

## INTRODUCTION TO THE CALCULATOR METHOD

The Calculator Method is designed to be a fairly rapid method for obtaining square foot costs for typical buildings. Refinements are given for each occupancy, so that the base cost can be modified to fit deviations from the standard building described. If further refinements are needed, the various Segregated or Unit-in-Place sections may be used to adjust the costs.

The costs are classified by class and quality of construction. Buildings typical of a certain quality have many characteristics in common. For example, a Good-Quality building will usually have a good-quality roof, so modifications for roof differences on a quality-classified building are seldom necessary. The following are the most important square foot cost modifications. Many other modifications are possible, and since they are seldom cost-important in relation to the additional time required to count and measure, they have been omitted from the Calculator Method. The base cost refinements that can be applied to buildings that vary from the general descriptions are as follows:

### HEATING AND COOLING

Each heating and cooling cost is an average cost for the entire building described. To adjust for variations in the heating and cooling type found, take the difference between the type indicated and the type found in the subject building and add to or subtract from the base cost. If only a portion of the building is heated or cooled, then a prorated amount is to be used.

The costs for the heating and cooling systems listed for each occupancy are based on the capacity, complexity and typical occupancy load, adjusted to Michigan's cold climate, and include a pro rata share of contractors' overhead and profit and architects' fee.

### ELEVATORS

The standard building description will indicate with an asterisk (in the Mechanical column) that an allowance was made for elevators. If the building under consideration has no elevators and the appropriate cost is marked with an asterisk, subtract the elevator cost (found on the refinement page) from the base square foot cost. Care must be exercised when using square foot costs where building sizes may fall outside a normal range of area served.

If elevators are found in a building not marked as typically having one, add the cost as a Lump Sum Adjustment from Section UIP 8.

Basement and mezzanine costs do not allow for elevators. Where elevator stops are found, add the cost per stop as a lump sum from the refinement pages, or see Section UIP 8.

### SPRINKLERS

The basic building costs do not include sprinkler systems. If sprinkler systems are found, add from the corresponding refinement page. For more detail on sprinkler costs, refer to the appropriate SEG section.

### HEIGHT

All base costs are for a typical base story height for that occupancy and for any basements associated with that

occupancy. Any variation from this base height can be made by an adjustment found on the refinement page listed under Story Height Multipliers. For multistory buildings, an average story height can be used. The height adjustment is for wall height and not ceiling height.

### SIZE AND SHAPE

The square foot cost is developed from variations in size and shape of a building. This is due to the variation in the proportion of exterior wall to total floor area. To adjust for this variation in cost, a Floor Area/Perimeter table is provided, which gives a multiplier for various floor area and wall perimeter ratios. Most buildings being evaluated will not have the exact area and perimeter shown on the table, and some interpolation will be necessary. Usually the multiplier can be accurately approximated without going through a detailed interpolation. To enter the Floor Area/Perimeter table for multistory buildings, use the average floor area and the average perimeter.

### MULTIPLE STORY BUILDINGS

The base costs given are for buildings of three stories or fewer. For buildings over three stories above ground, a recommended percentage adjustment is shown on the refinement page. This percent adjustment is based on the net of increased frame weight, construction difficulty, hi-rise wages, etc., less savings from shorter heating and plumbing runs, a single roof, etc. This added cost is applied to all floors, including basements, regardless of occupancy. In using the standard form, it is applied as a multiplier equal to one plus the percentage increase that is included on the refinement page.

### BASEMENTS

Basements should be computed separately from the upper floors and are subject to their own modifiers and multipliers except in multistory buildings where they additionally receive the same multistory multiplier as the balance of the building. Costs are set to the typical base height for the occupancy and must be refined to the correct height. Some average cost parameters for typical basement types (i.e., utility, parking, display, etc.) are listed on the Calculator pages under specific occupancies where commonly encountered. These costs can be used for all occupancies within the group, where appropriate.

Finished basements, i.e., those containing apartments, retail stores, etc., as a general rule of thumb will cost approximately 75% to 80% of the comparable aboveground portion of the building. Semibasements that are half exposed will cost 85% to 90% of the same figure.

