.14	36.30	35.66	35.38
3	58.78	55.84	54.43	52.85	52.25	50.84	49.80	48.98	48.55
4	111.27	103.12	99.35	94.58	93.09	89.02	86.13	83.65	82.56

1. Utility hook-up costs included.

2. Interior plumbing not included

Add for Class 1:	\$ 1,140	per fixture
Class 2:	1,743	per fixture
Class 3:	2,660	per fixture
Class 4:	4,128	per fixture

3. Domestic well or septic system not included. Refer to Section 4 for costs

4. Floor covering not included.

Add asphalt tile or linoleum:	\$ 7.10	per sq ft
Add installed carpet:	7.20	per sq ft

5. Cooling systems not included.

Add window units:	\$ -	per sq ft
Add for evaporative coolers, roof or wall units only:	3.89	per sq ft

6 Heating systems not included.

Add floor or wall furnace:	2.23	per sq ft
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7 Insulation not included.

Add for	Roof:	1.96	per sq ft
	Walls:	1.20	per sq ft

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

PART A
2023-2024 RURAL BUILDING COSTS

Section 4

UTILITIES

DOMESTIC WATER SYSTEMS - SEPTIC SYSTEMS - MOBILE HOME HOOKUPS

NOTE: The costs offered in this section represent general or average costs. Actual costs in specific geographic areas may vary substantially thereby requiring each assessor to substitute locally relevant cost data.

Residence and bunkhouse costs already include utility hookups. Mobile home hookup costs appear on Page 3 of this section.

PRESSURE TANK SIZES

42 gallons	16-inch diameter	x	48 height	50-inch circumference
82 gallons	20-inch diameter	x	60 height	63-inch circumference
120 gallons	24-inch diameter	x	60 height	75-inch circumference
220 gallons	30-inch diameter	x	72 height	94-inch circumference
315 gallons	36-inch diameter	x	72 height	113-inch circumference
525 gallons	36-inch diameter	x	120 height	113-inch circumference



SEPTIC TANKS

This table contains costs derived from the current Marshall Swift Commercial Manual without any adjustment for farm labor. Assessors should apply their knowledge of local market conditions to select an appropriate value.

Segregated by common sizes, these costs represent septic tanks installed and connected in normal soil with leach fields and lines, but do not include hookup costs, which are included with residences or bunkhouses. For mobile homes, add the sewer hookup costs listed below.

SEPTIC TANK COSTS CAPACITY (GAL)

QUALITY	LOW	AVG	GOOD
1000 GAL	\$ 2,101	2,584	3,066
1250 GAL	2,841	3,288	3,734
1500 GAL	3,337	3,949	4,560
LEACH LINES (per ft)	15.20	19.73	24.25
DRAINFIELD MULT.	1.25	1.25	1.25
PLASTIC PIPE 4"-6" (per ft)	9.16	12.18	15.20

MOBILE HOME HOOKUPS

TYPE	LOW	AVG	GOOD
Water	\$ 1,001	1344	1,890
Electric	1,498	2156	3,122
Sewer	1,127	1652	2,100
Gas	475	721	1,148

WATER hookups include trenching, pipe, and labor from unit to city main or domestic well system.

ELECTRIC hookups include pole, box, overhead wiring, and conduit for a 100-ampere system.

SEWER hookups include trenching, pipe, and labor to a city sewer main or septic system.

GAS hookups include trenching, pipe, and labor from unit to a gas main or a tank and regulator.

NOTE: Mobile home hookup costs do not include connector, service, or user fees.

Hookup costs do include combined piping for 40 linear feet of water and sewer lines.

For either water or sewer piping costs exceeding base, ADD per linear foot: \$7.72 to \$12.81

PART A
2023-2024 RURAL BUILDING COSTS

Section 5

CORRALS AND FENCES



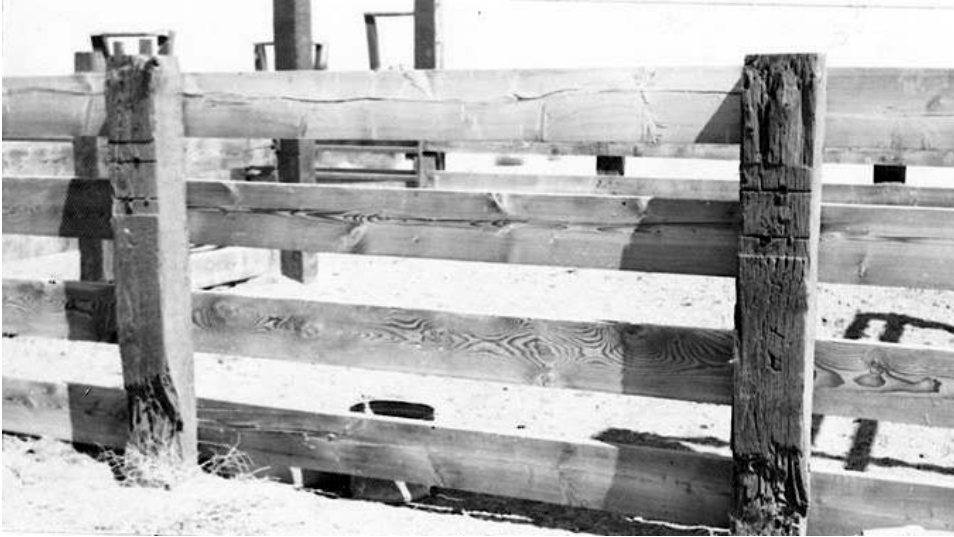
**RAILROAD TIE POSTS
10' OC
POLE RAIL FENCE
AVERAGE QUALITY
LESS 15 %**



**RAILROAD TIE POSTS
POLE RAIL FENCE
WITH FEED TROUGH
AVERAGE QUALITY**



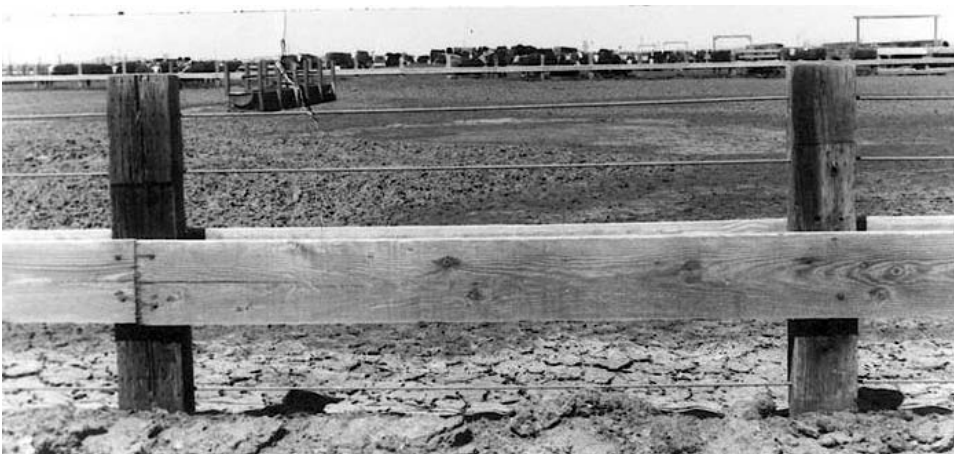
**RAILROAD TIE POSTS
CABLE FENCE
WITH FEED TROUGH
AVERAGE QUALITY**



**RAILROAD TIE POSTS
6' OC
2" X 8" FENCE RAILS
AVERAGE QUALITY
PLUS 15%**



**RAILROAD TIE POSTS
8' OC
2" X 8" FENCE RAILS
WITH POLES
GOOD QUALITY**



**RAILROAD TIE POSTS
CABLE FENCE
WITH FEED TROUGH
AVERAGE QUALITY**

CORRAL FENCING
COST PER LINEAR FOOT

TYPE	LOW	FAIR	AVG	GOOD
WOOD	\$ 12.14	\$ 14.61	\$ 17.65	\$ 21.22

Examples	4-4"	4-6"	5-6"	7-6"
of Rails	3-6"	3-8"	4-10"	6-8"
	2-10"	2-12"	3-12"	4-12"
	2 or 3 poles	4 or 5 poles	6 or 7 poles	7 or 8 poles

Base costs include railroad tie posts eight feet on center with two-inch thick rails. Reduce fair – good quality by one class for lighter wood posts or one-inch thick rails; reduce low quality by 20 percent. Adjust base cost plus or minus 7.5 percent for each foot of deviation from base of eight feet on center. Less than eight feet - increase costs, more than eight feet - reduce costs. For solid wood fence of two-inch thick rails, add 35 percent to good quality. Do not adjust base cost overall more or less than 50 percent.

TYPE	LOW	FAIR	AVG	GOOD
WIRE	\$ 4.39	\$ 4.97	\$ 5.55	\$ 6.13

Examples:	2 or 3 strands barbed or hog/cattle fence	3 or 4 strands barbed or light grade woven or welded wire	5 or 6 strands barbed or horse fence (medium welded wire)	7 or 8 strands barbed or bull panels (heavy welded wire)
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Base costs include railroad tie posts eight feet on center. Adjusted cost plus or minus 7.5 percent for each foot of deviation from base. Reduce one class for lighter wood posts; reduce two classes for metal "T" posts. Reduce low quality by 30 percent for light wood posts or 50 percent for metal "T" posts. Do not adjust base cost overall more or less than 50 percent.

PIPE AND CABLE FENCES

TYPE	LOW	FAIR	AVG
4" PIPE, CABLE RAILS	\$ 17.97	18.55	19.12
4" PIPE, 2" PIPE RAILS	22.93	23.66	24.38

WOODEN FEED TROUGHS

TYPE	LOW	FAIR	AVG	GOOD
W/O FENCE	\$ 9.45	\$ 12.48	15.99	22.56
WITH FENCE	\$ 13.29	17.24	21.08	27.46

For metal troughs, add 200 percent. For concrete troughs, add 250 percent.

CONCRETE

In-place cost for flatwork per square foot: \$ 5.58 to \$ 6.80
Cost per square foot of wall area: \$ 26.49

METAL FENCING AND GATES



**5' CHAIN LINK FENCE
NO TOP RAIL**



**COMMERCIALLY
MANUFACTURED GATE
GOOD QUALITY**



**EXPANDED TUBE
STEEL GATE**



**IRON PIPE CORRAL
AND HOLDING PEN**

CHAIN LINK FENCING

Average cost per linear foot, including complete installation on two-inch round or "H" posts set in concrete, 8 to 12 feet on center.

TYPE	HEIGHT				
	4'	6'	8'	10'	12'
2" INCH MESH AVERAGE QUALITY	\$ 16.21	23.53	30.98	37.97	44.73
ADD FOR RAILS	2.67	2.67	2.89	2.89	2.89
ADD FOR PRIVACY SLATS	8.09	12.30	16.59	21.20	25.39
ADD FOR 3 STRAND BARBED WIRE	3.46	3.46	3.88	3.88	3.88

Add 5 percent to 15 percent for aluminum or vinyl covered wire.

PORTABLE HORSE CORRALS & GATES

TYPE	LOW	FAIR	AVG	GOOD
METAL PIPE OR PORTABLE PANELS	\$ 9.32	\$ 14.84	\$ 19.82	\$ 28.75

Gates may be included in linear footage of fencing, commensurate to quality class, height, etc.

