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Chapter 14 – Atlanta



How to Estimate the Cost of a Building Exterior Enclosure at a Conceptual Level

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How to Estimate the Cost of a Building Exterior Enclosure at a Conceptual Level

SECTION I: INTRODUCTION

The purpose of this paper is to give the reader an understanding of how to prepare an estimate of the cost of an exterior enclosure with the limited information that is typically available at the time a conceptual estimate is being prepared. At the conceptual level, information is limited, and often times no drawings are available. This paper will discuss both situations of having conceptual floor plans, and also utilizing ratios of building gross areas to derive quantities when no drawings are available. The focus will be on the above-grade exterior wall of the building, and will not cover the roof and/or any basement wall construction. This information is based on an example of the exterior wall for a medical office building, though most of the information and methods discussed will be relevant for use on other types of buildings. The CSI divisions utilized in the examples utilized are listed below; however, these divisions will vary by project and be based mostly on the selection of the exterior wall materials.

CONSTRUCTION SPECIFICATIONS INSTITUTE

MAIN

Division 03 Concrete

03 40 00: Precast Concrete

Division 05 Metals

05 10 00: Structural Metal Framing (Misc. Supports)

05 40 00: Cold-Formed Metal Framing

Division 07 Thermal and Moisture Protection

07 27 00: Air Barriers

Division 08 Openings

08 40 00: Entrances, Storefronts, & Curtain Walls

08 80 00: Glazing

08 90 00: Louvers

Division 09 Finishes

09 20 00: Plaster and Gypsum Board

BRIEF DESCRIPTION

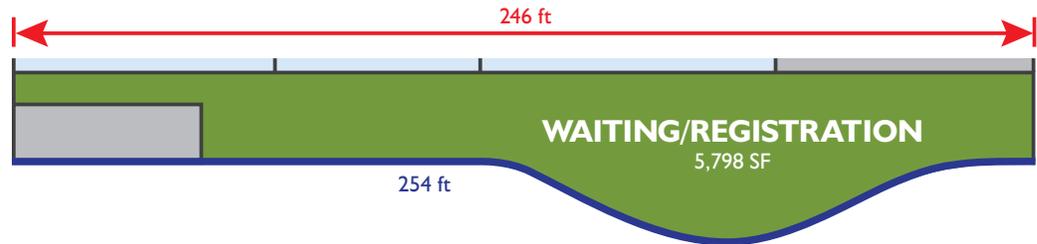
The exterior wall of a building is often a high priority issue as it holds a significant portion of the overall building costs, and also is the overall image or first impression of the building. Accurately representing these costs and defining the parameters early on in the estimating process is critical to maintaining a project budget through design.

This paper will discuss two scenarios for estimating an Exterior Enclosure at a Conceptual Level. In both scenarios, a ratio of materials will be utilized in order to calculate the total cost of the exterior enclosure. This assumes that no elevations and/or quantifiable renderings are available at the time of this estimate.

- 1) Conceptual floor plans or stacking diagrams are available and can be used for take-off of building perimeters.
- 2) No floor plans or drawings are available and ratios of exterior wall to building gross square footage (GSF) must be utilized.

Section 2: Types and Methods of Measurements

Exterior walls should be taken off by the linear feet of the perimeter and multiplied by the height in order to derive a total square footage. Taking quantities strictly from elevations of a building can result in missed quantities. For example:



Benchmark information and coordination with the Owner and Architect should drive the assumed FTF height for each floor. In many cases, the FTF is higher for the 1st floor or Lobby floor than on upper floors.

Here you can see if the takeoff was done by elevation (the red line), the “curve” or any undulations, pop-outs areas, or setbacks within the exterior shape would be overlooked.

Floorplan layouts often vary for some or all levels of the building. In this case, it is best to do the takeoff for each floor independent of the others and multiply the perimeter of each floor by the height of that given level. By adding up all of the levels of the building you will get the total raw takeoff of the exterior wall square footage (EWSF).

Carefully consider any spaces which may not yet be included within conceptual floorplans or stacking plans such as mechanical penthouses, screenwalls, etc. Assumptions will need to be made based on similar project types to include both the building area and exterior wall area for these elements.