### MEZZANINES

Mezzanine floors are computed separately and, since they do not include any exterior wall or heat, are not subject to any modifiers or multipliers for size and shape or height. Some average cost parameters for typical mezzanine types (i.e., storage office, display, etc.) are listed on the Calculator pages under specific occupancies where commonly encountered. These costs can be used for all occupancies within the group, where appropriate.

**COMMENTS AND EXPLANATIONS**

The costs on the Calculator pages are averages of detailed estimates, actual breakdowns, and total end costs of many actual construction projects. These costs are assembled into groups by typical occupancy and general quality, and each is adjusted to fit the base description. The only items adjusted are those outlined above. All other construction components are considered as commensurate with the general quality of the building. There are a number of construction components that affect the total cost of a building, and to take

them all into consideration would entail a complete, detailed estimate. The above refinements are provided as the ones that have significant effect on the total building cost, and can be computed readily, thus providing an accurate estimate in a reasonably short time. Those wishing to give more detailed consideration to additional construction components may use the Segregated Cost Method, Sections SEG 1 through 6, or for further refinement, use the various Unit-in-Place costs found in Sections UIP 1 through 8.

**County Multiplier For UIP Sections**

**COUNTY MULTIPLIER FOR UIP SECTIONS**

The county multiplier to be applied to UIP costs should be selected based on the following:

1. If the UIP cost is for a component of a building being priced, use the same county multiplier for the UIP costs as is being used for the building.
2. If the UIP cost is not associated with a building being priced use the following:

<u>Nature of Item Being Priced</u>	<u>Multiplier to Use</u>
Structural steel (fireproofed)	Class A
Reinforced concrete	Class B
Masonry	Class C
Wood on wood or steel stud	Class D
Prefabricated steel	Class S

3. If neither #1 nor #2 works, the assessor must use his/her judgement as to which multiplier to use or whether an average multiplier is appropriate.

**CALCULATOR EXAMPLE**

A filled-in field form and sample pages from which the prices in the examples are taken are shown in Figures 1 through 4. The subject building used in the example is a 3-story, Good-quality, Class C apartment building with brick exterior and no elevators or sprinklers. This building is priced from the page labeled Apartments. It is of heavier construction than the type found under Multiple Residences. The dimensions are 50' by 100', with a height of 33'. This information, along with the age and condition of the building, is entered on Lines 4 through 11 of the form. The area and perimeter are computed on the back of the form as shown in Figure 2.

The base square foot cost, \$81.90, is entered on Line 12 from the Calculator Cost page (Figure 3). In

this example, the subject building has a heat pump system. An amount for elevators is included in the base costs, and since the subject building has no elevators, a deduction of \$2.35 must be made (Figure 4) and entered on Line 14. There were no miscellaneous items to add, so that the adjusted square foot cost is \$81.90 minus \$2.35, or \$79.55. This is entered on Line 16. The number of stories (three) is the base figure, so the multiplier on Line 17 is 1.00. The 11-foot average story height is more than the 10-foot base height, so the correct multiplier, 1.03, is taken from the refinement page (Figure 4) and entered on Line 18. The subject has an average floor area of 5,000 square feet, and an average perimeter of 300 feet. Since 5,000 square feet is not on the table, but is between 4,000 square feet and 6,000 square feet, a multiplier can be found for it. Entering the table at a 300-foot perimeter, the multipliers are 1.02 and .95 respectively, and the interpolated value is .99, which is then entered on Line 19. Line 18 is multiplied by Line 19 and the answer is placed on Line 20. Line 16 is then multiplied by Line 20 and the answer of \$81.14 (the refined square foot cost) is entered on Line 21. The county multiplier is assumed to be .98 for this example, and is entered on Line 22.

Line 21 is multiplied by Line 22 to give the final square foot cost on Line 23, and this is multiplied by the total square footage of floor area (calculated on the back of the form). The answer, \$1,192,800 is placed on Line 25. In this example, there were no Lump Sum Additions, so Line 26 is left blank, and the sum of Lines 25 and 26 is entered on Line 27 as the reproduction cost.