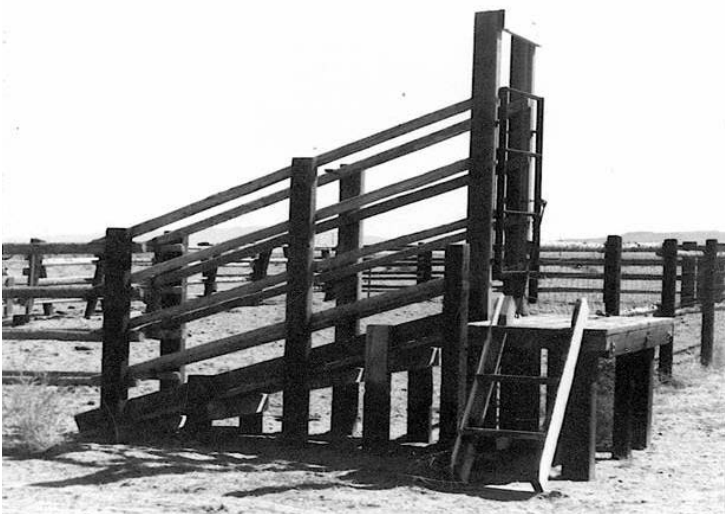
PLASTIC FENCING

TYPE	COST
POLYMER GRID , 5', 2" * 6" TOP RAIL	\$ 17.00
VINYL FENCE, 5" * 5" POSTS, 3 - 2" * 6" RAILS	24.16

For other types of plastic fence, see the Marshall & Swift Commercial Manual, Section 66 Page 5

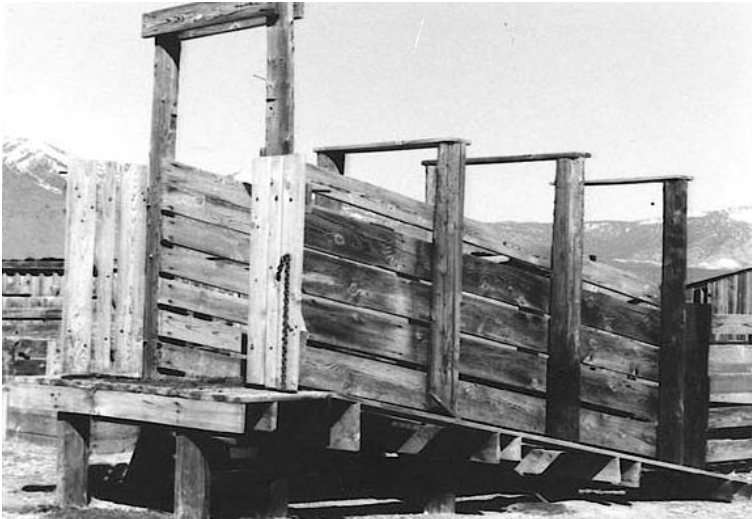
NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

CORRAL LOADING CHUTES



LIGHT SPACED CHUTE

HEAVY SPACED CHUTE



HEAVY SOLID CHUTE

CORRAL LOADING CHUTE
COST PER LINEAR FOOT INCLUDING BOTH SIDES

SPACED	LIGHT CHUTE	\$ 90.35	per lf
	HEAVY CHUTE (INCLUDES PLATFORM)	96.24	
SOLID	LIGHT CHUTE	102.14	
	HEAVY CHUTE (INCLUDES PLATFORM)	108.04	

CONCRETE DIPPING VAT

USUALLY COMPOSED OF:

Six-inch electric welded fabric reinforced concrete wade in dipping vat.

Three foot six inches wide by 30 feet long and four feet deep with two-inch supply and drain lines included.

Pump and valve not included.

COMPLETE IN PLACE COST \$ 6,317

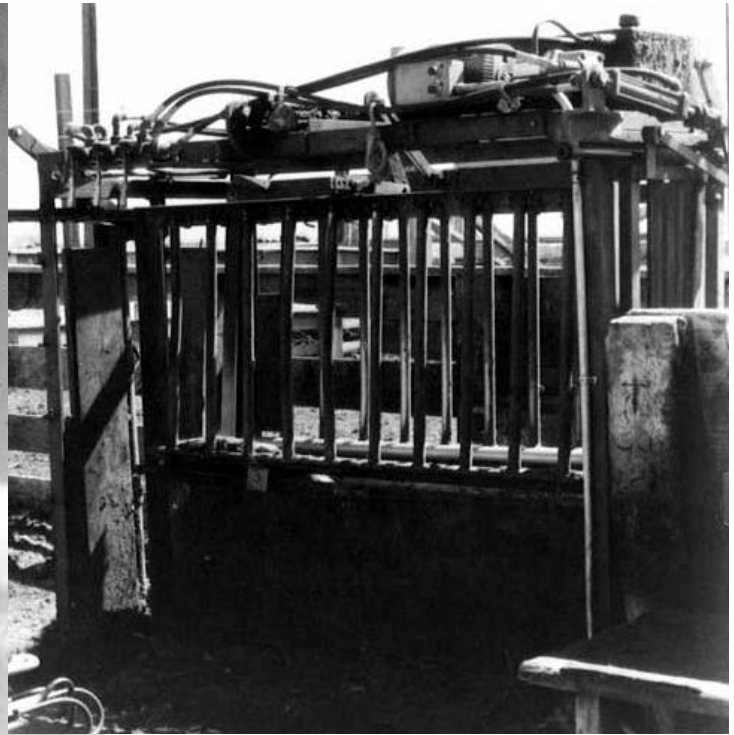


CALF TABLE

WINDMILLS & CATTLE SQUEEZES



SMALL WINDMILL



HYDRAULIC SQUEEZE



LIGHT STATIONARY SQUEEZE

COMMERCIALLY MANUFACTURED HEAVY DUTY CATTLEGUARDS

	7.5' x 8'	7.5' x 10'	7.5' x 12'	7.5' x 15'
\$	2,912	\$ 3,939	\$ 4,965	\$ 5,992

CATTLE SQUEEZE

STATIONARY MODEL, LIGHT	\$ 2,615
STATIONARY MODEL, HEAVY	4,135
HEAVY DUTY, HYDRAULIC	15,730
CALF TABLE	1,724



HEAVY STATIONARY SQUEEZE

WINDMILLS AND STEEL TOWERS

FAN		TOWER		INSTALLATION	TOTAL COST
6'	\$ 2,834	21'	\$ 2,999	\$ 3,022	\$ 8,855
6'	2,834	27'	3,891	2,923	9,648
6'	2,834	33'	4,820	3,249	10,903
8'	3,652	21'	2,999	2,798	9,449
8'	3,652	27'	3,891	2,369	9,912
8'	3,652	33'	4,820	2,695	11,168
10'	5,831	27'	3,891	2,767	12,489
10'	5,831	33'	4,820	3,886	14,538
12'	9,973	27'	3,891	4,639	18,502
12'	9,973	33'	4,820	5,031	19,824
14'	15,930	27'	3,891	6,479	26,300
14'	15,930	33'	4,820	8,325	29,075
16'	21,469	33'	4,820	9,261	35,551

Includes complete steel wheel, tower and installation excluding well.

CATTLE AND HORSE WATERING TANKS

ROUND BOTTOMLESS STOCK TANKS

25.5" Deep, Galvanized Corrugated

PER FOOT OF DIAMETER - 22 GAUGE METAL	\$ 43.79
12 GAUGE METAL	\$ 64.82
ADD: 10 GAUGE METAL	25%
PER SQUARE FOOT OF CONCRETE SLAB	\$ 5.58

COMMERCIALY MANUFACTURED METAL WATER TANKS

GALVANIZED WITH BOTTOM 25.5" TO 27" DEEP

PER FOOT OF DIAMETER - 22 GAUGE METAL	\$ 54.74
12 GAUGE METAL	\$ 83.74
ADD: 10 GAUGE METAL	25%

COMMERCIALY MANUFACTURED AUTOMATIC WATERERS WITH HEATERS

LEN	WDTH	HGHT	GAL	HEAD	COST
20	18	25	3	30 50	\$ 845
30	24	25	9	80 120	845
32	28	25	13	100 200	845
42	28	25	20	200 300	924
66	28	25	35	300 400	992
84	24	16	40	350 450	1,030
90	28	25	50	400 550	1,108
90	36	25	120	500 700	1,234

COMMERCIALY MANUFACTURED METAL WATER TROUGHS (GALVANIZED TANK)

GALLONS			
175	300	500	900
\$ 243	\$ 333	\$ 441	\$ 667

ALL OTHER WATER TROUGHS

1 cubic foot = 7.5 gallons

VOLUME	COST /	GAL	Cu Ft
LESS THAN 100 GALLONS		\$ 4.24	\$ 31.78
100 TO 175 GALLONS		3.88	29.04
176 TO 300 GALLONS		3.51	26.30
301 TO 500 GALLONS		3.14	23.56
OVER 500 GALLONS		2.78	20.82

COMMERCIALLY MANUFACTURED FENCE PANELS

Portable or stationary, not including posts. For wooden posts (RR Ties)

Add \$ 12.13 to \$ 26.84 EACH

64" HEIGHT, 5 RAIL MEDIUM DUTY	6'	\$ 185
	8'	248
	10'	272
	12'	301
	14'	366
	16'	402

64" HEIGHT, 5 RAIL EXTRA HEAVY DUTY	6'	\$ 306
	8'	367
	10'	409
	12'	460
	14'	525
	16'	567

For extra heavy-duty panels with solid steel sections, increase cost 100%.

COMMERCIALLY MANUFACTURED METAL GATES WITH LEVER LATCH

WIDTH			
6 FOOT	8 FOOT	12 FOOT	16 FOOT
\$ 317	\$ 297	\$ 368	\$ 458

**COMMERCIALLY MANUFACTURED
PROFESSIONAL ROPING AND DOGGING CHUTE**

FIRST SECTION WITH RELEASE GATE	\$ 3,422
SECOND SECTION	2,101
STRIPPING CHUTE	2,002

COMMERCIALLY MANUFACTURED BUCKING CHUTE

FIRST SECTION	\$ 9,453
ADDITIONAL SECTIONS, EACH	6,946

COMMERCIALLY MANUFACTURED CROWDING ALLEYS

24' x 60" INCLUDES FRAMES & HEADGATE w STAND	\$ 7,166
24' x 60" ADD-ON SECTION	2,219
ALLEY STOPS ADD	387
10' CUTOUT GATE INCLUDING FRAME AND 10' PANEL	3,113

CURVED CROWDING ALLEYS

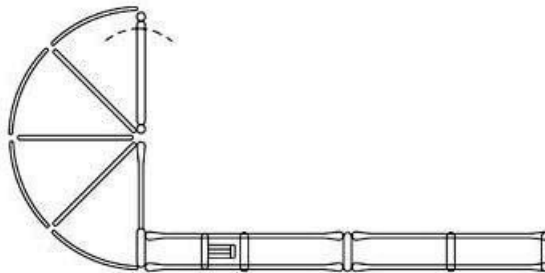
180 DEGREE SWEEP, 10' GATE & 24' ADJUSTABLE ALLEY WITH A1 CAGE & 10' X 20' LEAD-UP	\$ 16,213
180 DEGREE SWEEP, 10' GATE & 24' ADJUSTABLE ALLEY	11,301
BLOCKING DOOR ADD	1,132
ADJUSTABLE ALLEY BOW	300

COMMERCIALLY MANUFACTURED FEEDER PANEL

SIZE	EACH
6' x 64"	\$ 377
8' x 64"	452
10' x 64"	739
12' x 64"	848
16' x 64"	1,017

HEADGATES

SELF CATCH HEAVY DUTY	\$ 1,848
SELF CATCH LIGHT DUTY	1,444



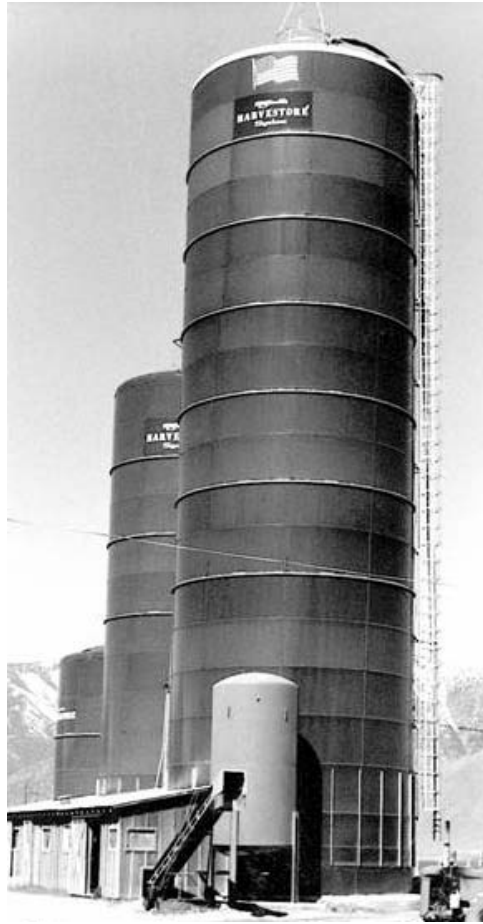
180' SWEEP w CROWDING ALLEY

PART A
2023-2024 RURAL BUILDING COSTS

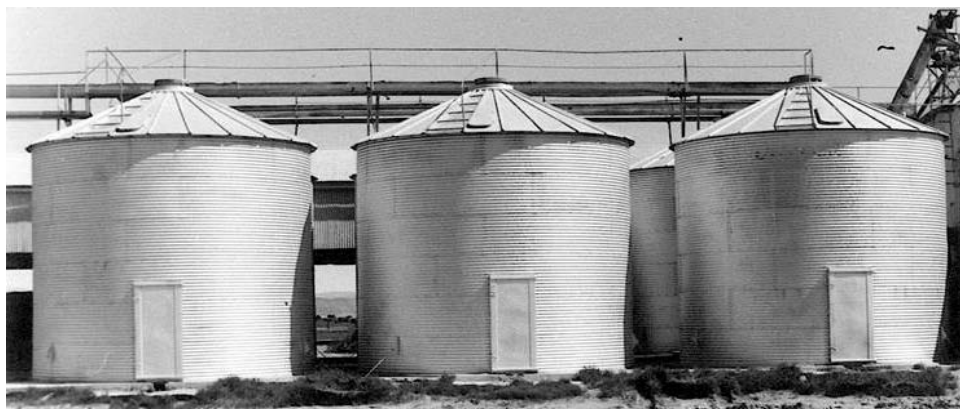
Section 6

MISCELLANEOUS COSTS

Most of the costs in this section are based on professional construction labor supervised by a contractor or his job foreman. Few of these costs should be adjusted downward for farm labor with no professional supervision, as most of these items are professionally installed with contractor supervisor.



