How to Estimate the Cost of a Medical Office Building Using Conceptual BIM (DProfiler)

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Section 1 – Introduction

When someone is considering how to create a budget when they have nothing more than a napkin sketch, the easiest thing to do is go look at their historical data and multiply the area of the building times the average cost per square foot of their benchmarks. But later on, when the building actually has a design and they're able to create a more detailed estimate, they know that it's very likely that their budget has missed the mark either high or low by +- 20%. And they don't have any backup to their budget costs to really know what trades are trending higher or lower. This is where they need to start thinking about different tools they can use to be able to provide detail at a conceptual level.

The intent of this paper is to describe the approach that one can take to create a detailed conceptual budget for a new Medical Office Building using a 3D BIM modeling tool called Dprofiler. This paper will focus on the building itself and won't take into account any of the Sitework elements of the project.

MAIN CSI DIVISIONS (Masterformat 2004):

01 00 00 GENERAL REQUIREMENTS
03 00 00 CONCRETE
05 00 00 METALS
06 00 00 WOOD and PLASTICS
07 00 00 THERMAL and MOISTURE PROTECTION
08 00 00 DOORS and WINDOWS
09 00 00 FINISHES
10 00 00 SPECIALTIES
11 00 00 EQUIPMENT
12 00 00 FURNISHINGS
13 00 00 SPECIAL CONSTRUCTION
14 00 00 CONVEYING SYSTEMS
21 00 00 WATER SUPPRESSION
22 00 00 PLUMBING
23 00 00 HVAC
25 00 00 INTEGRATED AUTOMATION
26 00 00 ELECTRICAL
27 00 00 COMMUNICATIONS
28 00 00 ELECTRICAL SAFETY AND SECURITY
31 00 00 EARTHWORK
33 00 00 UTILITIES

MAIN CSI SUBDIVISIONS (Masterformat 2004):

01 50 00 Temporary Facilities and Controls

03 10 00 Concrete Forming and Accessories

03 20 00 Concrete Reinforcing

03 30 00 Cast-In-Place Concrete

05 10 00 Structural Metal Framing

05 30 00 Metal Decking

05 50 00 Metal Fabrications

06 10 00 Rough Carpentry

06 40 00 Architectural Woodwork

07 20 00 Thermal Protection

07 40 00 Roofing and Siding Panels

07 50 00 Membrane Roofing

07 60 00 Flashing and Sheet Metal

07 70 00 Roof and Wall Specialties and Accessories

07 80 00 Fire and Smoke Protection

07 90 00 Joint Protection

08 10 00 Doors and Frames

08 30 00 Specialty Doors and Frames

08 40 00 Entrances, Storefronts, and Curtain Walls

08 50 00 Windows

08 70 00 Hardware

09 20 00 Plaster and Gypsum Board

09 30 00 Tiling

09 50 00 Ceilings

09 60 00 Flooring

09 70 00 Wall Finishes

09 80 00 Acoustic Treatment

09 90 00 Painting and Coating

10 10 00 Information Specialties

10 20 00 Interior Specialties

10 40 00 Safety Specialties

10 50 00 Storage Specialties

10 70 00 Exterior Specialties

11 70 00 Healthcare Equipment

12 20 00 Window Treatments

13 40 00 Integrated Construction

14 20 00 Elevators

21 10 00 Water-Based Fire-Suppression Systems

22 00 00 Plumbing

23 00 00 Heating, Ventilating, and Air-Conditioning (HVAC)

25 50 00 Integrated Automation Facility Controls

26 00 00 Electrical

27 00 00 Communications

28 00 00 Electronic Safety and Security

28 30 00 Electronic Detection and Alarm

31 20 00 Earth Moving

33 40 00 Storm Drainage Utilities

Brief Description

In order to create a detailed budget estimate, one of the tools available is a software package called Dprofiler that was created by Beck Technology and launched commercially in 2006. Dprofiler is a 3D BIM modeling tool that can be used at a very high conceptual level. Sketches or floor plans can be loaded into the software and used as references to create simple 3D masses of the building that's being budgeted. Once the mass has been created, then grid lines can be added to create floor slabs and the exterior cladding of the building can be measured. Then, all of the interiors can be added using historical metrics to create a complete estimate. This estimate can be tracked as the project goes along and compared against subsequent estimates. Some of the advantages of creating this type of estimate at such an early stage are that one will be able to see a visual representation of what the project could look like as well as have a comprehensive document that shows what the budget was based on. Estimating can largely be thought of as an "art" at the early stages of design and as a "science" at the later stages of design. This paper will describe the process one can take to use Dprofiler to create a conceptual estimate and try to blend both "art" and "science" together at this early stage.

Section 2 – Types and Methods of Measurement

Types of Measurement

There will be many types of measurements in this paper, including area measurements by square foot (SF), linear measurements by linear foot (LF), volume measurements by cubic yard (CY), measurement of counts by each (EA) and pairs (PAIR), measurement of weight by pounds (LB) and tons (TON), measurement of stairwells by flights (Flight), measurement of elevators by stops (STOP), and measurement of allowances by lump sum (LS).

Methods of Measurement

The method by which the estimate line items will be measured will vary in three different ways:

1. Actual measurement – this means that a quantity takeoff will be performed within Dprofiler and the measurement will be added to the estimate as a line item.
2. Approximate measurement – this means that a database of historical metrics will be used to generate quantities for these line items.
3. Gross Floor Area (GFA) measurements – this means that the total area of the building will be used as the quantity and a historical cost database will be used as a basis for the Cost per Square Foot.

Here are the steps required to create the estimate:

1. Sketches / floor plans / site plans are uploaded into the software as reference points. (See image on page 16)
2. The shape of the building is traced onto the sketch and once the area has been drawn it can be pulled up to the proper height of the building. This will calculate the total area of exterior cladding.
    a. Different materials are drawn on the exterior of the building mass. This can be done by actually drawing the doors, windows, and other materials to create actual quantities. Or a blended material can be created to allocate a certain percentage of the different materials which uses approximate quantities. For example, a blended material can be created allocating 30% glazing, 20% metal panel, and 50% plaster.
3. Floor to floor heights will then be added to create the slabs which will calculate the total Gross Floor Area of the Medical Office Building.
    a. The Gross Floor Area should be close to the area you're told the building should be – if it's not then the sides of the building can be pushed or pulled in or out to reduce or increase the Gross Floor Area of the building as necessary
    b. Assemblies will be added to the floor slabs to build up the total cost of each slab. For example, the first floor slab will contain the assembly for the Slab on Grade components along with calculations for the

Foundations depending on the foundation type. For the upper floor slabs, the user will need to select what type of slab it is. If there's structural steel, then that will need to be added on a pounds per square foot basis to create an approximate quantity.

4. Unique Features are added to the outside of the Medical Office Building.
    a. This includes items such as canopies or roof screens as well as any other miscellaneous exterior components.
5. Costs are applied to the Interiors of the Medical Office Building
    a. For items such as casework, doors, interior glazing, partitions, floor and ceiling finishes, and specialties - these will be based on historical metrics to create the approximate quantities.
    b. For the Mechanical / Electrical / Plumbing (MEP) systems – these are based on an average Cost per Square Foot from historical data and are applied on the total GFA of the building.
6. The entire Estimate is reviewed and revised as necessary to make sure it is as accurate as possible and reflects historical benchmarks.

Section 3 – Specific Factors to Consider

Some factors to consider when creating a detailed budget estimate:

1. Date of Historical Benchmarks (Escalation) – because many of the historical projects could have been completed in different years, they need to be escalated up to the present day to make sure the cost data is current.
2. Geographic Location of Project – this can affect the unit rates of the line items in many different ways. The labor rates are different for different parts of the country, there could be specific code requirements to take into account such as OSHPD in California, or there could be unions in the area and if it's a union job then those costs must be taken into consideration. If the location is in a secluded area and labor needs to be pulled from outside then this is also a factor.
3. Shell Space – it's important to verify whether any areas within the building are going to be "shelled" meaning that there will be no interior fit-out in those areas. This could greatly impact your historical data since the costs of buildings with shell space will be lower than if the building was completely fit-out.