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**STC CALCULATOR COST COMPUTATION SHEET (S.F. COSTS)**

1. OWNER	TENANT				PROPERTY CODE			
2. TYPE	YEAR BUILT	YEAR REMOD.	% GOOD	CAL PAGE	PROPERTY ADDRESS			
3. COUNTY	UNIT			EXAMINED BY		DATE		
	SECTION I		SECTION II		SECTION III		SECTION IV	
4. Occupancy .....	<i>Apartment</i>							
5. Building class and quality .....	Cls. <i>C</i>	Qual. <i>Good</i>	Cls.	Qual.	Cls.	Qual.	Cls.	Qual.
6. Exterior wall .....	<i>Brick</i>							
7. No. of stories & height per story .....	No. <i>3</i>	Ht. <i>11'</i>	No.	Ht.	No.	Ht.	No.	Ht.
8. Average floor area .....	<i>5,000 sq. ft.</i>							
9. Average perimeter .....	<i>300 lin. ft.</i>							
10. Year built, year remodeled .....	Blt.	Remod.	Blt.	Remod.	Blt.	Remod.	Blt.	Remod.
11. Percent condition .....	%		%		%		%	

	SECTION I	SECTION II	SECTION III	SECTION IV
12. <b>Base Square Foot Cost</b> .....	\$81.90			

**SQUARE FOOT REFINEMENTS**

13. Heating, cooling, ventilation .....				
14. Elevator deduction .....	2.35			
15. Miscellaneous .....				
16. Total lines 12 through 15	\$79.55			

**HEIGHT AND SIZE REFINEMENTS**

17. Number of stories-multiplier .....	1.00			
18. Height per story-multiplier (see line 7) .....	1.03			
19. Floor area-perimeter-multiplier (see lines 8 and 9) .....	.99			
20. Combined height and size multiplier (lines 17 x 18 x 19)	1.02			

**FINAL CALCULATIONS**

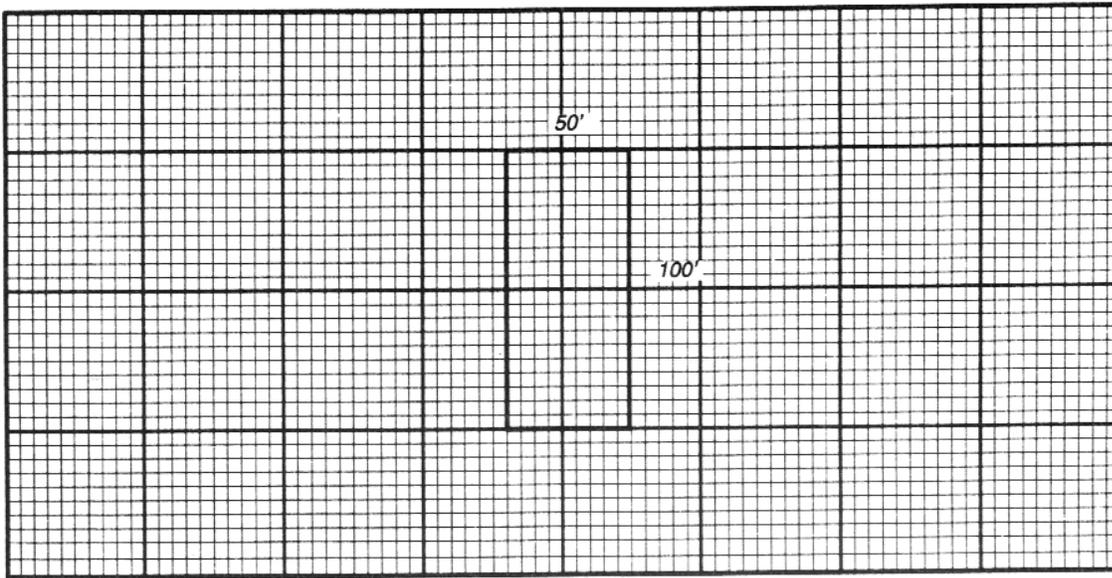
	SECTION I	SECTION II	SECTION III	SECTION IV
21. Refined square foot cost (line 16 x 20) .....	\$81.14			
22. County multiplier .....	.98			
23. Final sq. ft. cost (line 21 x line 22) .....	\$79.52			
24. Area (Back of this form) .....	15,000			
25. Line 23 x line 24 .....	\$1,192,800			
26. Lump sums (line 35, back of sheet) .....	—			
27. Reproduction/Replacement Cost (line 25 + line 26) .....	\$1,192,800			
28. Physical Depreciation multiplier (Assessors Manual) .....				
29. Functional obsolescence multiplier (Percent Good) .....				
30. Economic obsolescence multiplier (Percent Good) .....				
31. Depreciated Cost (Multiply line 27 x 28 x 29 x 30) .....				
32. Economic Condition Factor (E.C.F.) .....				
33. True Cash Value .....				