The floor to floor (FTF) height will vary by building type and is often constrained by any potential clearance requirements for equipment or other objects within the building. Benchmark information and coordination with the Owner and Architect should drive the assumed FTF height for each floor. In many cases, the FTF is higher for the 1st floor or Lobby floor than on upper floors.

Soffits are taken off by area and are calculated by utilizing floorplans or areas by level to find overhangs. A simplified example:

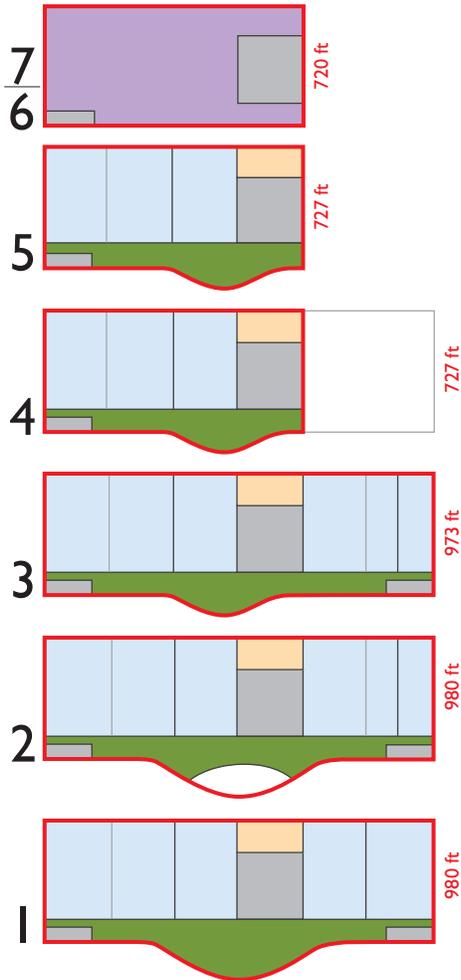
- Level 1 of Building ABC is 40,000 GSF
- Level 2 of Building ABC is 45,000 GSF
 - * This indicates there must be at least 5,000 sqft (45,000 minus 40,000) of overhangs/soffits below Level 2.

In many cases, soffits are accounted for by utilizing an allowance of area for these conditions and/or included in a waste factor to the raw exterior takeoff. Waste factors should also be included when utilizing conceptual drawings to allow for design evolution moving forward.

A sample sketch stacking diagram and take-off of a 7-story Medical Office Building is included on the following pages.

How to Estimate the Cost of a Building Exterior Enclosure ... continued

7-STORY MEDICAL OFFICE BUILDING DIAGRAM



When no drawings are available, overall exterior quantities must be derived from a ratio of the overall building GSF compared to the exterior wall square footage. Wall ratios should be taken from previous benchmarked projects and similar building types. The higher the ratio, the less efficient the shape of the building is. Buildings with large amounts of “ins” and “outs” as well as skinny / elongated buildings will tend to be less efficient.

The exterior wall ratio is calculated by the total exterior wall quantity (including screenwalls, penthouses, soffits, overhangs, etc.) divided by the total building GSF (including all mechanical spaces, shelled spaces, etc.)

Description	Perimeter (LF)	Area (GSF)	FTF Height (FT)	Area (SQFT)	Exterior Wall To Floor Ratio
Level 1	980	45,740	18	17,640	0.39
Level 2	980	43,774	14	13,720	0.31
Level 3	973	43,328	14	13,622	0.31
Level 4	727	29,271	14	10,178	0.35
Level 5	727	29,271	14	10,178	0.35
Level 6	720	28,055	14	10,080	0.36
Level 7	720	28,055	14	10,080	0.36
Penthouse (Not Shown)	500	10,000	14	7,000	0.70
Subtotals		257,494		92,498	0.36
Waste Factor - Soffits, Design Evolution, Etc.				15%	
Waste Amount				13,875	
Totals		257,494		106,373	0.41

Most building types will fall somewhere in between or near a range of 0.35 (more efficient like a developer office building) to 0.60 (less efficient). In this discussion, efficient is simply an analysis of how many sqft of exterior wall it takes to clad a specific building. Knowing this information allows us to target potential cost savings and/or identify budget issues as the process moves forward. Without doing any actual budgeting, you can quickly understand that an office building with a 0.55 exterior wall to building area ratio will be less cost effective than other similar buildings of that type, and may throw a red flag early in the process that changes may need to be made and/or explain why the overall project cost may not be in line with comparable projects.