SILO: GLASS-LINED STEEL



GRAIN STORAGE BINS with CONVEYOR

FARM SILOS

Costs of concrete stave silo, complete. For other construction material, see factors listed below.

TOTAL COST

DIAMETER	HEIGHT								
	30'	35'	40'	45'	50'	60'	70'	80'	90'
12'	\$ 16,905	19,888	22,871	25,668	28,465	33,934	-	-	-
14'	19,639	22,996	26,352	29,459	32,567	39,030	45,370	-	-
16'	20,385	23,741	27,097	30,454	33,810	40,398	47,110	53,822	-
18'	21,877	25,482	29,086	32,815	36,544	43,754	50,963	58,048	65,258
20'	24,487	28,527	32,567	36,731	40,895	49,099	57,054	65,258	73,337
22'	28,713	33,375	38,036	42,635	47,234	56,929	66,190	75,512	84,835
24'	-	-	-	-	54,568	65,258	76,134	86,389	97,576
30'	-	-	-	-	-	88,564	103,480	117,774	131,758

No chute, deduct per vertical foot of height \$ -
 Flat roof, deduct per square foot of floor area \$ 8.12
 No roof, deduct per square foot of floor area \$ 15.29

NOTE: For silos constructed from other materials, multiply the costs above by these factors:

Brick masonry	1.75	Glass lined steel	2.15
Reinforced concrete	1.60	Steel	1.80
Concrete block	1.20	Wood	1.10

SILO UNLOADER

EACH

12'	14'	16'	18'	20'	22'	24'	26'	28'	30'
\$ 13,424	14,170	14,916	15,662	16,656	17,402	18,272	N/A	N/A	19,391

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

STEEL GRAIN BINS

Costs are averages for utility type storage bins usually found on farms and ranches. Costs of standard bins are for tank with door and manhole, erected on buyer's slab. Height is to top of shell. Cost of ventilated floor includes floor, auger tube, and steel columns and beam supports for plenum assembly.

NOTE: To calculate capacity in bushels, multiply diameter squared x height x .63.

SIZE DIAM	HGHT	CAPACITY (BUSHELS)	COST W/O DRY BIN	COST WITH	
				DRY BIN	SLAB FLOOR
15	7	1,257	\$ 7,335	\$ 10,639	\$ 1,024
15	11	1,792	9,582	14,141	1,117
15	15	2,329	11,432	16,784	1,282
15	18	2,864	13,018	18,767	1,480
18	11	2,647	10,639	15,463	1,374
18	15	3,422	13,216	19,163	1,427
18	18	4,189	15,066	21,806	1,480
21	11	3,693	11,762	17,049	1,890
21	15	4,753	15,066	21,806	1,943
21	18	5,813	18,238	26,564	2,022
24	11	4,949	14,405	21,013	2,392
24	15	6,344	17,577	25,903	2,498
24	18	7,739	21,939	31,851	2,604
27	11	6,409	17,049	25,110	3,066
27	15	8,182	21,146	30,529	3,211
30	15	10,278	25,771	37,005	3,535
30	18	12,473	30,265	43,877	3,734
30	22	14,668	34,758	-	3,899
30	26	16,863	38,723	-	4,295
36	15	15,297	36,080	52,335	5,220
36	18	18,473	40,970	59,604	5,551
36	22	21,648	47,710	-	5,782

ADD: PER SQUARE FOOT OF CONCRETE SLAB \$ 5.58

LADDERS	\$ 102	PLUS	\$ 14.67	PER LINEAR FOOT
SAFETY CAGES	28.55	TO	35.35	PER FOOT INSTALLED
AUGER AND DRIVE	611	PLUS	65.75	PER FOOT OF TANK DIAMETER
SPREADERS	1,189	TO	1,784	EACH
STIRRATORS	277.54	TO	422.91	PER FOOT OF TANK DIAMETER

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

FEED TANKS

Costs are averages of typical farm hoppers with roof, manhole, and ladder including necessary steel structural supports and concrete footings. Height is overall from ground level to top of tank. Capacity in tons is figured at 50 pounds per bushel.

DIAMETER (FEET)	HEIGHT (FEET)	CAPACITY (BUSHEL)	CAPACITY (TONS)	COST
6	10'	120	3.0	\$ 2,722
6'	16'	240	6.0	3,866
6'	21'	360	9.0	4,394
6'	25'	480	12.0	4,956
6'	28'	600	15.0	5,452
7'	11'	157	4.0	3,734
7'	14'	239	6.0	4,031
7'	16'	321	8.0	4,361
7'	19'	403	10.0	4,659
9'	14'	300	7.8	5,617
9'	17'	450	11.3	6,740
9'	20'	590	14.8	7,335
9'	25'	855	21.4	8,458
9'	28'	1,000	25.0	8,921
9'	31'	1,130	28.5	9,251
12'	20'	870	21.8	12,621
12'	25'	1,345	33.6	14,273
12'	31'	1,825	45.6	16,256
12'	36'	2,300	57.5	17,577
12'	42'	2,780	69.5	19,163

ADD: PER SQUARE FOOT OF HEAVY DUTY CONCRETE SLAB \$ 6.80

NOTE: Above costs are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product.

GRAIN HANDLING SYSTEMS

Cost of handling equipment only does not include grain storage bins. Most grain handling systems are professionally installed with contractor supervision. In cases where unsupervised nonprofessional help such as farm labor is used, adjust the costs listed downward by 25 percent, depending on the quality of workmanship.

GRAIN LOADING AND UNLOADING SYSTEMS

CONVEYOR

AUGER-TYPE

DIAM	COST/LIN FT
6"	\$ 107
8"	145
10"	192
12"	259
14"	301
16"	375

BELT-TYPE

WIDTH	COST/LIN FT
12"	\$ 184
18"	284
24"	333
30"	383
36"	408
48"	525



FEED MILL and COMPONENTS

ELECTRIC POWER PLANTS

HOME GENERATOR SETS

RATING - KW	GASOLINE	DIESEL
3.0	\$ 4,354	\$ 5,225
4.0	\$ 5,291	\$ 6,349
5.0	\$ 6,290	\$ 7,548
7.0	\$ 8,436	\$ 10,123

COMMERCIAL INDUSTRIAL GENERATORS

RATING - KW	GASOLINE	DIESEL
10.0	\$ 20,036	\$ 24,850
12.5	\$ 23,640	\$ 29,174
15.0	\$ 26,391	\$ 32,477
20.0	\$ 30,683	\$ 38,109
25.0	\$ 32,682	\$ 38,671
30.0	\$ 34,681	\$ 39,233
40.0	\$ 41,637	\$ 47,381
50.0	\$ 45,809	\$ 52,621
60.0	\$ 59,858	\$ 69,274
100.0	\$ 73,907	\$ 85,928
150.0	\$ 99,132	\$ 117,050

For Air Cooling, Deduct: 15%
 For natural or LP gas fuel systems, Add per KW: \$ 30.99
 For remote control starting, gasoline fuel, Add: \$ 118.79

NOTE: Above costs include minimal current load control switchboard facilities. Above costs do not include mounting pads

**ALTERNATING CURRENT
LOAD CONTROL SWITCHBOARD**

**AUTOMATIC EMERGENCY
SWITCHBOARD FOR GASOLINE PLANT**

ALTERNATING CURRENT LOAD CONTROL SWITCHBOARD				AUTOMATIC EMERGENCY SWITCHBOARD FOR GASOLINE PLANT			
RATING KW	AMPS	VOLTAGE	COST EACH	RATING KW	AMPS	VOLTAGE	COST EACH
15	130	240; 230/400	\$ 2,084	15	130	120/240	\$ 812
20	170	120/240; 240	2,956	20	170	120/240	2,353
25	210	240; 120/240	3,828	25	210	120/240	3,894
30	250	240; 120/240	4,701	30	250	120/240	5,434
40	330	120/240; 240	5,573	40	330	120/240	6,975
50	420	480;240	6,445	50	420	120/240	8,516
60	500	480;240	7,318	60	500	120/240	10,056
100	830	480;240	8,190	100	830	120/240	11,597

ADD FOR DIESEL POWERED PLANTS: \$ 228
 FOR CIRCUIT BREAKERS: \$ 839 TO \$ 4,783

SCALES



LIVESTOCK SCALE with WOOD CAGE

LIVESTOCK SCALES

BEAM TYPE	SIZE	CAPACITY	COST
FULL CAPACITY	14' X 8'	5 TON	\$ 21,278
FULL CAPACITY	16' X 8'	10 TON	\$ 28,018
FULL CAPACITY	22' X 10'	15 TON	\$ 39,912

SCALE CAGES

SIZE	METAL	WOOD	COST
	COST	COST	
14'	\$ 2,068	14' X 8'	\$ 1,208
16'	2,324	16' X 8'	\$ 1,242
22'	3,208	22' X 10'	\$ 1,542
24'	3,495	24' X 10'	\$ 1,602

FOR TYPE REGISTERING BEAM, ADD. \$ 922
 FOR PRINTER, ADD 1,427
 FOR ELECTRONIC DIGITAL SCALE, ADD. 6,872

Scale pit 4-inch concrete walls and slab poured in place. May be poured in or on top of ground. If on top, compacted ramps and steps to scale beam included.

MOTOR TRUCK SCALES

Specifications

Reinforced concrete pit and platform. All steel structure and scale mechanism.

Motor truck scales are of two general types: the beam type (either manual or type registering) and the fully automatic dial type. The construction of both, insofar as the weight carrying mechanism is concerned, is very similar. The method of recording the weights makes the difference.

CAPACITY	TOTAL COST
20 TONS	\$ 52,335
30 TONS	\$ 61,058
40 TONS	\$ 56,829
50 TONS	\$ 79,296
60 TONS	\$ 89,538
70 TONS	\$ 103,085

FOR WOOD PLATFORM, DEDUCT:	6%
FOR STEEL PLATE, ADD:	5%
FOR AUTOMATIC DIAL MODEL, ADD: \$	3,370
FOR REMOTE READER-PRINTER, ADD:	13,216
FOR CARD PRINTER, ADD:	3,040



VINYARDS

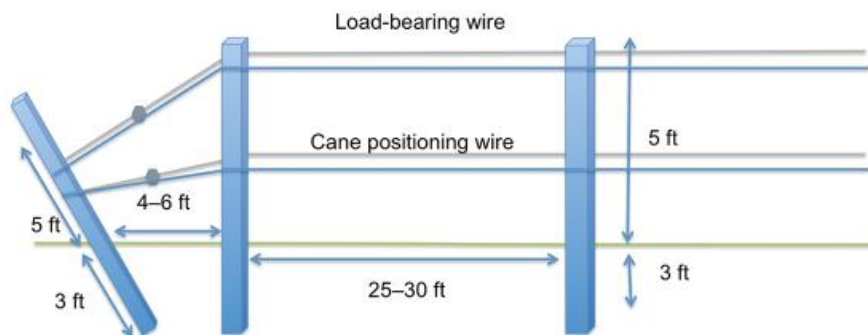
Vine Training Systems

Vine Training Systems are instrumental in good canopy management and productivity of the grape vines. The costs shown here include the T-posts, wire clips, two rows of trellis wire, and pencil rod stakes.