All of these items must be accounted for when a Historical Database is being used. The costs for each project must be normalized to take these factors into account to make sure the data is complete and accurate. Normalization of costs means that Escalation, Geo-Modifiers, and Fit-Out of Shell Space must be added to the relevant projects to make sure the historical averages are based on like for like projects. Without normalization of the costs, the benchmarks will reflect incorrect data and the estimate will be flawed.

Section 4 – Overview of Labor, Material, Equipment, Indirect Costs and Approach to Markups

Because this estimate is conceptual in nature, the unit rates for each line item are based on historical data which contain labor, material, and equipment and are marked up to include subcontractor's overhead and profit. This overhead and profit covers each subcontractor's cost for labor burden, materials and equipment sales taxes, field overhead, home office overhead, and profit. The general contractor's markups are found below the line and include General Conditions, General Requirements, Insurance, and Overhead and Profit along with a Design Contingency. This Design Contingency is an allowance for undeveloped / unknown design details and will be reduced during each stage of design as details which historically increase costs come to light. All costs are in current dollars and escalation of costs to the midpoint of construction is excluded at this stage of design due to an unknown construction schedule.

Section 5 – Special Risk Considerations

Mechanical / Electrical / Plumbing Costs

One of the largest risk considerations in this type of estimating are the costs of the MEP systems. It's very important that it's understood that those costs are based on the historical averages for Medical Office Buildings and don't take into consideration specific types of systems unless those types have already been selected. Without specific MEP information at the early conceptual stage it's more difficult to define what the costs will end up being. The costs in the budget don't have to reflect the average but can be adjusted to reflect closer to the high or low in the database depending on how risk tolerant someone is. Being that the costs of these systems can equate from 30% - 50% of the costs of the building, it's a huge consideration to make.

Exterior Cladding Complexity

When an estimate is based on an early sketch, it will mostly likely be much more of a square or rectangular shape and won't reflect the complexity that the exterior cladding will end up having when all is said and done. This affects the entire quantity of the exterior cladding and could result in a large cost implication. The costs to capture this unknown complexity will either need to be included as an allowance within the estimate or it will need to be stated that the costs for this risk is captured within the Design Contingency.

Clarify Assumptions

One of the most important aspects when someone is building up the 3D model is that they must make sure that any assumptions are clarified up front. This alerts everyone to the basis of the estimate and is another way to make sure that the budget is on track. Without clarifying these assumptions, the costs could end up being completely different than what the estimator assumes. These assumptions include the following:

- Gross Floor Area of the building
- Number of stories of the building
- Structural foundation system of the building – this could be a number of different systems such as a mat foundation, shallow foundation of spread and continuous footings, or a deep foundation with piles and pile caps.
- Superstructure system of the building – It could be a steel superstructure with metal decking and concrete topping (how many pounds per square feet of steel should be allowed for?) Or it could be a concrete superstructure or a post tensioned concrete superstructure. Or it could even have different types on the lower levels as compared to the upper levels.

- Type of finishes at the exterior cladding
- Level of Finishes – are there any high end finishes / features that are known at this time that need to be accounted for?
- Mechanical / Electrical systems – if they're known at this time

Here is the list of Assumptions we're using for our Sample Estimate:

- Floor to Floor Heights - 15'-0" for all floors
- Number of Stories – up to 3 stories (see sample sketch for specific areas)
- Structure
    - Shallow foundation system - spread footings - 5' x 5' x 1.5'; grade beams and continuous footings - 3' wide, 1.5' deep
    - Structural Steel - 13 lbs/sf
    - Floor Structure - 3" metal deck with 3-1/2" concrete topping
    - Roof Structure - 1-1/2" metal deck with 3-1/2" concrete topping
- Exterior Cladding Finish
    - 65% Rainscreen, 20% Curtainwall, 10% Windows, 5% Storefront
- Roofing
    - Single ply membrane roofing
    - Roof Screen - 260 feet long x 10 feet high
    - Main Entry Dropoff Canopy - 1,460 SF
- High End Finishes
    - Allowance for Stone Flooring and Base and a Suspended Wood Panel Ceiling System
- Mechanical / Electrical / Plumbing
    - MEP costs are based on the average costs of similar MOB projects and are not based on a specific type of system

Section 6 – Ratios and Analysis

One would think that because most of the estimate is largely based on historical data, that there would be no need to test the estimate, but that's not true at all. Once the estimate has been completed, a thorough review of the detail must be undertaken to confirm that what its showing is accurate and there are no errors. Because the quantities are largely database driven, it's easy to fall into the trap of running the cost model and submitting the estimate without review but that is never a good practice. Here are a few ways that the estimate can be tested:

1. Cost per Square Foot Basis (See Figures 1 and 2 below)
    a. First, the total Cost/SF of the Medical Office Building should be looked at to see where it compares to Historical Data.
    b. Then, it should be looked at on a CSI Divisional basis to see if it's trending higher or lower in a specific section to make sure there aren't any outliers. If it is extremely high or low is a specific Division, then this could mean there's an error in the calculations and the estimate should be double checked.
2. Quantity Metrics Basis (See Figure 3 below)
    a. The quantities in the estimate should be compared to historical projects to make sure it falls within the +-20% range. This is also a good check to make sure there aren't any outliers which could signify errors within the calculations.

MOB Cost Benchmarks

Project Name	Building $/SF
Confidential MOB 1	$317.55
Confidential MOB 2	$324.91
Confidential MOB 3	$295.43
Confidential MOB 4	$295.97
Confidential MOB 5	$425.04
Confidential MOB 6	$350.97
Confidential MOB 7	$356.16
Confidential MOB 8	$329.45
Confidential MOB 9	$316.26
Confidential MOB 10	$384.98
Confidential MOB 11	$392.18
Confidential MOB 12	$379.17
Confidential MOB 13	$359.07
High of MOB's	$425.04
Average of MOB's	$348.24
Low of MOB's	$295.43