**TOTAL OF ALL SECTIONS**

34. Reproduction/Replacement cost \_\_\_\_\_ Depreciated cost \_\_\_\_\_ True Cash Value \_\_\_\_\_

See back of form for drawings and area and lump sum value calculations.

Figure 1



Calculations (Area, etc.)  $50' \times 100' = 5,000 \text{ sq. ft.} \times 3 \text{ floors} = 15,000 \text{ sq. ft.}$

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35. LUMP SUMS (Sprinklers, Elevators, etc.)

Section	Item	Cost	Section	LUMP SUMS (Sprinklers, Elevators, etc.)			Area	Total Cost
				County	Architect Fees	Composite		
Section I								
Section II								
Section III								
Section IV								

Figure 2

## APARTMENTS

**OCCUPANCY DESCRIPTION:** High-rise apartments are structures with three or more stories of multiple dwelling units. Each dwelling unit consists of its own separate living area and kitchen facility.

**INCLUDED IN COSTS:** Architects' fees and contractors' overhead and profit. Allowance for lobby area and interior hall access to dwelling units. Elevators included where designated with an (\*) asterisk



**AVERAGE CLASS B**

**NOT INCLUDED IN COSTS:** Sprinklers, appliances or balconies.

**SQUARE FOOT COST TABLE**

CLASS	TYPE	COST/ SQ. FT.	EXTERIOR WALLS	INTERIOR FINISH	LIGHTING, PLUMBING AND MECHANICAL	HEAT
<b>A</b>	Good	\$106.25	Face brick, limestone, metal or concrete and glass panels	Good interior detail, carpet, or hardwood, sheet vinyl or ceramic tile	*Many good fixtures, TV jacks, good baths and kitchens	Warm and cool air (zoned)
	Average	83.85	Little trim, brick, block, metal or concrete and glass	Drywall or plaster, average carpet and vinyl composition floors	*Few electric fixtures, average plumbing, one bath per unit	Heat pump system
	Low cost	66.60	Very plain, brick or block, or low-cost concrete panels	Drywall, sprayed or painted ceilings, very plain, asphalt tile	*Minimum uniform code, one bath per unit	Hot water
<b>B</b>	Good	101.05	Face brick, limestone, metal or concrete and glass panels	Good interior detail, carpet or hardwood, sheet vinyl or ceramic tile	*Many good fixtures, TV jacks, good baths and kitchens	Warm and cool air (zoned)
	Average	79.85	Little trim, brick, block, metal or concrete and glass	Drywall or plaster, vinyl composition tile and average carpet	*Few electric fixtures, average plumbing, one bath per unit	Heat pump system
	Low cost	63.50	Very plain, brick or block or low-cost concrete panels	Drywall, sprayed or painted ceilings, very plain, asphalt tile	*Minimum uniform code, one bath per unit	Hot water
<b>A-B</b>	Basement units	69.40	Half exposed, good fenestration	Drywall or plaster, painted, vinyl composition and average carpet	Few electric fixtures, average plumbing, one bath per unit	Hot water
	Finished basement	44.25	Finished interior	Finished floor and ceilings, game room	Adequate lighting/plumbing	Forced air
	Parking basements	36.25	Unfinished interior	Concrete w/ hardener, lines & stops	Minimum lighting, floor drains	Ventilation
	Utility basement.	31.95	Painted interior	Utility and storage areas	Utility lighting and plumbing	None
<b>C</b>	Good	(81.90)	Brick, metal or concrete and glass panels, some trim	Drywall or plaster, good carpet or hardwood, vinyl composition, cer. tile	*Good electric/plumbing, good baths and kitchens	Heat pump system
	Average	62.30	Little ornamentation, brick or block, concrete panels	Drywall or plaster, average carpet and vinyl composition	*Average fixtures, one bath per unit, average circuits	Forced air
	Low cost	46.95	Very plain brick or block, minimum fenestration	Drywall and painted masonry/plaster coat, asph. tile, low-cost carpet	Minimum uniform code, one bath per unit	Indiv. thru-wall heat pumps