VINYARD STAKE & TRELLIS SYSTEM	EACH VINE	PER ACRE
4X7 (VINES 4' APART; ROWS 7' APART); EVERY VINE (7' T POST WITH WIRE CLIPS, STAKES, 2 ROWS OF WIRE FOR TRELLIS)	\$ 5.09	\$ 7,913.38



I-Trellis with End Post Configuration



PART A
2023-2024 RURAL BUILDING COSTS

Section 7

COMPUTATIONAL TABLES

MEASUREMENT PRINCIPLES

PLANE FIGURE	A plane surface bounded by either straight or curved lines having no thickness.
SOLID	A body, such as a barrel, building, etc.
SQUARE MEASURE	Area calculation requiring only two dimensions, length and width.
CUBIC MEASURE	Cubic or cubage means volume and gives size in terms of its bulk. Calculation requires three dimensions: length times width times depth or height or thickness.

WEIGHTS AND MEASURES

Tables of weights, measures and other information helpful to the assessor-appraiser.

METRIC MEASURE

Millimeter	0.001 meters
Centimeter	0.01 meters
Decimeter	0.1 meters
Meter	39.3685 inches
Kilometer	1,000 meters
Kilometer	0.62137 miles
Meter	1.0935 yards
Meter	3.2807 feet
1 foot	0.30480 meter
1 foot	30.48 centimeters
1 inch	2.54 centimeters

LINEAR MEASURE

1 foot	12 inches
1 yard	3 feet or 36 inches
1 rod	5 1/2 yards or 16 1/2 feet or 25 links
1 furlong	40 rods or 220 yards or 660 feet
1 mile	8 furlongs or 320 rods or 1,760 yards or 5,280 feet

SURVEYOR'S LINEAR MEASURE

1 link	7.92 inches
1 rod	25 links
1 chain	4 rods or 100 links or 66 feet
1 furlong	10 chains
1 mile	8 furlongs or 80 chains

WEIGHTS AND MEASURES

SQUARE MEASURE

1 square foot	144 square inches
1 square yard	9 square feet or 1,296 square inches
1 square rod	1 pole or perch or $30 \frac{1}{4}$ square yards or $272 \frac{1}{4}$ square feet
1 rood	40 square rods or 1,210 square yards or $\frac{1}{4}$ acre
1 acre	160 square rods or 4,840 square yards or 43,560 square feet
1 square mile	640 acres

SURVEYOR'S SQUARE MEASURE

1 square rod	625 square links
1 square chain	16 square rods
1 acre	10 square chains
1 square mile	640 acres

CUBIC MEASURE

1 cubic foot	1,728 cubic inches or 7.481 gallons
1 cubic yard	27 cubic feet
1 cord foot	16 cubic feet
1 cord of wood	8 cord feet or 128 cubic feet
1 perch of masonry	$24 \frac{3}{4}$ cubic feet
1 bushel	1.2445 cubic feet

ANGLES AND ARCS

1 minute	60 seconds
1 degree	60 minutes
1 right angle	90 degrees or 1 quadrant
1 circumference	360 degrees or 4 quadrants

BOARD MEASURE

1 board foot	length in feet times width in feet times thickness in inches
--------------	--

AREAS

Square feet of surface area equal square of one side multiplied by the given factor.

<u>REGULAR SHAPED</u>	<u>NUMBER OF SIDES</u>	<u>FACTOR</u>
Equilateral triangle	3	0.433
Pentagon	5	1.721
Hexagon	6	2.598
Heptagon	7	3.634
Octagon	8	4.828
Nonagon	9	6.182
Decagon	10	7.694
hendecagon	11	9.366
Dodecagon	12	11.196

MEASURES AND THEIR EQUIVALENTS

- A gallon of water (U. S. Standard) weighs $8 \frac{1}{3}$ pounds and contains 231 cubic inches.
- A cubic foot of water contains $7 \frac{1}{2}$ gallons, 1,728 cubic inches and weighs $62 \frac{1}{2}$ pounds.
- Doubling the diameter of a pipe increases its capacity four times.
- To find the capacity of any size tank given the dimensions of a cylinder in inches, to find its capacity in U. S. gallons; square the diameter, multiply by the length and by 0.0034. (Note: See table on tank capacities.)
- Rectangular tanks: multiply the length by the width by the depth (all in inches) and divide the result by 231. The answer is the capacity in gallons.
- Thirty-one and one half ($31 \frac{1}{2}$) gallons water equals one barrel by weight.
- British Thermal Unit (BTU) is the amount of the heat required to raise one pound of water one-degree Fahrenheit.
- A ton of refrigeration is measured by the displacement of the amount of heat required to melt a ton of ice in 24 hours. One motor horsepower of an electrically powered unit is normally required to produce one ton of refrigeration. Twelve thousand British Thermal Units (12,000 BTU) equals one ton.
- Watts = Volts multiplied by Amps
- Horsepower equals Kilowatts multiplied by 1.3405.
- Kilowatts equal horsepower multiplied by 0.746.

WEIGHTS

- BRICK:** Common brick of the national size weigh from 4 1/2 to five pounds; pressed and paving brick, from six to seven pounds, depending upon clay, burning and size.
- LIME:** On the basis of 53 pounds to the cubic foot, lime weighs about 66 pounds to the bushel, but in bulk it often sells on the basis of 80 pounds to the bushel or 200 pounds to the barrel of 2 1/4 bushels.

MISCELLANEOUS WEIGHT AND MEASURE EQUIVALENTS

- 1 cubic inch of cast iron weighs 0.26 pounds
- 1 cubic inch of wrought iron weighs 0.28 pounds
- 1 cubic inch of water weighs 0.036 pounds
- 1 cubic foot of water weighs 62.321 pounds
- 1 United States gallon weighs 8.34 pounds
- 1 Imperial gallon weighs 10.00 pounds
- 1 United States gallon equals 231.01 cubic inches
- 1 Imperial gallon equals 277.274 cubic inches
- 1 cubic foot of water equals 7.48 U. S. gallons

- 1-gallon (water) weighs 8.34 pounds
- 1 gallon equals 0.1337 cubic feet
- 1 gallon equals 0.1074 bushels
- 1 cubic foot equals 0.8032 bushels
- 1 barrel (oil) equals 42 gallons
- 1 barrel (water) equals 31.5 gallons

- A span is 9 inches
- A hand, horse measurement, equals 4 inches
- A knot, nautical, equals 6,080.27 feet
- A fathom, nautical, equals 6 feet
- A stone equals 14 pounds

- Pressure in pounds per square inch of column of water equals 0.434 times the height of the column in feet.
- A square acre measures approximately 208.7 feet on each side.
- 1 acre measures about 8 rods by 20 rods, or any two combinations of rods whose product equals 160.

MISCELLANEOUS

WEIGHT AND MEASURE EQUIVALENTS

- To convert bushels to tons, multiply number of bushels by 60 and divide the product by 2,000 (average maximum weight of commodities 60 pounds per bushel).
- To convert gallons to bushels, divide gallons by 9.35. Answer in bushels.
- To convert cubic measure into bushels, multiply by 0.8035.

AREAS AND MEASUREMENTS

- To find the circumference of a circle, multiply the diameter by 3.1416.
- To find the diameter, multiply circumference by 0.3183 or divide circumference by 3.1416.
- To find the radius, multiply circumference by 0.15915.
- To find the side of an inscribed square, multiply the diameter by 0.07071 or multiply the circumference by 0.2251.
- To find the side of an equal square, multiply the diameter by 0.8863 or multiply the circumference by 0.2821.

SQUARE: A side multiplied by 1.4142 equals the diameter of its circumscribing circle.

A side multiplied by 4.443 equals the circumference of its circumscribing circle.

A side multiplied by 1.126 equals the diameter of an equal circle.

A side multiplied by 3.547 equals the circumference of an equal circle.

- To find the area of a circle, multiply the circumference by one-quarter of the diameter or multiply the square of the diameter by 0.7854 or multiply the square of the circumference by 0.07958 or multiply the square of one-half of the diameter by 3.1416.
- To find the surface of a sphere or globe, multiply the diameter by the circumference or multiply the square of the diameter by 3.1416 or multiply four times the square of the radius by 3.1416.
- To find tank capacities, diameter square times .0034 equals gallons per inch of height - Base 42 gallons per barrel.
- To find area of a triangle, multiply base by 1/2 perpendicular height.
- To find area of an ellipse, product of both diameters times 0.7854.
- To find area of a parallelogram, base times altitude.
- To find cubic inches in a ball, multiply cube of diameter by 0.5236.
- To find cubic contents of a cone, multiply area of base by one third the altitude.
- Area of rectangle equals length multiplied by width.
- Surface of frustum of cone or pyramid equals sum of circumference of both ends times 1/2 slant height plus area both ends.
- Contents of frustum of cone or pyramid: multiply area of two ends and get square root, add the two areas and times 1/3 altitude.

CONVERSION TABLES

TABLE FOR AREA AND CAPACITY OF CIRCULAR TANKS / FOOT

DIAMETER	CIRCUMFERENCE	AREA	GALLONS		BARRELS (OIL)
3	9.42	7.07	53	6	1.26
4	12.57	12.57	94	10	2.24
5	15.71	19.63	147	16	3.50
6	18.85	28.27	212	23	5.00
7	21.99	38.48	288	31	6.80
8	25.13	50.27	376	42	9.00
9	28.27	63.62	477	51	11.30
10	31.42	78.54	587	63	14.00
11	34.56	95.03	711	76	16.90
12	37.69	113.10	846	91	20.20
13	40.84	132.73	993	107	23.70
14	43.98	153.94	1,151	124	27.40
15	47.12	176.72	1,322	142	31.50
16	50.26	201.06	1,054	162	35.80
17	53.41	226.98	1,698	182	40.40
18	56.55	254.47	1,903	204	45.30
19	59.69	283.53	2,121	228	50.50
20	62.83	314.16	2,350	252	56.00
21	65.97	346.36	2,591	278	61.70
22	69.12	380.13	2,843	305	67.70
23	72.26	415.48	3,108	334	74.00
24	75.40	452.39	3,384	364	80.60
25	78.54	490.87	3,672	394	87.40
26	81.68	530.93	3,971	427	94.60
27	84.82	572.56	4,283	460	102.00
28	87.97	615.75	4,606	495	109.70
29	91.11	660.52	4,941	531	117.60
30	94.25	706.86	5,287	568	125.80
31	97.39	754.77	5,646	606	134.40
32	100.53	804.25	6,016	646	143.20
33	103.67	855.30	6,398	687	152.30
34	106.81	907.92	6,791	730	161.60
35	109.96	962.11	7,197	773	171.30
36	113.10	1,017.88	7,614	818	181.30
37	116.24	1,075.21	8,043	864	191.50
38	119.38	1,134.11	8,483	911	202.00
39	122.52	1,194.59	8,936	960	212.70
40	125.66	1,256.64	9,400	1,010	223.80

NOTE: Capacity of cylindrical tanks standing on end.

CONVERSION TABLES

NOTES on cylindrical tanks: To find the capacity in cubic feet of a round tank or cistern, multiply the square of the average diameter by the depth and multiply the product by 0.785.

*To find the capacity in barrels (oil) equals diameter squared times 0.1399 times height.

** To find the capacity in gallons equals diameter squared times 5.8748 times height.

TABLE FOR CONVERSION OF LINEAR FEET INTO BOARD FEET

2 by 4	0.667 board feet
3 by 4	1.000 board feet
2 by 6	1.000 board feet
2 by 8	1.333 board feet
2 by 10	1.667 board feet
2 by 12	2.000 board feet
2 by 14	2.333 board feet
2 by 16	2.667 board feet
3 by 6	1.500 board feet
4 by 6	2.000 board feet
4 by 10	3.333 board feet
4 by 12	4.000 board feet
6 by 6	3.000 board feet
6 by 8	4.000 board feet
10 by 12	10.000 board feet
12 by 12	12.000 board feet

BOARD MEASURE

Multiply thickness in inches by width in inches, divide product by 12 and multiply result by the length in feet. The result is board measure content.