Figure 1

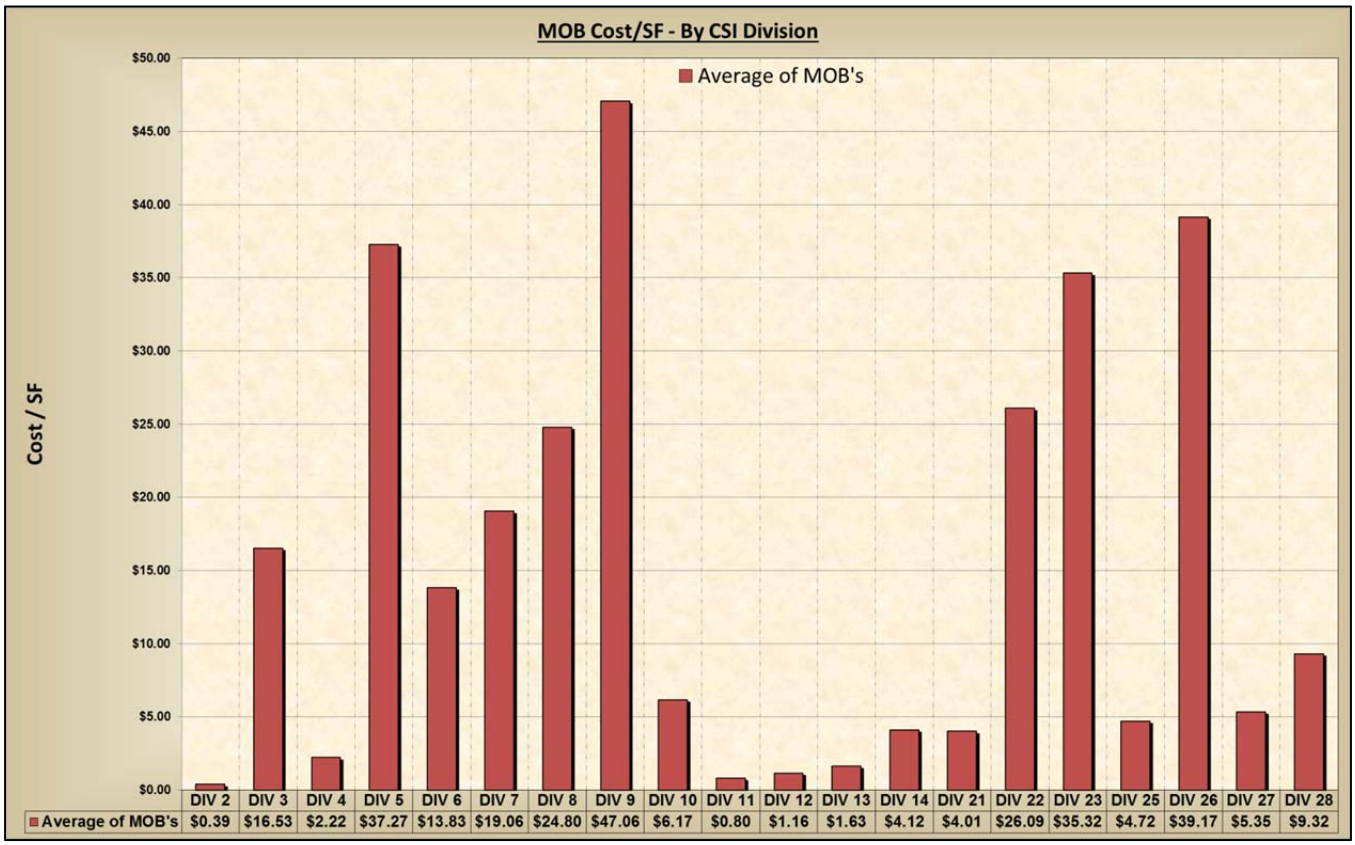


Figure 2

MOB Benchmarks
Schedule of Project Metrics

Elements	U/M	Confidential MOB 1	Confidential MOB 2	Confidential MOB 3	Confidential MOB 4	Confidential MOB 5	Confidential MOB 6	Confidential MOB 7	Avg Ratio	Ratio Range within 20%
Quantity Ratios										
Structural										
CY of Concrete per SF of GFA		0.015	0.032	0.038	0.030	0.042	0.031	0.029	0.031	0.025 to 0.037
Lbs of Rebar per CY of Concrete		111.82	168.99	84.44	59.80	132.30	124.33	109.68	112.16	89.73 to 134.59
Lbs of Steel per SF of GFA		10.80	12.99	8.56	10.44	12.88	15.16	9.29	11.60	9.28 to 13.92
Exterior Façade										
SF of Façade per SF of GFA		0.42	0.51	0.72	0.39	0.44	0.64	0.82	0.552	0.442 to 0.663
SF of Glazing per SF of Facade		0.41	0.29	0.18	0.29	0.30	0.36	0.16	0.28	0.22 to 0.33
SF of Roofing per SF of GFA		0.32	0.34	0.94	0.51	0.27	0.37	1.09	0.56	0.44 to 0.67
Interiors										
LF of Casework per SF of GFA		0.016	0.022	0.027	0.017	0.017	0.021	0.023	0.020	0.016 to 0.024
# of Interior Doors per SF of GFA		0.0038	0.0042	0.0035	0.0031	0.0046	0.0037	0.0036	0.0038	0.0030 to 0.0046
SF of Partion Framing per SF of GFA		1.94	1.65	1.53	1.46	1.97	1.93	1.17	1.65	1.32 to 1.98
SF of Partion Drywall per SF of Partion Framing		1.6950	2.4801	2.0234	2.2748	1.9104	1.6707	2.0538	1.9685	1.5748 to 2.3622
SF of Partion Insulation per SF of Partion Framing		0.89	1.00	0.38	0.84	0.30	1.00	1.02	0.79	0.63 to 0.95
SF of Ceiling Drywall per SF of GFA		0.19	0.13	0.13	0.14	0.15	0.09	0.42	0.16	0.13 to 0.19

Ratio Legend:
Greater than +Ratio Range within 20% variance to the average of MOB projects
Within +-Ratio Range within 20% variance to the average of MOB projects
Less than -Ratio Range within 20% variance to the average of MOB projects

Figure 3

Section 7 – Miscellaneous Pertinent Information

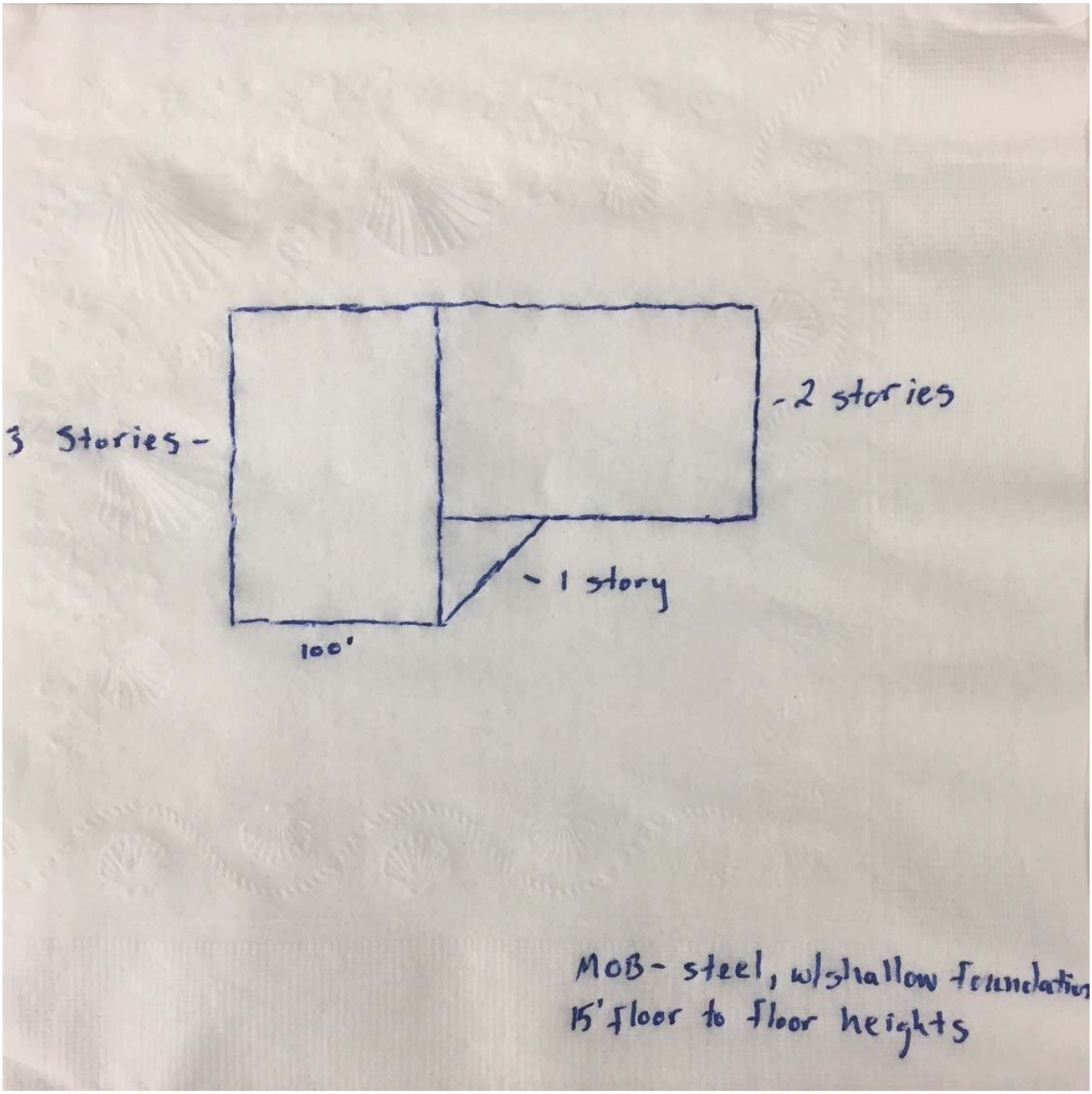
One important consideration to make in the estimate is what type of departments will be included in the Medical Office Building. This will determine some of the line items that will be included in the estimate.