<b>CMILL</b>	Good	92.90	Mill type construction, heavy brick wall, trusses, good sash	Drywall, or plaster, good carpet or hardwood, vinyl comp., ceramic tile	*Good electric/plumbing, good baths and kitchens	Heat pump system
	Average	75.85	Mill type construction, brick and block, wood trusses	Drywall, or plaster, average carpet and vinyl composition, softwood	*Average fixtures, one bath per unit, average circuits	Hot water
<b>D</b>	Good	77.90	Good stucco or siding with ornamentation	Good drywall or plaster, carpet, good vinyl composition tile or sheet	*Good fixtures, many outlets, over one bath per unit	Heat pump system
	Average	59.15	Frame and stucco, little trim, standard design	Plaster or drywall, carpet or hardwood, vinyl composition tile	*Average fixtures, one bath per unit, average circuits	Forced air
	Low cost	44.45	Low-cost siding or stucco	Drywall, low-cost carpet, asphalt tile	Minimum uniform code, one bath per unit	Indiv. thru-wall heat pumps
<b>D MASON. VEN.</b>	Good	80.80	Good brick veneer with ornamentation	Good drywall or plaster, carpet, good vinyl composition tile or sheet	*Good fixtures, many outlets, over one bath per unit	Forced air
	Average	61.40	Brick veneer, little trim, standard design	Plaster or drywall, carpet or hardwood, vinyl composition tile	*Average fixtures and circuits, one bath per unit	Heat pump system
<b>S</b>	Good	74.35	Best insulated sandwich walls, good fenestration, good frame	Drywall, carpet and vinyl composition, ceramic tile	*Good fixtures, many outlets, over one bath per unit	Heat pump system
	Average	56.10	Sandwich walls, fenestration to code, little trim	Drywall, carpet and vinyl comp., average cabinetry and finish	*Average fixtures, one bath per unit, average circuits	Forced air
<b>CDS<sup>†</sup></b>	Basement units	51.90	Half exposed, good fenestration	Drywall or plaster, vinyl composition tile and average carpet	Few electric fixtures, average plumbing, one bath per unit	Forced air
	Finished basement.	29.70	Finished interior, add for saunas, pools, bars and equip.	Gypsum board ceiling, vinyl composition tile sheet vinyl	Adequate lighting/plumbing	Electric wall heaters
	Parking basement.	23.60	Unfinished interior	Plaster or drywall ceiling, concrete floor	Minimum lighting, floor drains	Ventilation
	Utility basement.	20.90	Unfinished interior	Unfinished floor and ceiling	Minimum lighting/plumbing	None

<sup>†</sup>For fire-resistant Type I basements, with concrete slab separation under Class C, D or S units, add \$4.35 per square foot to the basement cost.

**Figure 3**

## APARTMENTS

**REFINEMENTS:** On this page are the means of making major adjustments to the base costs on the previous page. Follow Steps 1 through 5 to attain final costs, adjusted for lump sums, heating and cooling, story height, floor area/perimeter ratio and locality.

**1 BUILT-IN APPLIANCES:** For individual listing, see Segregated cost, Section SEG 1.

	LOW	AVG.	GOOD	EXCL.	Sq. Ft.	LOW	AVG.	GOOD	EXCL.
Allowance (if not itemized) . . . . .	\$875	\$1,425	\$2,300	\$3,775	3,000	\$2.45	\$3.15	\$4.00	\$5.15
					5,000	2.25	2.85	3.65	4.70
					10,000	2.00	2.55	3.25	4.10
					20,000	1.80	2.25	2.85	3.60
					50,000	1.55	1.95	2.45	3.05
					100,000	1.40	1.75	2.15	2.65
					200,000	1.25	1.55	1.90	2.35

**ELEVATORS:** Buildings whose base costs include elevators are marked with an asterisk (\*). If the building under consideration has no elevators, deduct the following from the base costs so marked. For detailed costs see Section UIP 8.