EXAMPLE

Two inches times 10 inches equal 20 square inches divided by 12 equals 1.667 board feet times 1,000 linear feet equals 1,667 board feet.

CENTER PIVOT IRRIGATION SYSTEM DATA

-----AREA COVERED IN ACRES

TOTAL SYSTEM LENGTH (IN FEET) <u>2/</u>	PERCENT OF WATER APPLIED IN LAST 100 FEET <u>1/</u>	TOTAL ACRES OF SQUARE FIELD TWICE LENGTH OF SYSTEM	WITH GUN <u>3/</u> SPRINKLER CORNERS USED ONLY	WITH GUN SPRINKLER USED ON ENTIRE CIRCLE <u>3/</u>	WITHOUT END GUN
600	30.6	33.1	30.8	35.3	26.0
650	28.4	38.8	36.0	40.6	30.5
700	26.5	45.0	41.5	46.2	35.3
750	24.9	51.7	47.3	52.1	40.6
800	23.4	58.8	53.4	58.4	46.2
850	22.1	66.3	59.8	65.1	52.1
900	21.0	74.4	66.5	72.1	58.4
960	19.9	82.9	73.6	79.5	65.1
1,000	19.0	91.8	81.1	87.3	72.1
1,050	18.1	101.2	89.0	95.4	79.5
1,100	17.4	111.1	97.3	103.8	87.3
1,150	16.6	121.4	106.0	112.7	95.4
1,200	16.0	132.2	115.1	121.9	103.9
1,250	15.4	143.5	124.6	131.4	112.7
1,300	14.8	155.2	134.5	141.4	121.9
1,320	14.6	16.0	138.5	145.4	125.7
1,350	14.3	167.4	144.7	151.6	131.4
1,400	13.8	180.0	155.4	162.3	141.4
1,450	13.3	193.1	166.5	173.3	151.6
1,500	12.9	206.6	178.0	184.6	162.3

1/ Less volume of end gun when used.

2/ Generally outside drive wheel is approximately 50 feet from end.

3/ Based on 100 feet gun coverage.

EXAMPLE: System is 900 feet long. Then 21 percent of water is applied in last 100 feet; 66.5 acres are covered with gun used in corners only.

2023-2024

PART B

ALTERNATE COSTS

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MUNICIPAL UTILITY PLANTS

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PART B
2023-2024 ALTERNATE COSTS

Section 1

TELECOM/COMMUNICATIONS

TELECOM / COMMUNICATION EQUIPMENT SHELTERS



LOW QUALITY



AVERAGE QUALITY



GOOD QUALITY

PREFABRICATED TELECOM / COMMUNICATION EQUIPMENT SHELTERS

Costs are for complete installation of small prefabricated modular buildings used for weather- and vandal-resistant equipment storage. Costs include a foundation and all wall, roof, and floor panels. Steel wall vents and entry door, and minimum electrical. Air conditioning and equipment power panel and wiring are not included.

TELECOM / COMMUNICATION EQUIPMENT SHELTERS SQUARE FOOT COSTS

CLASS	100	150	200	300	500	750
1	\$ 159.04	\$ 136.58	\$ 125.02	\$ 107.33	\$ 89.64	\$ 78.75
2	\$ 193.82	\$ 162.93	\$ 148.91	\$ 127.14	\$ 104.69	\$ 89.72
3	\$ 228.09	\$ 188.63	\$ 172.30	\$ 146.44	\$ 119.23	\$ 100.18

NOTE: For very low-quality metal or fiberglass structures, reduce Class 3 costs by 55%.

PART B
2023-2024 ALTERNATE COSTS

Section 2

FUELING COSTS

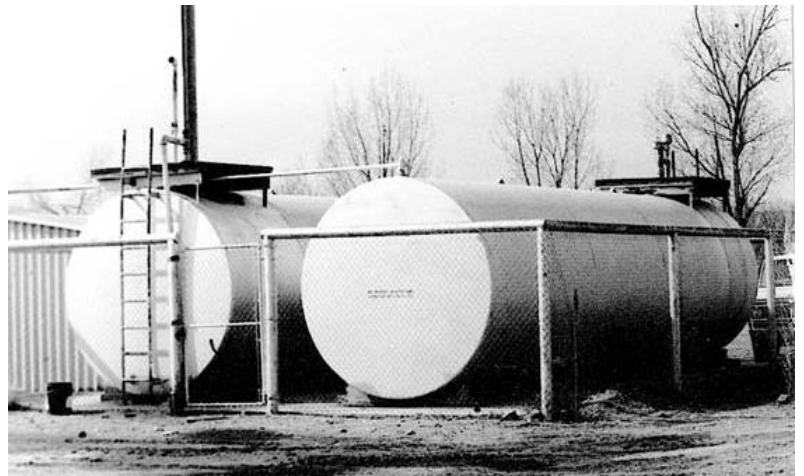
BULK FUEL TANKS

ABOVE GROUND HORIZONTAL BULK (FUEL) STORAGE

Costs are for complete installation. Includes holding stand, discharge hose and valve. Does not include any electric pumps. See following Page 3 in this section for pumps/dispenser costs.

ABOVE GROUND FUEL STORAGE

GALLONS	COST	GALLONS	COST
200	\$ 4,863	3,000	\$ 10,125
350	5,138	4,000	11,847
550	5,524	5,000	13,776
1,000	6,509	7,500	18,598
2,000	8,197	10,000	23,281



NOTE: To calculate tank volume use the following formula:

$$\text{Volume in gallons} = \text{Pi} \times \text{radius squared} \times \text{length} \times 7.5.$$

EXAMPLE: A tank five feet in diameter and 14 feet in length; Pi equals 3.1416;

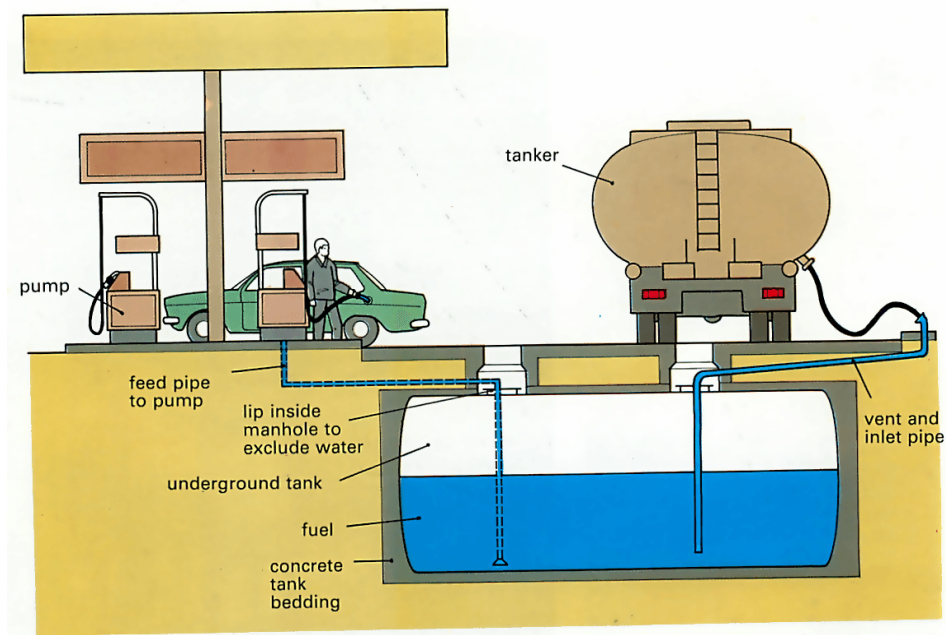
Radius (one-half of diameter) equals 2.5 feet: $3.1416 \times 2.5 \text{ squared} \times 14 \text{ feet} \times 7.5 = 2,062$ gallons.

UNDERGROUND FUEL STORAGE

Costs are for complete installation and are based on professional construction labor supervised by a contractor or his job foreman. For farm labor with no professional supervision, costs should be adjusted downward by 25 percent relative to the quality of the finished product. For multiple installation, two or more tanks in one hole, deduct 7 percent for each extra tank, consider the largest tank as the base. Costs do not include electric pumps. See following page 8 in this section for pump costs.

UNDERGROUND FUEL STORAGE

GALLONS	COST	GALLONS	COST
300	\$ 8,817	4,000	\$ 22,730
550	10,125	5,000	26,037
1,000	13,363	6,000	30,720
2,000	17,358	8,000	34,578
3,000	19,562	10,000	41,741



PUMPS/DISPENSERS

ELECTRONIC FUEL DISPENSERS

TYPE I					
	WITHOUT METER	\$ 368	TO	\$	1,043
	WITH METER	744	TO		1,185
TYPE II					
	WITHOUT METER	\$ 484	TO	\$	976
	WITH METER	870	TO		1,526
TYPE III		\$ 1,141	TO	\$	1,708
TYPE IV		\$ 1,667	TO	\$	3,320
TYPE V		\$ 4,202	TO	\$	5,431



TYPE I—NO METER



TYPE I METER



TYPE II—WITH METER



TYPE III



TYPE IV



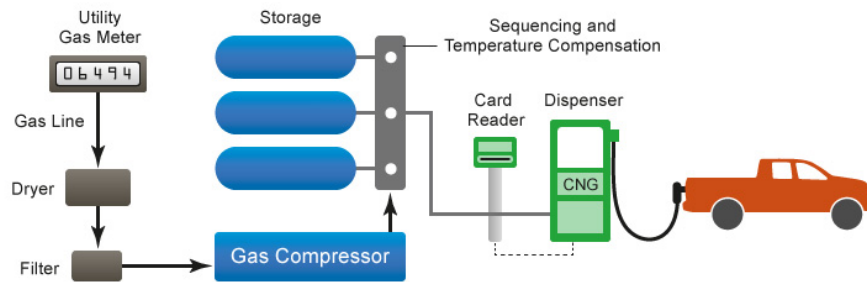
TYPE V

COMPRESSED NATURAL GAS FILLING STATIONS

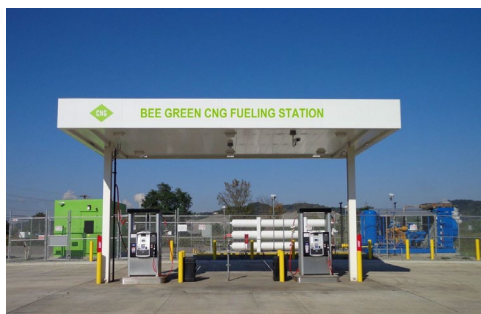
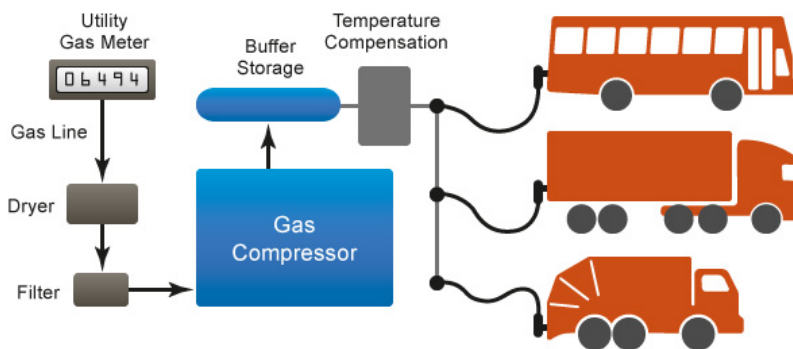
Costs are for complete installation of a compressed natural gas fueling station. Costs include compressor, gas inlet, dispenser, installation and other costs identified below.

SMALL FAST-FILL STATION 1-4 vehicles/day fueling cycle: 70% of fuel dispensed 2 hrs 2 times a day	Includes: 6 scfm compressor, 2-5 psi inlet gas pressure, 3,780 scf storage, 1 single-hose dispenser, installation at 65% of equipment costs, priority panel, credit card reader and gas dryer.	\$60,000
MEDIUM TIME-FILL STATION 75-80 light/medium-duty vehicles/day fueling cycle: 1 time/day for 10 hrs	Includes: 100-175 scfm compressor, 30 psi inlet gas pressure, 10-40 dual-hose posts, 1 time-fill panel; 10hr fueling window, installation at 65% of equipment costs	\$700,000

Fast-Fill Station



Time-Fill Station



ELECTRIC CAR CHARGERS

Residential (Small) - Costs include car charger, electrical work and installation costs.