- If there is a Pharmacy then there could be a premium for casework and there will need to be wire mesh in the walls around it. There may also be a large overhead coiling doors or smaller coiling doors at the point of sale counters.
- If there are any Imaging rooms, then lead shielding at the walls, doors, and windows will need to be accounted for to protect from radiation.
- And medical gases such as Oxygen, Nitrogen, Vacuum, etc. may need to be included depending on the departments as well.

Another consideration to make is that typical line items that are based on the number of stories of may need to be reviewed.

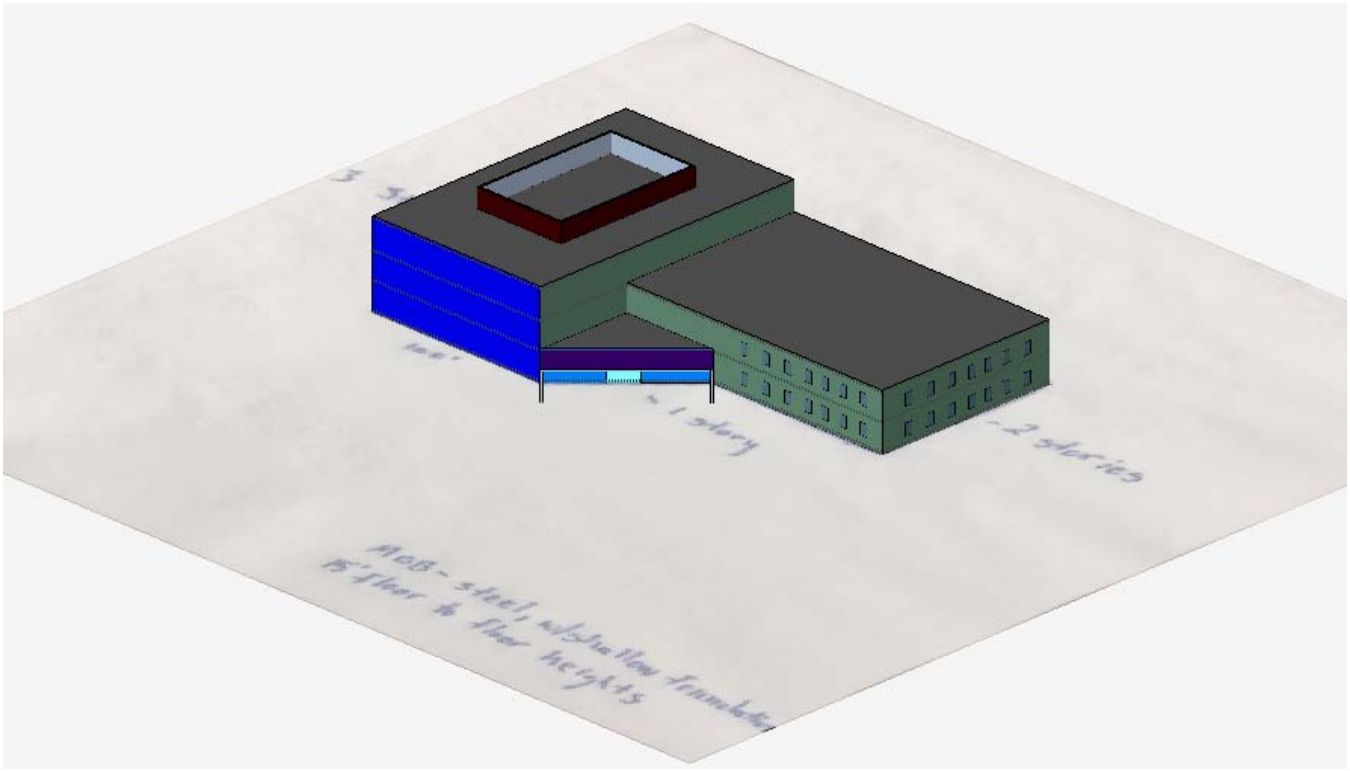
- Stairs – the number of flights of stairs is based on the number of stories and how many stairwells there are. This quantity will need to be reviewed and adjusted to make sure it makes sense.
- Elevators – similar to stairs, the number of elevator stops depends on the number of stories and how many elevator cabs there are and it must be reviewed.