Classes A/B	Sq. Ft. Costs	Class C	Sq. Ft. Costs	Classes D/S	Sq. Ft. Costs
Good . . . . .	3.70	Good . . . . .	2.35	Good . . . . .	2.30
Average . . . . .	2.80	Average . . . . .	1.90	Average . . . . .	1.90
Low cost . . . . .	2.15				

**SPRINKLERS:** Apply to sprinklered area.

**BALCONIES:** Exterior balconies generally cost 1/3 to 1/2 of the final base cost per square foot of the building or they may be computed from the Segregated or Unit-in-Place costs.

**ELEVATOR STOPS:** For basement stops, add \$4,250 to \$6,450 per stop.

**2 HEATING AND COOLING**

These costs are averages of total installed cost of the entire heating or cooling installation including its prorated share of contractors' overhead and profit and architects' fees. If the heating found in the building being assessed is different from that indicated, take the difference between the costs of the two and add to or subtract from the base square foot cost. For other types or system adjustments, see Segregated costs.

HEATING ONLY	Sq. Ft. Costs	HEATING & COOLING	Sq. Ft. Costs	COOLING ONLY	Sq. Ft. Costs
Electric cable or baseboard . . . . .	\$3.55	Package A.C. (short ductwork) . . . . .	\$ 7.00	Central refrigeration (zoned) . . . . .	\$5.70
Electric wall heaters . . . . .	1.40	Warm and cool air (zoned) . . . . .	9.75	package (short ductwork) . . . . .	3.95
Forced air furnace . . . . .	4.55	Hot/chilled water (zoned) . . . . .	15.40	Central evaporative . . . . .	2.70
Hot water, baseboard/convactor . . . . .	6.75	Heat pump system . . . . .	7.95	Pkg. refriger. . . \$1,200 to \$1,575 per ton capacity	
radiant floor/ceiling . . . . .	7.05	Ind. thru-wall heat pumps . . . . .	3.50	Evap. coolers . . \$155 to \$240 per MCFM capacity	
Steam (including boiler) . . . . .	6.10				
without boiler . . . . .	5.40	Small indiv. heat pumps cost \$1,075 to \$1,475 per ton of rated capacity.		<b>VENTILATION ONLY</b>	
Wall or floor furnace . . . . .	1.55			Vent. (blowers/ducts) . . . . .	\$1.10

**3 HEIGHT REFINEMENTS**

**MULTISTORY BUILDINGS:** Add .5% (1/2%) for each story over three, above ground, to all base costs.

**STORY HEIGHT MULTIPLIERS:** Multiply base cost by following multipliers for any variation in average story height.

Average Wall Height	Square Foot Multiplier	Average Wall Height	Square Foot Multiplier
8	.95	12	1.06
9	.97	13	1.08
10	1.00 (base)	14	1.11
11	1.03		

**4 AVERAGE PERIMETER**

Average Floor Area Sq. Ft./Story	200	250	300	350	400	450	500	550	600	650	700	750	800	850	Average Floor Area Sq. Ft./Story
2,000	1.09	1.16	1.23	1.30	---	---	---	---	---	---	---	---	---	---	2,000
4,000	.95	.99	1.02	1.06	1.09	1.13	---	---	---	---	---	---	---	---	4,000
6,000	---	.93	.95	.98	1.00	1.02	1.05	1.07	---	---	---	---	---	---	6,000
8,000	---	---	.92	.94	.95	.97	.99	1.01	1.02	1.04	---	---	---	---	8,000
10,000	---	---	---	.91	.93	.94	.95	.97	.98	1.00	1.01	1.02	---	---	10,000
12,000	---	---	---	.90	.91	.92	.93	.94	.95	.97	.98	.99	1.00	---	12,000
14,000	---	---	---	---	.89	.90	.91	.92	.93	.94	.95	.96	.97	.98	14,000
16,000	---	---	---	---	.88	.89	.90	.91	.92	.93	.94	.95	.95	.96	16,000
18,000	---	---	---	---	---	.88	.89	.90	.91	.92	.92	.93	.94	.95	18,000
20,000	---	---	---	---	---	---	.88	.89	.90	.91	.91	.92	.93	.93	20,000
22,000	---	---	---	---	---	---	---	.88	.88	.89	.90	.91	.92	.92	22,000
25,000	---	---	---	---	---	---	---	---	.88	.88	.89	.89	.90	.91	25,000

**5 USE COUNTY MULTIPLIERS IN MULTIPLIER SECTION.**

Figure 4