ELECTRIC CAR CHARGERS

30-AMP ELECTRIC CAR CHARGER	SINGLE UNIT	\$	4,851
30-AMP ELECTRIC CAR CHARGER	DOUBLE UNIT	\$	6,067



PART B
2023-2024 ALTERNATE COSTS MANUAL

Section 3

MUNICIPAL UTILITY PLANTS

WASTE-WATER TREATMENT PLANTS

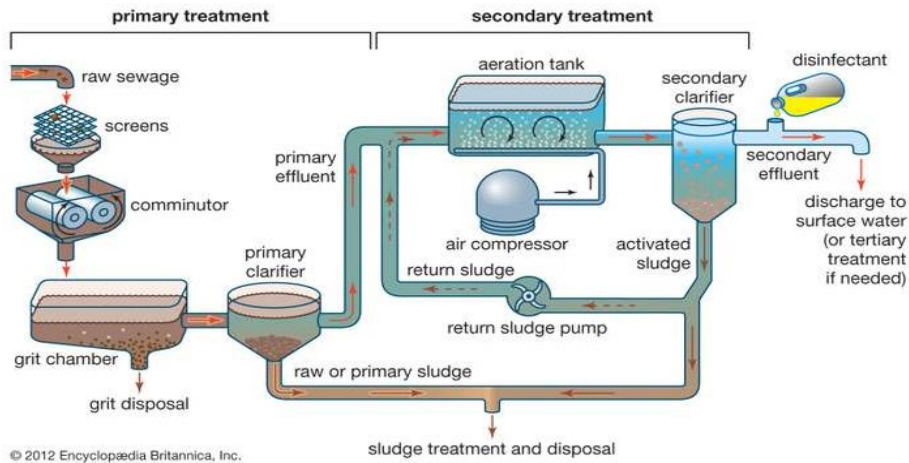
Municipal waste water treatment plants speed up the natural process of water filtration from homes, businesses and industries to produce effluents suitable for discharge into surface waters.

The following sections provide information and each of the process and also offers suggested cost locations in the Marshall & Swift Commercial Costing Manual and the Department's Personal Property Manual for these facilities' real property improvements and/or fixtures and personal property business equipment.

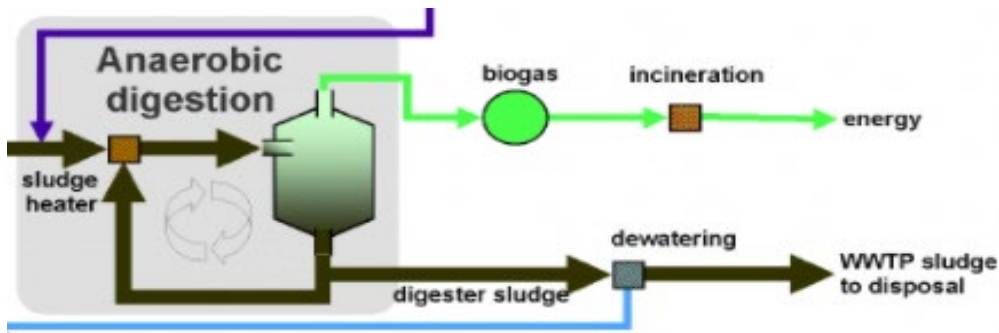
Municipal wastewater treatment plants allow for the collection and treatment of industrial and domestic sewage and wastewater before discharging it into water bodies, onto the land or reusing it.

Treatment Process

- 1 Pretreatment/Screening The raw sewage is passed through screening equipment to remove foreign objects such as plastic, rags, wood fragments, and grease (coarse solids). The coarse solids material is disposed of in a landfill. The screened wastewater is pumped into the activation tank for grit removal.
- 2 Communitor The screened wastewater is pumped into the communitor to cut up solids in the raw sewage.
- 3 Grit Removal Heavy material such as sand and gravel (grit) is removed from the wastewater. This material is disposed of in a landfill. The wastewater is sent to the primary clarifier.
- 4 Primary Clarifier The material that settles at a slower rate than material in grit removal, is taken out using clarifier tanks. The settled material, called primary sludge, is pumped off the bottom and sent to sludge treatment and disposal. The wastewater exits the tank from the top as primary effluent. Floating debris such as grease, is skimmed off the top and sent with the settled material to digesters. Chemicals are also added to remove phosphorus.
- 5 Aeration/Activated Sludge The wastewater receives most of its treatment in this stage. Through biological degradation, the pollutants are consumed by microorganisms and transformed into cell tissue, water, and nitrogen. The wastewater is sent to the secondary clarifier.
- 6 Secondary Clarifier Secondary clarifiers allow treated wastewater to separate from the biologically treated material in the aeration tanks. This yields secondary effluent. The activated sludge is pumped from the bottom of the clarifier and is returned to the aeration tanks.
- 7 Filtration Clarified effluent is filtered. The material captured on the disc filters is backwashed and returned to pretreatment/screening.
- 8 Disinfection Ultraviolet/chemical disinfection is used after the filtration step to assure the treated wastewater is free of bacteria.
- 9 Oxygen Uptake The treated water is aerated if necessary to bring the dissolved oxygen levels up and the water is released back into the water supply.
- 10 Sludge Treatment/Disposal The primary sludge pumped from the primary clarifiers along with the activated sludge must be treated to reduce volume and produce a usable end product (if needed).
- 11 Air Floatation Thickening Activated sludge is removed by attaching the biological solids to minute bubbles of air. The floating mass is then removed using surface skimmers. The water that is removed is sent back to screening and pumping for treatment.
- 12 Anaerobic Digestion The activated sludge is pumped into the primary digester where it is heated and mixed. Anaerobic bacteria is used for treatment. The pollutants are digested and converted to cell mass, water, methane gas, and carbon dioxide gas.
- 13 Gravity Belt Thickening After digestion, sludge is pumped to the gravity belt thickener to be thickened. Polymer is added to the sludge as it is pumped from the digester to allow the water to drain away from the solids. The polymer treated sludge is directed to a porous, traveling belt where the water (filtrate) drains through the belt and into a collection basin. It is very high in ammonia and is pumped to a holding tank where it is metered back to the beginning for further treatment. The thickened sludge is pumped into storage and used later for agricultural.



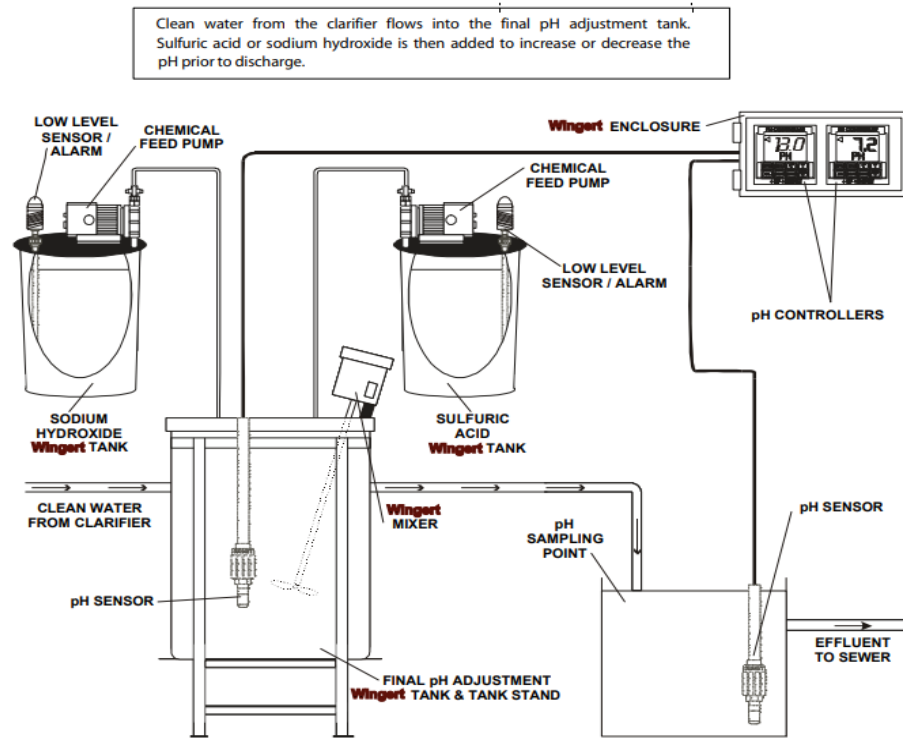
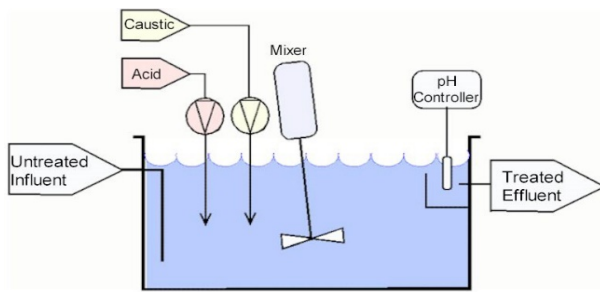
sewage-treatment-plant-process-flow-diagram-pdf-netsolwatersolution



Asset Group	Item	Description	Valuation Method	Cost Source	Comment
Real Property Improvements, Fixtures					
Land	Fee simple ownership	The amount of land necessary to support the treatment of water	Market		
Site Preparation, Land Enhancements	Construction Survey				
	Grading			M & S, Sec. 51	Earthwork
	Drainage Features			M&S, Sec. 66, p. 1	Public Utilities
	Erosion Protection features			M&S, Sec. 66, p. 1	Public Utilities
	Diversion Channels			M&S, Sec. 66, p. 1	Public Utilities
	Detention Ponds			M&S, Sec. 66, p. 1	Public Utilities
	Culverts for road crossings			M&S, Sec. 66, p. 1	Public Utilities
	Containment berms/dikes			M&S, Sec. 66, p. 1	Public Utilities
	Firebreak			M&S, Sec. 51	Earthwork
Buildings	Operations and Maintenance Building		RCNLD	M&S, Sec. 14, p.15	Heavy industrial
Access	Facility Access Roads	Paved or gravel surfaced	RCNLD	M&S, Sec. 66, p. 1	Residential street improvements
Concrete Flatwork	Tank foundations/sidewalks		RCNLD	M&S, Sec. 66, p.2	
Ponds	Treatment and holding		RCNLD	M&S, Sec. 66, p. 1	Catch Basins
Outside Area Lighting	Provides operations and maintenance personnel with illumination.		RCNLD	M&S, Sec. 66, P.5; also Sec. 54, P.5	
Fencing/Gates	Chain link fencing	Chainlink metal fabric security fencing, 8 foot tall with one-foot barbed wire or razor wire on top	RCNLD	M&S, Sec. 66, pp. 4-5	
	Controlled access gates		RCNLD	M&S, Sec. 66, pp. 4-5	

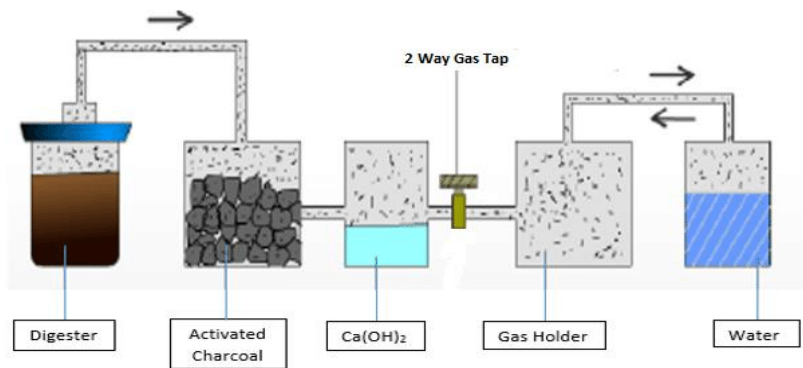
Asset Group	Item	Description	Valuation Method	Cost Source	Comment
pH Neutralization	Tanks			Acquisition	
	Tank Stands			Acquisition	
	Chemical Feed Pumps			Acquisition	
	Programmable Controllers			Acquisition	
	Controller Enclosures			Acquisition	
	Low Level Sensor/Alarms			Acquisition	
	pH Sensors			Acquisition	
	Mixers			Acquisition	
	Piping			Acquisition	

pH neutralization systems are used to neutralize high acidic or high alkaline wastewater.