Section 8 – Sample Sketch

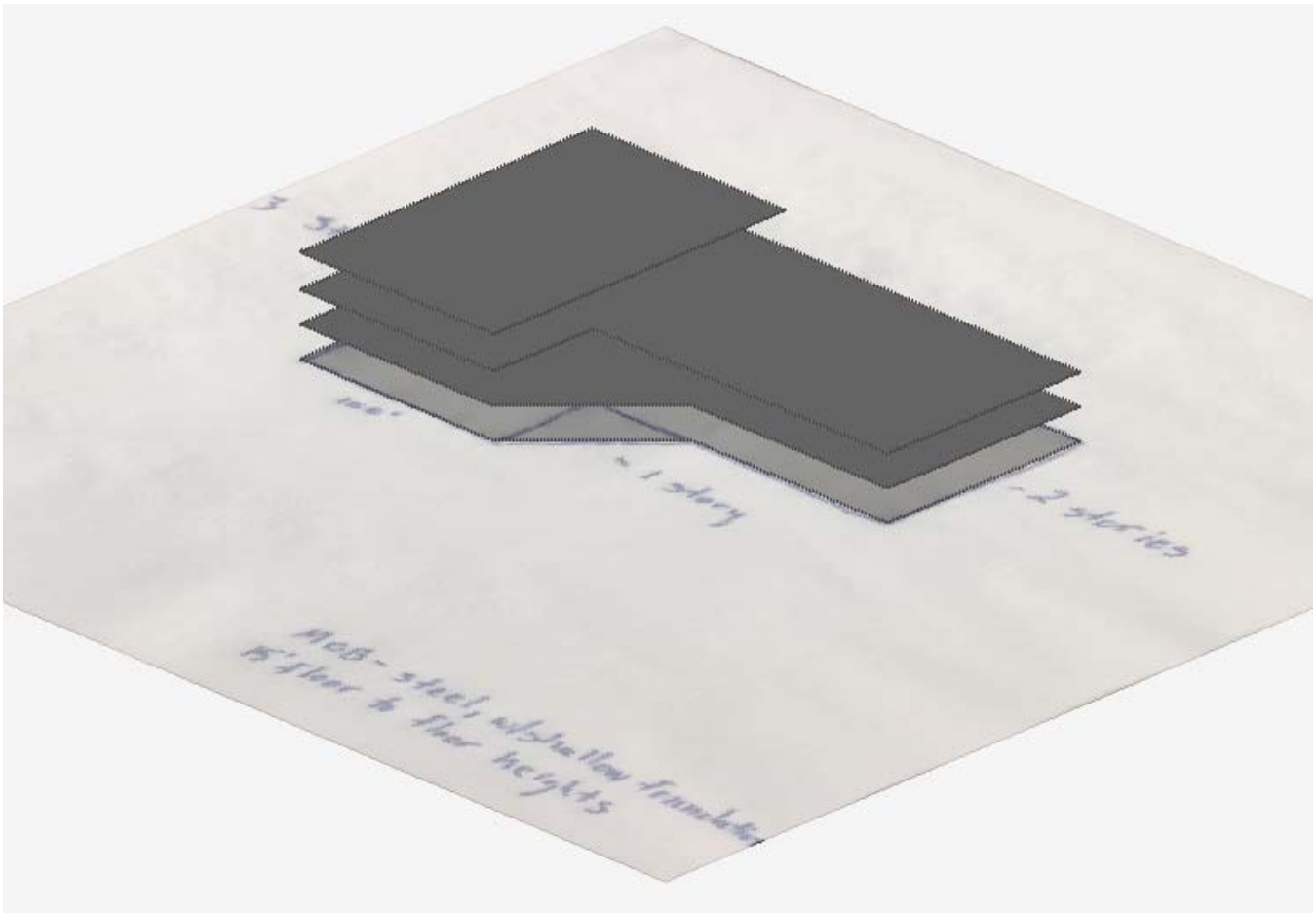


Section 9 – Sample Takeoff and Pricing Sheets

Sample Takeoff – Exterior Cladding:



Sample Takeoff – Structural Slabs:



Sample Estimate:

Estimate Name: Sample Medical Office Building
Estimate Number: 00-1000.00

Direct Cost Summary		Cost	Cost / Area
01.00.00	GENERAL REQUIREMENTS	$46,331.73	$0.60
03.00.00	CONCRETE	$878,628.46	$11.34
05.00.00	METALS	$2,375,305.74	$30.65
06.00.00	WOOD	$836,089.16	$10.79
07.00.00	THERMAL AND MOISTURE PROTECTION	$1,769,264.84	$22.83
08.00.00	OPENINGS	$1,346,440.56	$17.37
09.00.00	FINISHES	$3,024,293.44	$39.02
10.00.00	SPECIALTIES	$593,059.80	$7.65
11.00.00	EQUIPMENT	$80,211.25	$1.04
12.00.00	FURNISHINGS	$82,249.74	$1.06
13.00.00	SPECIAL CONSTRUCTION	$23,051.52	$0.30
14.00.00	CONVEYING EQUIPMENT	$193,191.66	$2.49
21.00.00	FIRE SUPPRESSION	$327,819.89	$4.23
22.00.00	PLUMBING	$1,937,469.79	$25.00
23.00.00	HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)	$3,099,951.66	$40.00
25.00.00	INTEGRATED AUTOMATION	$348,744.56	$4.50
26.00.00	ELECTRICAL	$3,199,150.12	$41.28
27.00.00	COMMUNICATIONS	$511,492.02	$6.60
28.00.00	ELECTRONIC SAFETY AND SECURITY	$758,325.68	$9.79
31.00.00	EARTHWORK	$116,509.06	$1.50
33.00.00	UTILITIES	$20,309.34	$0.26
Subtotal Direct Cost		**$21,567,890.04**	**$278.30**

General Conditions and Fees		
Design Contingency	$2,156,789.00	$27.83

Estimate Name: Sample Medical Office Building
Estimate Number: 00-1000.00

General Conditions	$1,509,752.30	$19.48
General Requirements	$647,036.70	$8.35
Insurance	$244,364.19	$3.15
Overhead and Profit	$711,740.37	$9.18
Subtotal Fees	**$5,269,682.57**	**$68.00**
Total Cost	**$26,837,572.62**	**$346.30**

Estimate Name: Sample Medical Office Building
Estimate Number: 00-1000.00

Division	Description	Quantity	Unit	Unit Price	Cost	Cost / Area
01.00.00	**GENERAL REQUIREMENTS**					
01.50.00	**TEMPORARY FACILITIES AND CONTROLS**					
0001	Scaffolding	31,199.82	S.F.	$1.49	$46,331.73	$0.60
Total -	TEMPORARY FACILITIES AND CONTROLS				$46,331.73	$0.60
Total - GENERAL REQUIREMENTS					**$46,331.73**	**$0.60**
03.00.00	**CONCRETE**					
03.10.00	**CONCRETE FORMING AND ACCESSORIES**					
0001	Spread Footing Formwork	1,050.00	S.F.	$6.71	$7,040.25	$0.09
0002	Continuous Footing Formwork	2,336.82	S.F.	$6.18	$14,448.59	$0.19
0003	Grade Beam Formwork	6,300.00	S.F.	$5.92	$37,308.60	$0.48
0006	Slab on Grade Formwork	778.94	L.F.	$6.43	$5,005.48	$0.06
Total -	CONCRETE FORMING AND ACCESSORIES				$63,802.92	$0.82
03.20.00	**CONCRETE REINFORCING**					
0001	Spread Footing Reinforcement	6,416.67	Lb.	$0.94	$6,006.00	$0.08
0002	Continuous Footing Reinforcement	25,705.07	Lb.	$0.94	$24,059.95	$0.31
0003	Grade Beam Reinforcement	63,000.00	Lb.	$0.94	$58,968.00	$0.76
0006	Slab on Grade Reinforcing steel	47,714.05	Lb.	$0.94	$44,660.35	$0.58
0017	Concrete Topping Reinforcement	115,863.00	Lb.	$0.94	$108,447.77	$1.40
Total -	CONCRETE REINFORCING				$242,142.06	$3.12
03.30.00	**CAST-IN-PLACE CONCRETE**					
0001	Finish to Slab On Grade	31,809.36	S.F.	$0.64	$20,326.18	$0.26
0001	Miscellaneous concrete - curbs, pads, etc.	77,498.79	S.F.	$0.23	$17,437.23	$0.23
0001	Spread Footing Concrete	53.47	C.Y.	$165.16	$8,831.42	$0.11
0002	Continuous Footing Concrete	142.81	C.Y.	$165.16	$23,585.69	$0.30
0003	Grade Beam Concrete	350.00	C.Y.	$165.16	$57,805.65	$0.75
0006	Elevator pit	3.00	Ea.	$8,653.99	$25,961.96	$0.33
0007	Finish to floor deck fill	77,242.79	S.F.	$0.64	$49,358.14	$0.64
0007	Slab on Grade Concrete including placing	539.97	C.Y.	$162.34	$87,660.42	$1.13
0008	Add for thickened edges at slab on grade	31.73	C.Y.	$156.51	$4,966.79	$0.06