The exterior wall ratio typically will assume that all exterior components are included (walls, soffits, screenwalls, etc.). If not, these items will need to be accounted for in addition to the ratio.

BENCHMARK RATIO CALCULATION

BUILDING A:
 200,000 sqft and 100,000 exterior wall sqft
 100,000 EWSF / 200,000 GSF = **0.50**

Building B:
 150,000 sqft and 60,000 exterior wall sqft
 60,000 EWSF / 150,000 GSF = **0.40**

Average of Above = 0.45

Concept Budget Building GSF = 255,000 sqft
Exterior Wall to Building GSF Ratio = 0.45
Total Assumed Exterior Wall Quantity = 114,750 sqft of Exterior Wall

Section 3: Factors That May Affect Takoff, Pricing, Etc.

There are a number of factors that affect the pricing of an exterior wall.

The primary factor to the pricing is the material selections. Material selections, quantities/ratios, and unit pricing of each material are made based on a combination of several potential factors:

- **Owner and/or Architect Preferences** – it is always best practice to confirm and discuss your assumptions with the project team whenever possible.
- **Building Type**
 - Examples:
 - Hospitals require windows for patient rooms, but would be a “solid” material in various other locations such as precast, metal panels, stucco, etc.
 - Many high-rise office buildings are nearly 100% curtainwall
- **Geographic Location and Availability of Products**
- **Local Workforce – availability, labor unions, etc.**
- **Adjacent or Nearby Building Facades** – potential of needing to match or complement such elements
- **Local Codes and/or Regulations**
- **Ballistic Requirements**
- **Building Shape/Configuration**
- **Access to the Building** – for installation
- **Fire-Resistant Requirements**
- **Hurricane or Wind Ratings**
- **Sustainability Requirements**
- **Small quantities vs. large quantities**
 - Smaller quantities of certain materials may result in a higher unit cost due to setup costs, overhead expenses, etc.
- **Rooftop screenwalls**
 - Screenwalls utilized to hide equipment are often overlooked and need to be considered in the exterior wall quantities.

It is always best practice to confirm and discuss assumptions with the Project Team.

Once material selections and/or assumptions have been made, utilizing the same general criteria above you will need to derive a ratio for each type of material.

For this example, the project is in Florida and has wind rating criteria that must be met. Through discussions with the Owner and Architect, reviewing benchmarked projects, and considering the multiple factors listed previously, we have come up with the following ratio of exterior materials:

40% Curtainwall:	$114,750 \text{ sqft} \times 0.40 = 45,900 \text{ sqft}$
50% Precast:	$114,750 \text{ sqft} \times 0.50 = 57,375 \text{ sqft}$
8% Stucco	$114,750 \text{ sqft} \times 0.08 = 9,180 \text{ sqft}$
	*Primarily for soffits and/or screen walls
2% Louvers	$114,750 \text{ sqft} \times 0.02 = 2,295 \text{ sqft}$

Louvers should be considered for any building that has ventilation or exhaust requirements for anything that is contained within the building footprint, such as mechanical or electrical equipment. This item often requires coordination with the mechanical estimate to confirm the scope is not double-covered and/or overlooked.

Pricing of each material should take into consideration all of the factors listed previously. Knowledge and coordination with local market subcontractor pricing is essential to providing accurate overall pricing for the exterior enclosure. Note, timing of the project and contingencies for any potential escalation should also be considered at this phase of the process.

Also keep in mind that we are pricing the entire exterior enclosure (a full system), so other components to consider in the pricing are:

- Framing & sheathing
- Insulation
- Air / Vapor Barriers
- Caulking and sealants
- Misc. support steel

Each unit price should include a list of assumptions, clarifications and exclusions that provide parameters for how the unit price was derived.