Asset Group	Item	Description	Valuation Method	Cost Source	Comment
Anaerobic Digestion System	Pumps		RCNLD	M&S, Sec. 62, p. 1	Industrial Pumps
	Digester		Acquisition		
	Piping		RCNLD	M&S, Sec. 62, pp. 2-3	Piping
	Tank		RCNLD	M&S, Sec. 61	
	Tank Cover				Incl. in M/S Tank Cost

Anaerobic digestion is a sequence of processes using microorganisms to break down biodegradable material in the absence of oxygen. This process reduces the emission of landfill gas.



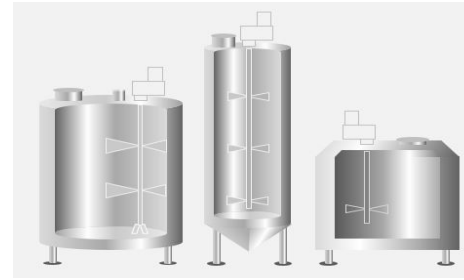
Asset Group	Item	Description	Valuation Method	Cost Source	Comment
Tanks	Double-Wall Tank		RCNLD	M&S, Sec. 61	
	Stainless Steel Tank		RCNLD	M&S, Sec. 61	
	Prestressed Concrete Tank		RCNLD	M&S, Sec. 61	
	Mix Tank		RCNLD	M&S, Sec. 61	
	Storage Tanks		RCNLD	M&S, Sec. 61	
	Rolled, Tapered Panel Bolted Tank		RCNLD	M&S, Sec. 61	
	Folding Frame Tank		Acquisition		
	Portable Storage Tank		Acquisition		



Rolled, Tapered Panel Bolted Tank



Folding Frame Tank



Mix Tanks



Double Wall Tanks

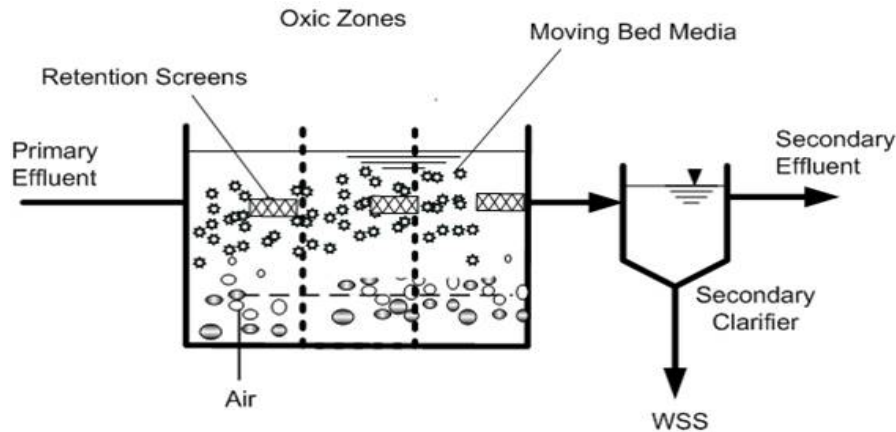
Asset Group	Item	Description	Valuation Method	Cost Source	Comment
Moving Bed Bioreactor	Screens		Acquisition		
	Piping		RCNLD	M&S, Sec. 62, pp. 2-3	Piping
	Tanks		RCNLD	M&S, Sec. 61	

The process takes place in an aeration tank where influent enters. The tanks are open at the top, exposing the water to open air for aerobic filtration to take place.

The basin is full of thousands of small plastic chips, called media or carriers. This allows biofilm to grow on them. The carriers mimic the density of water, allowing them to mix throughout the fluid. The biofilm that is created are microroganisms that consume the waste in the water, leaving it cleaner.

An aeration grid is essentially a fan located at the bottom of the aeration tank. It helps keep carriers on the move so they can come into contact with all the waste present and efficiently decompose it. It also introduces more oxygen into the tank.

There is a sieve, or mesh material, which allows water to pass through but keeps the plastic carriers inside the basin allowing the filtered water to move to the next phase in the filtration process.



Asset Group	Item	Description	Valuation Method	Cost Source	Comment
Sump/Sewage Pump	Sump Pump		RCNLD	M&S Sect 53, Pg 9	

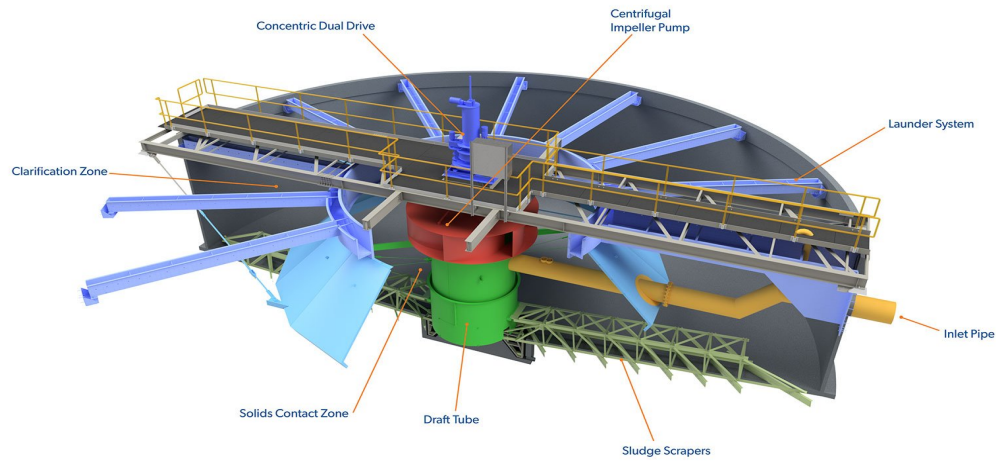


Large sump pumps are used to transfer liquid and solid waste from one place to another.

Asset Group	Item	Description	Valuation Method	Cost Source	Comment
Clarifiers/Components	Container Filter		Acquisition		
	Microsand Filter		Acquisition		
Solids-Contact Clarifier	Drive Unit		RCNLD	M&S Sect 53, Pg 11	
	Centrifugal Pump		RCNLD	M&S Sect 53, Pg 11	
	Piping		RCNLD	M&S, Sec. 62, pp. 2-3	
	Sludge Scrapers		Acquisition		
	Draft Tube		Acquisition		

Clarifiers are settling tanks built with mechanical means for continuous removal of solids being deposited by sedimentation. It is used to remove solid particulates or suspended solids from wastewater for clarification and/or thickening. Solid contaminants (sludge) settle at the bottom of the tank where it is collected by a scraper mechanism.

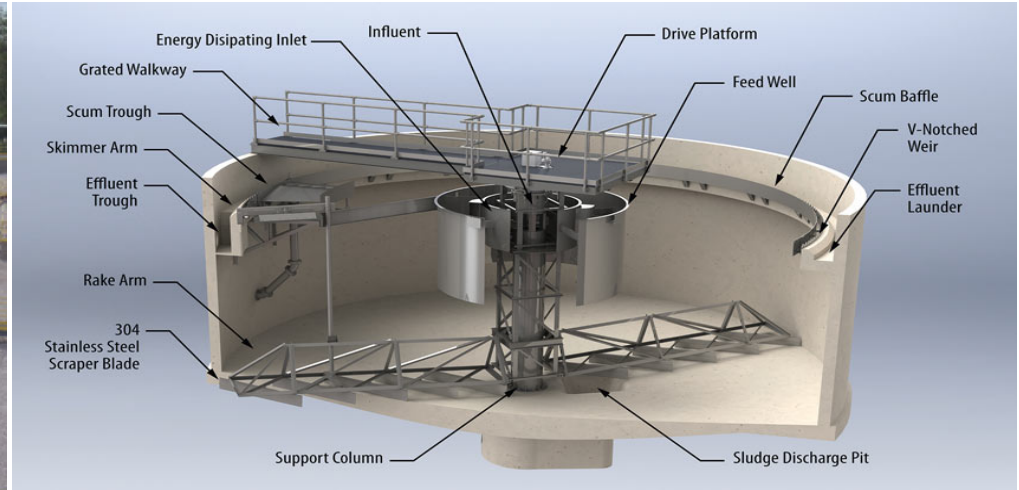
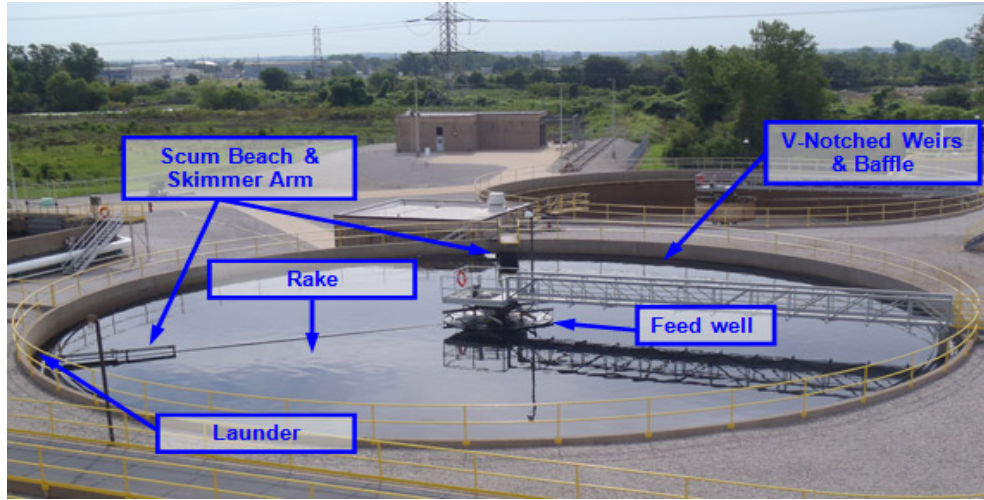
Solids CONTACT CLARIFIER™



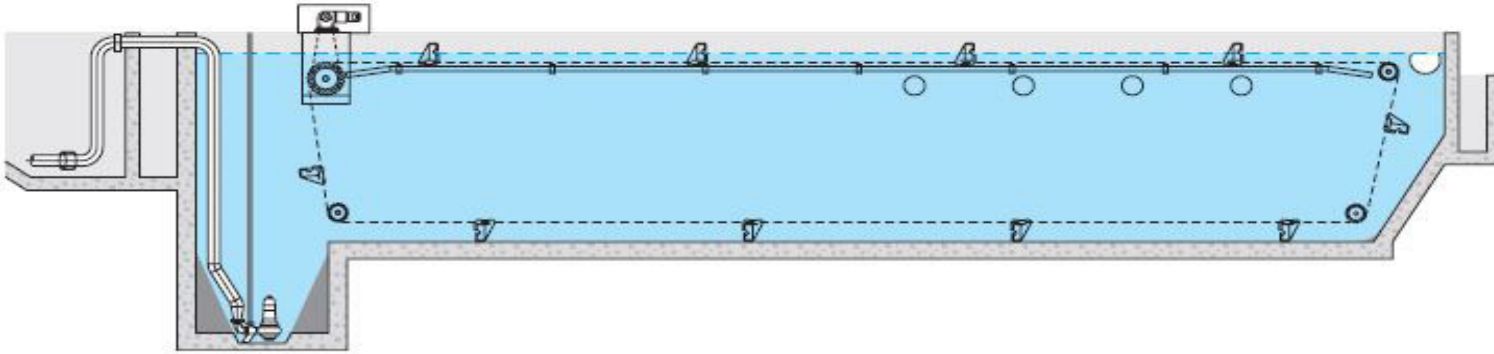
Asset Group	Item	Description	Valuation Method	Cost Source	Comment
Skimming Tank	Tank		RCNLD	M&S, Sec. 61	
	Skimmer		Acquisition		
	Piping		RCNLD	M&S, Sec. 62, pp. 2-3	

A skimming tank is a chamber that has floating matter like oil, fat, grease, etc. which rises and remains on the surface of the waste water until it is removed. The liquid flow out from partitions in the bottom of the tank.

The floating matter (scum) is removed with skimmer arms which sweep the scum to the scum trough.



