

R011105-60 Weights and Measures

Measures of Length

- 1 Mile = 1760 Yards = 5280 Feet
- 1 Yard = 3 Feet = 36 inches
- 1 Foot = 12 Inches
- 1 Mil = 0.001 Inch
- 1 Fathom = 2 Yards = 6 Feet
- 1 Rod = 5.5 Yards = 16.5 Feet
- 1 Hand = 4 Inches
- 1 Span = 9 Inches
- 1 Micro-inch = One Millionth Inch or 0.000001 Inch
- 1 Micron = One Millionth Meter + 0.00003937 Inch

Surveyor's Measure

- 1 Mile = 8 Furlongs = 80 Chains
- 1 Furlong = 10 Chains = 220 Yards
- 1 Chain = 4 Rods = 22 Yards = 66 Feet = 100 Links
- 1 Link = 7.92 Inches

Square Measure

- 1 Square Mile = 640 Acres = 6400 Square Chains
- 1 Acre = 10 Square Chains = 4840 Square Yards = 43,560 Sq. Ft.
- 1 Square Chain = 16 Square Rods = 484 Square Yards = 4356 Sq. Ft.
- 1 Square Rod = 30.25 Square Yards = 272.25 Square Feet = 625 Square Lines
- 1 Square Yard = 9 Square Feet
- 1 Square Foot = 144 Square Inches
- An Acre equals a Square 208.7 Feet per Side

Cubic Measure

- 1 Cubic Yard = 27 Cubic Feet
- 1 Cubic Foot = 1728 Cubic Inches
- 1 Cord of Wood = 4 x 4 x 8 Feet = 128 Cubic Feet
- 1 Perch of Masonry = 16½ x 1½ x 1 Foot = 24.75 Cubic Feet

Avoirdupois or Commercial Weight

- 1 Gross or Long Ton = 2240 Pounds
- 1 Net or Short Ton = 2000 Pounds
- 1 Pound = 16 Ounces = 7000 Grains
- 1 Ounce = 16 Drachms = 437.5 Grains
- 1 Stone = 14 Pounds

Power

- 1 British Thermal Unit per Hour = 0.2931 Watts
- 1 Ton (Refrigeration) = 3.517 Kilowatts
- 1 Horsepower (Boiler) = 9.81 Kilowatts
- 1 Horsepower (550 ft-lb/s) = 0.746 Kilowatts

Shipping Measure

For Measuring Internal Capacity of a Vessel:
1 Register Ton = 100 Cubic Feet

For Measurement of Cargo:

Approximately 40 Cubic Feet of Merchandise is considered a Shipping Ton, unless that bulk would weigh more than 2000 Pounds, in which case Freight Charge may be based upon weight.

40 Cubic Feet = 32.143 U.S. Bushels = 31.16 Imp. Bushels

Liquid Measure

- 1 Imperial Gallon = 1.2009 U.S. Gallon = 277.42 Cu. In.
- 1 Cubic Foot = 7.48 U.S. Gallons

R011110-10 Architectural Fees

Tabulated below are typical percentage fees by project size, for good professional architectural service. Fees may vary from those listed depending upon degree of design difficulty and economic conditions in any particular area.

Rates can be interpolated horizontally and vertically. Various portions of the same project requiring different rates should be adjusted proportionately. For alterations, add 50% to the fee for the first \$500,000 of project cost and add 25% to the fee for project cost over \$500,000.

Architectural fees tabulated below include Structural, Mechanical and Electrical Engineering Fees. They do not include the fees for special consultants such as kitchen planning, security, acoustical, interior design.

Civil Engineering fees are included in the Architectural fee for project sites requiring minimal design such as city sites. However, separate Civil Engineering fees must be added when utility connections require design, drainage calculations are needed, stepped foundations are required, or provisions are required to protect adjacent wetlands.