For example - Curtainwall is budgeted at \$90/sqft based on the following criteria:

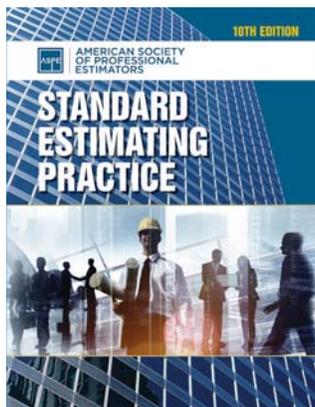
- 7" deep mullions
- Large missile impact rating below 30', small missile above 30'
- Low-E, laminated, insulated impact glazing (clear)
- 3-coat Kynar finish (or equal)
- Fire-rated glass systems are excluded

Specialty entrance doors such as sliding glass doors, alum/glass entrance doors, revolving doors, etc. should be accounted for within your overall quantity take-off. Assumptions will need to be made on the quantities and types of entrance doors. The estimator should not assume that these costs are included in the overall unitcost of the exterior. **For example:**

- A pair of 3'-6" x 8'-0" glass entrance doors may cost in the range of \$8,000 - \$12,000 per pair for the location of the example being used in this document. If a vestibule is anticipated, this cost would double (\$16,000 - \$24,000), if not accounted for elsewhere within the overall project budget.
- This same area, if assumed to be included in the exterior wall quantity, is:
 $3.5' \times 8.0' \times 2 \text{ each} = 56 \text{ sqft}$
 $56 \text{ sqft} \times \$90/\text{sqft} = \$5,040$
(a budget shortage of anywhere from \$3,000 to \$19,000)

Each unit price should include a list of assumptions, clarifications and exclusions that provide parameters for how the unit price was derived.

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Section 4: Labor, Material, Equipment, and Indirect Costs

At a conceptual level estimate, unit costs are derived from historical data such as benchmarking or using publications such as RS Means, local market knowledge, and/or subcontractor feedback. These unit rates are to include all labor, material, equipment, and overhead costs as evaluated by considerations listed in Sections 3 and 5 of this paper.

Labor, material, and equipment pricing all factor into the applied unit rate, but are not typically evaluated individually at this stage in the process.

Section 5: Special Risk Considerations

Escalation – Since conceptual estimates are often a year or more prior to the start of a project, escalation should strongly be considered in either the unit pricing of the estimate and/or as an overall allowance for the total project budget.

Design Evolution/Variance from assumptions – As stated before, the estimator needs to clearly state the assumptions upon which the estimate is based, and include those written assumptions with the estimate. Often including takeoff files and calculations is also a good practice to clearly identify what the conceptual pricing is based on. This is simply a way of documenting what was priced compared to what may be designed later in the process, and help explain variances between estimates.

New Construction vs. Renovation – Renovations often create difficulty for installations and should be strongly considered when making material and unit price assumptions.

Sole Source Products – Most projects are required to provide at least 2 to 3 approved manufacturers for all specified materials. In some cases, single manufacturers can be selected (for various reasons). Sole sourcing of products can often increase pricing due to lack of competition in the market. Sole sources products should be taken into consideration for unit pricing, and unless otherwise known, should be excluded from conceptual pricing exercises.

Project Schedule – The overall project schedule can have an impact on both material assumptions and on unit pricing. Material assumptions should consider long-lead durations which may affect the project timeline. Unit pricing may also be affected based on project schedule. Example would be a requirement for the exterior contractors to work in multiple elevations at the same time or needing to work overtime or premium time hours to maintain schedule durations.

New Construction vs. Renovation – Renovations often create difficulty for installations and should be strongly considered when making material and unit price assumptions.

Sole Source Products – Most projects are required to provide at least 2 to 3 approved manufacturers for all specified materials. In some cases, single manufacturers can be selected (for various reasons). Sole sourcing of products can often increase pricing due to lack of competition in the market. Sole sources products should be taken into consideration for unit pricing, and unless otherwise known, should be excluded from conceptual pricing exercises.

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Section 6: Ratios and Analysis

Quantities, unit pricing, ratios, and overall costs should be compared to other relevant projects within the area to test and confirm if the information is within a reasonable range.