Asset Group	Item	Description	Valuation Method	Cost Source	Comment
Sludge Removal System	Tank		RCNLD	M&S, Sec. 61	
	Piping		RCNLD	M&S, Sec. 62, pp. 2-3	
	Scraper System		Acquisition		

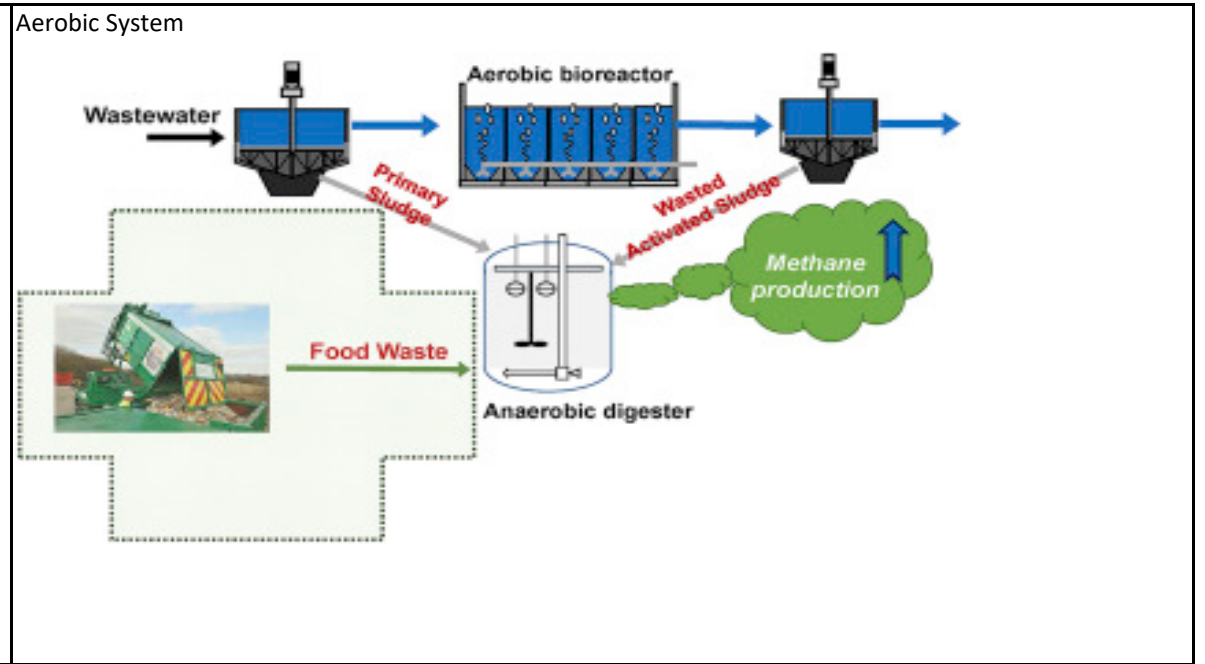
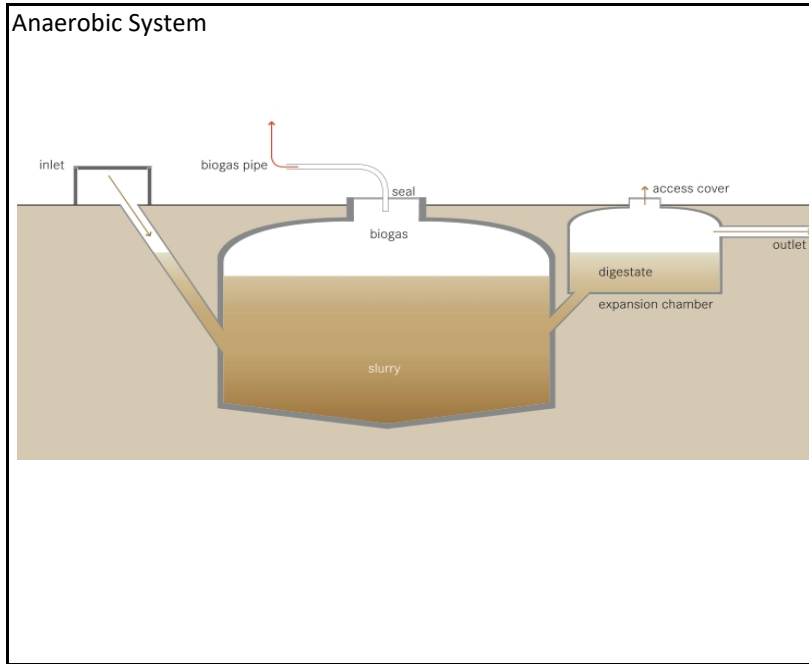


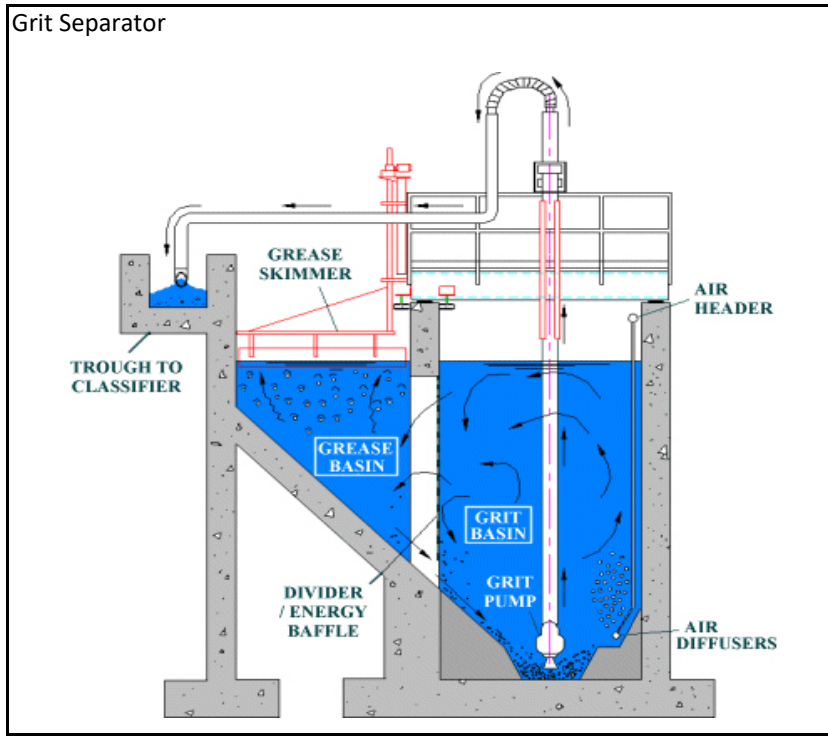
4-shaft scraper (collecting bottom and floating sludge)

How it works: Chain and flight scrapers convey the bottom sludge into a hopper and the floating sludge into the scum pipe.

Application: e. g. municipal and industrial wastewater treatment plants.

Asset Group	Item	Description	Valuation Method	Cost Source	Comment
Anaerobic Digester	Tank		RCNLD	M&S, Sec. 61	
	Tank Cover			Incl. in M/S Tank Cost	
	Piping		RCNLD	M&S, Sec. 62, pp. 2-3	
Aerobic Digester	Tank		RCNLD	M&S, Sec. 61	
	Bioreactor		Acquisition		
	Piping		RCNLD	M&S, Sec. 62, pp. 2-3	
Grit Separator			Acquisition		





Asset Group	Item	Description	Valuation Method	Cost Source	Comment
	Grating		Acquisition		
	Safety Rails		Acquisition		
	Stairs		Acquisition		
	Ladders		Acquisition		



2023-2024 ALTERNATE COSTS MANUAL

Section 4

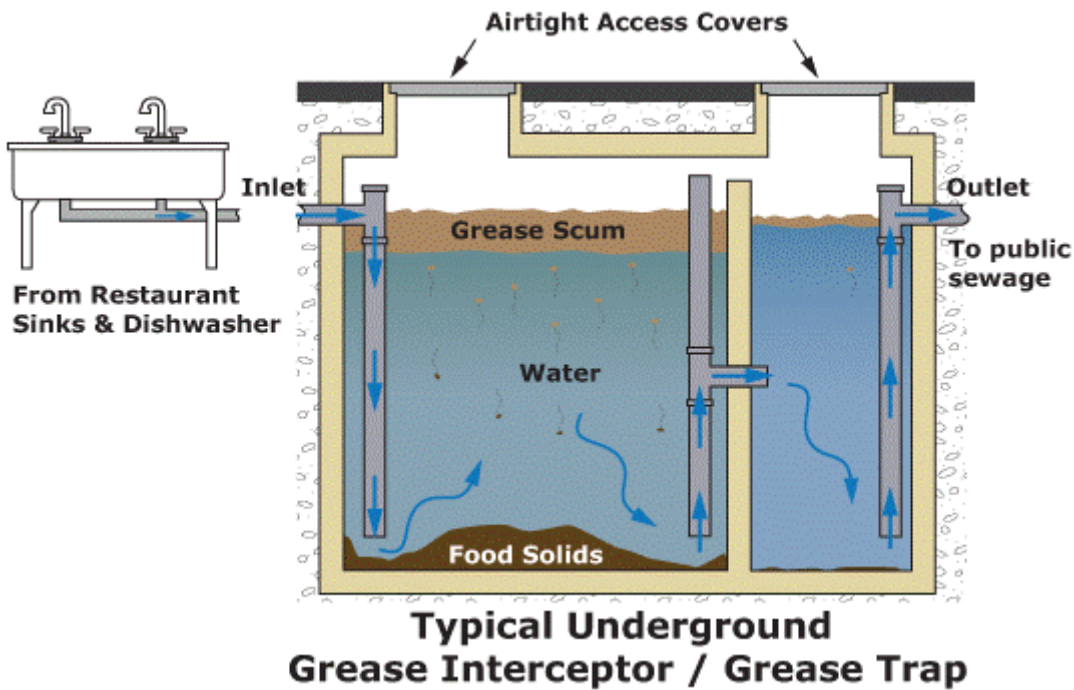
MISCELLANEOUS COSTS

GREASE INTERCEPTORS

Gravity grease interceptors are in-ground tanks designed to reduce the amount of animal and vegetable fats, oils and greases in wastewater from institutional and commercial food handling establishments. This table indicates complete costs for the tank installation.

PRECAST CONCRETE GREASE INTERCEPTOR

750 GAL	\$	11,232
1000 GAL	\$	13,489
1500 GAL	\$	15,708
2500 GAL	\$	21,759
3000 GAL	\$	26,523
5000 GAL	\$	38,609



SAND/OIL INTERCEPTORS

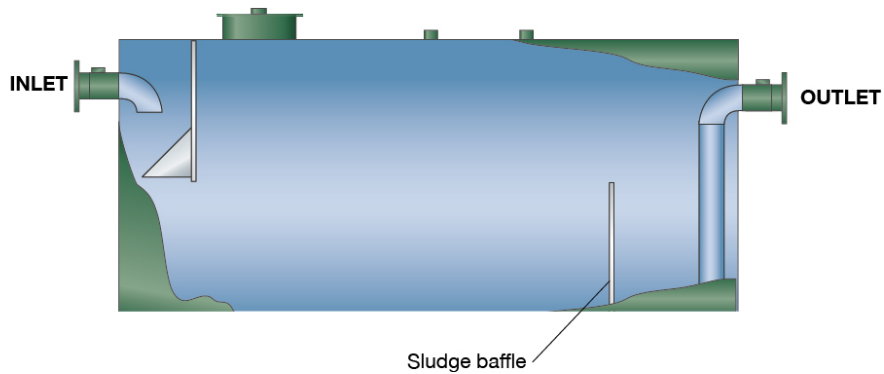
Sand/oil interceptors are in-ground tanks designed to capture dirt, sand, sweepings, minor petroleum spills, etc. from car washes and vehicle maintenance facilities to keep these substances out of our wastewater system.

PRECAST CONCRETE OIL & SAND INTERCEPTOR

750 GAL	\$	10,509
1000 GAL	\$	12,630
1200 GAL	\$	13,782
1500 GAL	\$	14,707

Single-Basin Oil/Sand Interceptor

Simple oil/sand "knock-out" design.



Single Basin Interceptors have a single collection chamber and sludge baffle to remove sand, grit, grease and free oil.