Building Types	Total Project Size in Thousands of Dollars						
	100	250	500	1,000	5,000	10,000	50,000
Factories, garages, warehouses, repetitive housing	9.0%	8.0%	7.0%	6.2%	5.3%	4.9%	4.5%
Apartments, banks, schools, libraries, offices, municipal buildings	12.2	12.3	9.2	8.0	7.0	6.6	6.2
Churches, hospitals, homes, laboratories, museums, research	15.0	13.6	12.7	11.9	9.5	8.8	8.0
Memorials, monumental work, decorative furnishings	—	16.0	14.5	13.1	10.0	9.0	8.3

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Churches, hospitals, homes, laboratories, museums, research	15.0	13.6	12.7	11.9	9.5	8.8	8.0
Memorials, monumental work, decorative furnishings	—	16.0	14.5	13.1	10.0	9.0	8.3

Architectural fees tabulated below include Structural, Mechanical and Electrical Engineering Fees. They do not include the fees for special consultants such as kitchen planning, security, acoustical, interior design, etc.

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R011110-30 Engineering Fees

Typical Structural Engineering Fees based on type of construction and total project size. These fees are included in Architectural Fees.

Type of Construction	Total Project Size (in thousands of dollars)			
	\$500	\$500-\$1,000	\$1,000-\$5,000	Over \$5000
Industrial buildings, factories & warehouses	Technical payroll times 2.0 to 2.5	1.60%	1.25%	1.00%
Hotels, apartments, offices, dormitories, hospitals, public buildings, food stores		2.00%	1.70%	1.20%
Museums, banks, churches and cathedrals		2.00%	1.75%	1.25%
Thin shells, prestressed concrete, earthquake resistive		2.00%	1.75%	1.50%
Parking ramps, auditoriums, stadiums, convention halls, hangars & boiler houses		2.50%	2.00%	1.75%
Special buildings, major alterations, underpinning & future expansion		Add to above 0.5%	Add to above 0.5%	Add to above 0.5%

For complex reinforced concrete or unusually complicated structures, add 20% to 50%.

Typical Mechanical and Electrical Engineering Fees are based on the size of the subcontract. The fee structure for both is shown below. These fees are included in Architectural Fees.

Type of Construction	Subcontract Size							
	\$25,000	\$50,000	\$100,000	\$225,000	\$350,000	\$500,000	\$750,000	\$1,000,000
Simple structures	6.4%	5.7%	4.8%	4.5%	4.4%	4.3%	4.2%	4.1%
Intermediate structures	8.0	7.3	6.5	5.6	5.1	5.0	4.9	4.8
Complex structures	10.1	9.0	9.0	8.0	7.5	7.5	7.0	7.0

For renovations, add 15% to 25% to applicable fee.

R012153-60 Security Factors

Contractors entering, working in, and exiting secure facilities often lose productive time during a normal workday. The recommended allowances in this section are intended to provide for the loss of productivity by increasing labor costs. Note that different costs are associated with searches upon entry only and searches upon entry and exit. Time spent in a queue is unpredictable and not part of these allowances. Contractors should plan ahead for this situation.

Security checkpoints are designed to reflect the level of security required to gain access or egress. An extreme example is when contractors, along with any materials, tools, equipment, and vehicles, must be physically searched and have all materials, tools, equipment, and vehicles inventoried and documented prior to both entry and exit.

Physical searches without going through the documentation process represent the next level and take up less time.

Electronic searches—passing through a detector or x-ray machine with no documentation of materials, tools, equipment, and vehicles—take less time than physical searches.

Visual searches of materials, tools, equipment, and vehicles represent the next level of security.

Finally, access by means of an ID card or displayed sticker takes the least amount of time.

Another consideration is if the searches described above are performed each and every day, or if they are performed only on the first day with access granted by ID card or displayed sticker for the remainder of the project. The figures for this situation have been calculated to represent the initial check-in as described and subsequent entry by ID card or displayed sticker for up to 20 days on site. For the situation described above, where the time period is beyond 20 days, the impact on labor cost is negligible.

There are situations where tradespeople must be accompanied by an escort and observed during the work day. The loss of freedom of movement will slow down productivity for the tradesperson. Costs for the observer have not been included. Those costs are normally born by the owner.