Notable guideline mentioned previously:

- **Exterior wall to building area ratios are typically between 0.35 and 0.60.**

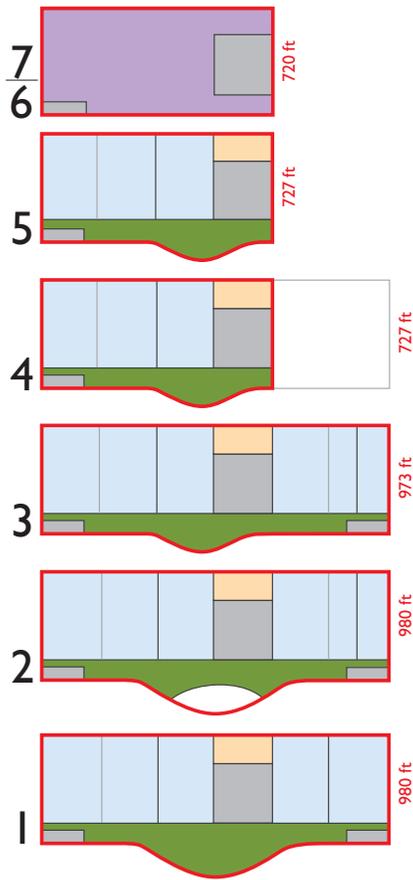
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Section 7: Sample Takeoff and Pricing Sheets: *This example is utilizing quantities derived from the stacking diagrams, and varies slightly from the previous examples where no floorplans were available.

Description	Perimeter (LF)	Area (GSF)	FTF Height (FT)	Area (SQFT)	Exterior Wall To Floor Ratio
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Waste Amount				13,875	
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Concept Budget Assumptions/Criteria: *Pricing is based on start of Construction date on or before March 2017.

Pkg. #	Description	Qty	Unit	Unit Cost	Total	Notes
B.2	Exterior Enclosure					
	Exterior Wall Supports - 2# / EWSF	106	TONS	\$4,500.00	\$478,679	
	Exterior Enclosure - Based on Concept Stacking Plans:					Total of 106,373 SQFT of Exterior Wall
	Curtainwall - 40%	42,549	SF	\$90.00		
	Precast - 50%	53,187	SF	\$50.00		
	Framing / Sheathing @ Above	53,187	SF	\$10.00	\$531,865	
	Insulation - Rigid - 2" @ Above	53,187	SF	\$2.00	\$106,373	
	Air / Vapor Barrier @ Above	53,187	SF	\$4.00	\$212,746	
	Caulking @ Above	53,187	SF	\$0.65	\$34,571	
	Stucco - 8%	8,510	SF	\$15.00	\$127,648	
	Framing / Sheathing @ Above	8,510	SF	\$18.00	\$153,177	Framing to meet Wind Requirements
	Insulation - Rigid - 2" @ Above	8,510	SF	\$2.00	\$17,020	
	Air / Vapor Barrier @ Above	8,510	SF	\$4.00	\$34,039	
	Caulking @ Above	8,510	SF	\$0.65	\$5,531	
	Louvers - 2%	2,127	SF	\$115.00	\$244,658	
	Exterior Aluminum / Glass Entry Doors - Sliding	4	PAIR	\$10,000.00	\$40,000	
	Exterior Aluminum / Glass Entry Doors - Single	4	EA	\$5,000.00	\$20,000	
B.2	Exterior Enclosure					



Stucco – 8% of Total Exterior Wall Quantity

- Fluid applied moisture barrier
- 3-coat stucco system (STO or equal) over metal lath
- Integral color
- Includes PVC trim (no aluminum)
- Minimum reveal dimensions of roughly 4' x 8'

Curtainwall – 40% of Total Exterior Wall Quantity

- 5", 7", & 9" mullions as required for missile impact ratings based on span
- Low-E, laminated, insulated impact glazing (clear)
- 3-coat Kynar finish (or equal)
- Fire-rated glass systems are excluded
- Sunshades are not anticipated.

Precast – 50% of Total Exterior Wall Quantity

- 6" precast panel thickness
- Max 3/4" depth reveals
- White cement-based mix – 1 color
- Sandblast finish
- Plain steel reinforcing

Louvers – 2% of Total Exterior Wall Quantity

- Architectural louvers are included as an allowance of \$115/sqft ▲

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Just a reminder regarding Registration fees

\$ 850	Early Registration	Current
\$ 950	Regular Registration	Begins 05/01/2018
\$1,100	Late Registration	Begins 06/01/2018

If your plans are to join us, you are encouraged to complete your Registration soon!