Estimate Name: Sample Medical Office Building
Estimate Number: 00-1000.00

Division	Description	Quantity	Unit	Unit Price	Cost	Cost / Area
0014	3 1/2" thick lightweight concrete topping	1,230.00	C.Y.	$225.00	$276,750.00	$3.57
Total -	CAST-IN-PLACE CONCRETE				$572,683.48	$7.39
Total - CONCRETE					**$878,628.46**	**$11.34**
05.00.00	**METALS**					
05.10.00	**STRUCTURAL METAL FRAMING**					
0001	Structural Steel	463.45	Ton	$3,240.00	$1,501,566.88	$19.38
0002	Miscellaneous bolts and connections	46.35	Ton	$3,777.53	$175,102.51	$2.26
0002	Roof screen, corrugated metal panels, including tube steel framing	2,600.00	S.F.	$44.59	$115,923.60	$1.50
Total -	STRUCTURAL METAL FRAMING				$1,792,592.99	$23.13
05.30.00	**METAL DECKING**					
0001	3", 18 ga. metal deck	45,689.43	S.F.	$5.00	$228,629.90	$2.95
0002	1 1/2", 18 ga. metal deck	31,553.36	S.F.	$3.87	$122,111.52	$1.58
0003	Deck Edging, 16 Ga	3,529.42	L.F.	$7.71	$27,222.42	$0.35
Total -	METAL DECKING				$377,963.83	$4.88
05.50.00	**METAL FABRICATIONS**					
0001	Miscellaneous metals	77,498.79	S.F.	$0.90	$69,748.91	$0.90
0001	Stair, metal pan, concrete fill, 4'-8" wide	6.00	Flight	$22,500.00	$135,000.00	$1.74
Total -	METAL FABRICATIONS				$204,748.91	$2.64
Total - METALS					**$2,375,305.74**	**$30.65**
06.00.00	**WOOD**					
06.10.00	**ROUGH CARPENTRY**					
0001	Exterior walls, densglas	21,073.88	S.F.	$2.55	$53,675.18	$0.69
Total -	ROUGH CARPENTRY				$53,675.18	$0.69
06.40.00	**ARCHITECTURAL WOODWORK**					
0001	Base cabinets, plastic laminate countertops	775.00	L.F.	$363.56	$281,755.13	$3.64
0001	Wood paneling	2,975.95	S.F.	$31.32	$93,206.87	$1.20

Estimate Name: Sample Medical Office Building
Estimate Number: 00-1000.00

Division	Description	Quantity	Unit	Unit Price	Cost	Cost / Area
0002	Plywood paneling at telephone rooms	2,975.95	S.F.	$5.33	$15,855.88	$0.20
0002	Upper cabinets	387.00	L.F.	$185.47	$71,777.66	$0.93
0003	Worktop, laminated, including all supports	155.00	L.F.	$151.87	$23,539.23	$0.30
0004	Full height cabinets	221.00	L.F.	$341.24	$75,412.94	$0.97
0005	Vanity units, solid surface countertop	126.00	L.F.	$369.00	$46,494.00	$0.60
0008	Miscellaneous Casework Allowance (MOB)	77,498.79	S.F.	$2.25	$174,372.28	$2.25
Total - ARCHITECTURAL WOODWORK					$782,413.98	$10.10
Total - WOOD					**$836,089.16**	**$10.79**
07.00.00	**THERMAL AND MOISTURE PROTECTION**					
07.20.00	**THERMAL PROTECTION**					
0001	R-19 batt insulation, exterior walls	22,276.27	S.F.	$1.13	$25,261.29	$0.33
0001	Rigid roof insulation, poly iso insulation	31,553.36	S.F.	$3.49	$110,184.35	$1.42
0001	Vapor Barrier Beneath Slab on Grade	31,809.36	S.F.	$0.36	$11,451.37	$0.15
0001	Weather barrier membrane	21,073.88	S.F.	$2.70	$56,899.48	$0.73
0002	Vapor control barrier	31,809.36	S.F.	$3.47	$110,219.45	$1.42
Total - THERMAL PROTECTION					$314,015.93	$4.05
07.40.00	**ROOFING AND SIDING PANELS**					
0001	Rainscreen system including support	21,073.88	S.F.	$44.59	$939,600.11	$12.12
Total - ROOFING AND SIDING PANELS					$939,600.11	$12.12
07.50.00	**MEMBRANE ROOFING**					
0001	Single ply membrane roofing	31,553.36	S.F.	$7.20	$227,184.22	$2.93
Total - MEMBRANE ROOFING					$227,184.22	$2.93
07.60.00	**FLASHING AND SHEET METAL**					
0002	Sheetmetal (on a SF GFA basis)	77,498.79	S.F.	$1.20	$92,766.05	$1.20
Total - FLASHING AND SHEET METAL					$92,766.05	$1.20
07.70.00	**ROOF AND WALL SPECIALTIES AND ACCESSORIES**					
0001	Access hatch	3.00	Ea.	$2,379.76	$7,139.29	$0.09
0002	Walkway pads	1,078.06	S.F.	$9.00	$9,702.56	$0.13

Estimate Name: Sample Medical Office Building
Estimate Number: 00-1000.00

Division	Description	Quantity	Unit	Unit Price	Cost	Cost / Area
Total - ROOF AND WALL SPECIALTIES AND ACCESSORIES					$16,841.85	$0.22
07.80.00	**FIRE AND SMOKE PROTECTION**					
0001	Fireproofing to steelwork	509.80	Ton	$276.74	$141,082.62	$1.82
0001	Firesafing at perimeter walls	2,092.00	L.F.	$8.72	$18,244.36	$0.24
Total - FIRE AND SMOKE PROTECTION					$159,326.99	$2.06
07.90.00	**JOINT PROTECTION**					
0001	Miscellaneous caulking and sealants	77,498.79	S.F.	$0.25	$19,529.70	$0.25
Total - JOINT PROTECTION					$19,529.70	$0.25
Total - THERMAL AND MOISTURE PROTECTION					**$1,769,264.84**	**$22.83**
08.00.00	**OPENINGS**					
08.10.00	**DOORS AND FRAMES**					
0001	Interior SC Wood Door, Single	250.00	Ea.	$1,506.03	$376,508.25	$4.86
0002	Interior SC Wood Door, Double	28.00	Pair	$2,889.63	$80,909.64	$1.04
0003	Interior HM Door, Single	13.00	Ea.	$1,477.02	$19,201.22	$0.25
0004	Interior HM Door, Double	1.00	Pair	$2,833.72	$2,833.72	$0.04
Total - DOORS AND FRAMES					$479,452.83	$6.19
08.30.00	**SPECIALTY DOORS AND FRAMES**					
0001	Ceiling access panels, 24" x 24"	31.00	Ea.	$155.84	$4,831.16	$0.06
0001	Exterior sliding glass doors	1.00	Ea.	$6,750.00	$6,750.00	$0.09
0001	Smoke containment doors	6.00	Ea.	$8,421.11	$50,526.67	$0.65
Total - SPECIALTY DOORS AND FRAMES					$62,107.83	$0.80
08.40.00	**ENTRANCES**					
0001	Curtainwall vision glazing	4,809.55	S.F.	$81.71	$392,993.08	$5.07
0001	Exterior aluminum windows/storefront, vision glazing, generic	4,114.00	S.F.	$67.34	$277,028.53	$3.57
0002	Curtainwall spandrel glazing	1,202.39	S.F.	$86.67	$104,210.91	$1.34
Total - ENTRANCES					$774,232.52	$9.99

Estimate Name: Sample Medical Office Building
Estimate Number: 00-1000.00

Division	Description	Quantity	Unit	Unit Price	Cost	Cost / Area
08.50.00	**WINDOWS**					
0001	Interior windows	310.00	S.F.	$54.76	$16,974.10	$0.22
Total - WINDOWS					$16,974.10	$0.22
08.70.00	**HARDWARE**					
0002	Automatic door opening, per double leaf set	1.00	Ea.	$3,043.21	$3,043.21	$0.04
0003	Interior door panic hardware, per leaf	16.00	Ea.	$664.38	$10,630.08	$0.14
Total - HARDWARE					$13,673.29	$0.18
Total - OPENINGS					**$1,346,440.56**	**$17.37**
09.00.00	**FINISHES**					
09.20.00	**PLASTER AND GYPSUM BOARD**					
0001	5/8" thick gypsum board X, finished, interior of exterior	21,073.88	S.F.	$3.18	$66,951.72	$0.86
0001	Cementitious backerboard at tiled walls	3,719.94	S.F.	$3.55	$13,190.91	$0.17
0001	Miscellaneous blocking/strapping and backing	77,498.79	S.F.	$0.09	$6,974.89	$0.09
0002	Exterior metal stud framing, 6" 18 ga at 16" O.C.	21,073.88	S.F.	$9.13	$192,320.25	$2.48
0002	Interior gypsum board, 5/8" thick, finished (l4), type X	154,842.59	S.F.	$2.98	$461,276.06	$5.95
0003	Interior gypsum board, 5/8" thick, unfinished	5,231.17	S.F.	$2.03	$10,593.12	$0.14
0004	Interior gypsum board, 1" thick coreboard at shaft walls	5,231.17	S.F.	$3.74	$19,585.49	$0.25
0004	Interior metal stud framing, 6", 16 GA, at 16" OC	17,204.73	S.F.	$6.48	$111,486.66	$1.44
0005	Gypsum board ceilings, including framing	7,749.88	S.F.	$12.00	$92,975.30	$1.20
0006	Gypsum board soffit drops, including framing	7,750.00	S.F.	$14.37	$111,390.75	$1.44
0006	Interior metal stud framing, 3 5/8", 20 GA, at 16" OC	51,614.20	S.F.	$4.65	$240,160.85	$3.10
0007	Interior metal stud framing, 2 1/2", 20 GA, at 24" OC, furring	12,903.55	S.F.	$4.14	$53,420.69	$0.69
0012	Notched and flat backing	4,898.75	L.F.	$5.45	$26,673.69	$0.34
0014	Interior metal stud shaft framing, 4" CH, 20 GA, at 24" OC	5,231.17	S.F.	$6.37	$33,333.01	$0.43
Total - PLASTER AND GYPSUM BOARD					$1,440,333.40	$18.59
09.30.00	**TILING**					
0001	Ceramic floor tile	3,874.94	S.F.	$13.89	$53,811.29	$0.69
0001	Ceramic wall tile	3,719.94	S.F.	$14.34	$53,332.81	$0.69
0002	Quarry floor tile	1,549.98	S.F.	$16.32	$25,290.96	$0.33

Estimate Name: Sample Medical Office Building
Estimate Number: 00-1000.00

Division	Description	Quantity	Unit	Unit Price	Cost	Cost / Area
0003	Stone flooring	2,324.96	S.F.	$51.18	$118,998.62	$1.54
0004	Ceramic tile base	929.99	L.F.	$13.85	$12,881.23	$0.17
0005	Quarry tile base	371.99	L.F.	$16.60	$6,173.62	$0.08
0006	Stone base	557.99	L.F.	$36.06	$20,122.84	$0.26
Total - TILING					$290,611.35	$3.75
09.50.00	**CEILINGS**					
0001	ACT ceilings, 2'-0" x 4'-0"	63,549.01	S.F.	$4.46	$283,682.78	$3.66
0001	Suspended wood panel ceiling system	2,324.96	S.F.	$20.12	$46,766.65	$0.60
Total - CEILINGS					$330,449.42	$4.26
09.60.00	**FLOORING**					
0001	Carpeting	7,749.88	S.F.	$2.90	$22,459.15	$0.29
0001	Sealed concrete	3,874.94	S.F.	$1.33	$5,161.42	$0.07
0003	Resilient base	4,649.93	L.F.	$2.86	$13,308.09	$0.17
0004	Rubber base, 4"	12,089.81	L.F.	$6.12	$73,989.65	$0.95
0006	Resilient sheet flooring	7,749.88	S.F.	$6.30	$48,824.24	$0.63
0007	Resilient tile flooring	50,374.21	S.F.	$8.78	$442,033.73	$5.70
Total - FLOORING					$605,776.28	$7.82
09.70.00	**WALL FINISHES**					
0001	Fabric wrapped acoustic wall panels	2,975.95	S.F.	$11.32	$33,693.75	$0.43
0002	FRP panels	2,975.95	S.F.	$10.22	$30,426.15	$0.39
0003	Vinyl wall covering	2,975.95	S.F.	$3.89	$11,570.51	$0.15
Total - WALL FINISHES					$75,690.40	$0.98
09.80.00	**ACOUSTIC TREATMENT**					
0001	Interior sound batt insulation, unbacked	104,623.37	S.F.	$0.86	$89,452.98	$1.15
Total - ACOUSTIC TREATMENT					$89,452.98	$1.15
09.90.00	**PAINTING AND COATING**					
0004	Interior door paint finish, per leaf	321.00	Ea.	$91.65	$29,418.69	$0.38
0005	Paint walls	203,118.54	S.F.	$0.74	$149,901.49	$1.93
0006	Paint gypsum board ceilings / soffit drops	7,749.88	S.F.	$0.86	$6,626.15	$0.09

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Division	Description	Quantity	Unit	Unit Price	Cost	Cost / Area
0007	Paint exposed ceiling	3,874.94	S.F.	$1.56	$6,033.28	$0.08
Total - PAINTING AND COATING					$191,979.60	$2.48
Total - FINISHES					**$3,024,293.44**	**$39.02**
10.00.00	**SPECIALTIES**					
10.10.00	**INFORMATION SPECIALTIES**					
0001	Interior code and wayfinding signage	77,498.79	S.F.	$1.98	$153,447.61	$1.98
Total - INFORMATION SPECIALTIES					$153,447.61	$1.98
10.20.00	**INTERIOR SPECIALTIES**					
0001	Bathroom mirrors	504.00	S.F.	$29.84	$15,036.84	$0.19
0001	Toilet Cubicle, Standard, stainless steel	12.00	Ea.	$1,443.87	$17,326.44	$0.22
0002	Coat hook	40.00	Ea.	$22.83	$913.32	$0.01
0002	Toilet Cubicle, Handicap, stainless steel	6.00	Ea.	$1,555.98	$9,335.90	$0.12
0003	Grab bars	56.00	Ea.	$153.41	$8,591.18	$0.11
0003	Miscellaneous Wall Protection (MOB)	77,498.79	S.F.	$0.99	$76,723.80	$0.99
0003	Urinal screen, stainless steel	6.00	Ea.	$500.71	$3,004.24	$0.04
0004	Janitor mop sink rack	8.00	Ea.	$102.56	$820.44	$0.01
0005	Paper towel dispenser combo unit, recessed	34.00	Ea.	$276.74	$9,409.19	$0.12
0006	Sanitary napkin dispenser	3.00	Ea.	$310.38	$931.15	$0.01
0007	Sanitary napkin disposal	25.00	Ea.	$138.38	$3,459.38	$0.04
0008	Seat cover dispenser	40.00	Ea.	$104.73	$4,189.32	$0.05
0009	Shower accessories, per stall	1.00	Ea.	$793.04	$793.04	$0.01
0010	Soap dispenser	42.00	Ea.	$74.11	$3,112.45	$0.04
0011	Toilet paper dispenser	40.00	Ea.	$65.13	$2,605.32	$0.03
Total - INTERIOR SPECIALTIES					$156,252.01	$2.02
10.40.00	**SAFETY SPECIALTIES**					
0001	Fire extinguisher and cabinet	31.00	Ea.	$332.80	$10,316.86	$0.13
Total - SAFETY SPECIALTIES					$10,316.86	$0.13
10.50.00	**STORAGE SPECIALTIES**					
0001	Lockers, 2-tier including concrete base	51.67	Ea.	$198.26	$10,243.33	$0.13

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Estimate Number: 00-1000.00

Division	Description	Quantity	Unit	Unit Price	Cost	Cost / Area
Total - STORAGE SPECIALTIES					$10,243.33	$0.13
10.70.00	**EXTERIOR SPECIALTIES**					
0001	Exterior canopy, including structure	1,460.00	S.F.	$180.00	$262,800.00	$3.39
Total - EXTERIOR SPECIALTIES					$262,800.00	$3.39
Total - SPECIALTIES					**$593,059.80**	**$7.65**
11.00.00	**EQUIPMENT**					
11.70.00	**HEALTHCARE EQUIPMENT**					
0001	Installation of OFCI equipment	77,498.79	S.F.	$1.04	$80,211.25	$1.04
Total - HEALTHCARE EQUIPMENT					$80,211.25	$1.04
Total - EQUIPMENT					**$80,211.25**	**$1.04**
12.00.00	**FURNISHINGS**					
12.20.00	**WINDOW TREATMENTS**					
0001	Mechoshade, manual	4,860.45	S.F.	$12.41	$60,323.04	$0.78
0002	Mechoshades, motorized	1,215.11	S.F.	$18.05	$21,926.70	$0.28
Total - WINDOW TREATMENTS					$82,249.74	$1.06
Total - FURNISHINGS					**$82,249.74**	**$1.06**
13.00.00	**SPECIAL CONSTRUCTION**					
13.40.00	**INTEGRATED CONSTRUCTION**					
0001	Premium for lead wall shielding at imaging rooms	640.00	S.F.	$24.77	$15,851.52	$0.20
0003	Lead-shielded door, single	1.00	Ea.	$4,000.00	$4,000.00	$0.05
0004	Lead-shielded glazing	16.00	S.F.	$200.00	$3,200.00	$0.04
Total - INTEGRATED CONSTRUCTION					$23,051.52	$0.30
Total - SPECIAL CONSTRUCTION					**$23,051.52**	**$0.30**

Estimate Name: Sample Medical Office Building
Estimate Number: 00-1000.00

Division	Description	Quantity	Unit	Unit Price	Cost	Cost / Area
14.00.00	**CONVEYING EQUIPMENT**					
14.20.00	**ELEVATORS**					
0001	Elevator cab finishes	2.00	Ea.	$9,000.00	$18,000.00	$0.23
0001	Hydro elevator, per stop	6.00	Stop	$29,198.61	$175,191.66	$2.26
Total -	ELEVATORS				$193,191.66	$2.49
Total - CONVEYING EQUIPMENT					**$193,191.66**	**$2.49**
21.00.00	**FIRE SUPPRESSION**					
21.10.00	**WATER-BASED FIRE-SUPPRESSION SYSTEMS**					
0001	Fire Protection Systems (MOB)	77,498.79	S.F.	$4.23	$327,819.89	$4.23
Total -	WATER-BASED FIRE-SUPPRESSION SYSTEMS				$327,819.89	$4.23
Total - FIRE SUPPRESSION					**$327,819.89**	**$4.23**
22.00.00	**PLUMBING**					
22.00.01	**PLUMBING**					
0001	Plumbing Systems (MOB)	77,498.79	S.F.	$25.00	$1,937,469.79	$25.00
Total -	PLUMBING				$1,937,469.79	$25.00
Total - PLUMBING					**$1,937,469.79**	**$25.00**
23.00.00	**HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)**					
23.00.01	**HVAC**					
0001	HVAC Systems (MOB)	77,498.79	S.F.	$40.00	$3,099,951.66	$40.00
Total -	HVAC				$3,099,951.66	$40.00
Total - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)					**$3,099,951.66**	**$40.00**
25.00.00	**INTEGRATED AUTOMATION**					
25.50.00	**INTEGRATED AUTOMATION FACILITY CONTROLS**					

Estimate Name: Sample Medical Office Building
Estimate Number: 00-1000.00

Division	Description	Quantity	Unit	Unit Price	Cost	Cost / Area
0001	DDC Controls (MOB)	77,498.79	S.F.	$4.50	$348,744.56	$4.50
Total -	INTEGRATED AUTOMATION FACILITY CONTROLS				$348,744.56	$4.50
Total - INTEGRATED AUTOMATION					**$348,744.56**	**$4.50**
26.00.00	**ELECTRICAL**					
26.00.01	**ELECTRICAL**					
0001	Electrical Systems (MOB)	77,498.79	S.F.	$41.28	$3,199,150.12	$41.28
Total -	ELECTRICAL				$3,199,150.12	$41.28
Total - ELECTRICAL					**$3,199,150.12**	**$41.28**
27.00.00	**COMMUNICATIONS**					
27.00.01	**COMMUNICATIONS**					
0001	Communications Systems (MOB)	77,498.79	S.F.	$6.60	$511,492.02	$6.60
Total -	COMMUNICATIONS				$511,492.02	$6.60
Total - COMMUNICATIONS					**$511,492.02**	**$6.60**
28.00.00	**ELECTRONIC SAFETY AND SECURITY**					
28.00.01	**ELECTRONIC SAFETY AND SECURITY**					
0001	Electrical Safety and Security Systems (MOB)	77,498.79	S.F.	$6.41	$496,767.25	$6.41
Total -	ELECTRONIC SAFETY AND SECURITY				$496,767.25	$6.41
28.30.00	**ELECTRONIC DETECTION AND ALARM**					
0001	Fire Alarm System, complete (MOB)	77,498.79	S.F.	$3.38	$261,558.42	$3.38
Total -	ELECTRONIC DETECTION AND ALARM				$261,558.42	$3.38
Total - ELECTRONIC SAFETY AND SECURITY					**$758,325.68**	**$9.79**
31.00.00	**EARTHWORK**					
31.20.00	**EARTH MOVING**					

Estimate Name: Sample Medical Office Building
Estimate Number: 00-1000.00

Division	Description	Quantity	Unit	Unit Price	Cost	Cost / Area
0001	Foundation Layout	31,809.36	S.F.	$0.24	$7,729.68	$0.10
0001	Spread Footing Excavation	80.21	C.Y.	$17.36	$1,392.50	$0.02
0002	Spread Footing Backfill	26.74	C.Y.	$15.07	$402.81	$0.01
0003	Spread Footing Haul excess	53.47	C.Y.	$10.43	$557.77	$0.01
0004	Continuous Footing Excavation	214.21	C.Y.	$17.36	$3,718.88	$0.05
0005	Continuous Footing Backfill	71.40	C.Y.	$15.07	$1,075.76	$0.01
0006	Continuous Footing Haul excess	142.81	C.Y.	$10.43	$1,489.61	$0.02
0007	Grade Beam Excavation	525.00	C.Y.	$17.36	$9,114.53	$0.12
0008	Grade Beam Backfill	175.00	C.Y.	$15.07	$2,636.55	$0.03
0009	Grade Beam Haul excess	350.00	C.Y.	$10.43	$3,650.85	$0.05
0016	Slab on Grade Sand base - 4"	31,809.36	S.F.	$1.42	$45,232.92	$0.58
0017	Slab on Grade Gravel sub base - 6"	31,809.36	S.F.	$1.24	$39,507.23	$0.51
Total -	EARTH MOVING				$116,509.06	$1.50
Total - EARTHWORK					**$116,509.06**	**$1.50**
33.00.00	**UTILITIES**					
33.40.00	**STORM DRAINAGE UTILITIES**					
0001	Perimeter drain	778.94	L.F.	$26.07	$20,309.34	$0.26
Total -	STORM DRAINAGE UTILITIES				$20,309.34	$0.26
Total - UTILITIES					**$20,309.34**	**$0.26**
Subtotal Direct Cost					**$21,567,890.04**	**$278.30**

Section 10 – Glossary

- Medical Office Building (MOB) – Office building separate from a Hospital that can contain physician offices as well as exam rooms, pharmacies, optical services, imaging, and other outpatient services.
- BIM – Building Information Modeling often referring to the containment of digital information in three dimensions of a building
- Dprofiler – a type of BIM tool used for estimating that contains cost information and is commonly used at an early conceptual level
- Benchmark – historical projects used as comparison points for current projects
- Escalation – the increase or decrease in costs over time based on market conditions, inflation, and other factors
- Normalization – the modifying of costs to reflect the same date in time, the same geographical location, and the same complete fit-out of building space