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HTETCO Limestone Veneer on an Exterior Wall

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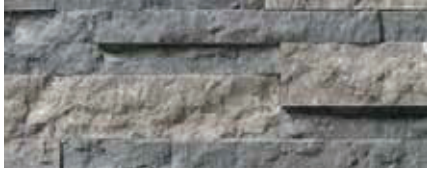

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SECTION 1: INTRODUCTION

This technical paper is intended to provide the reader with a general understanding of how to effectively estimate limestone veneer. It outlines the components of a limestone veneer estimate including labor, productivity, material, freight, taxes, profit, overhead, escalation, mobilization, mock-ups, equipment, location, safety, size of job, and collecting historical data.

CONSTRUCTION SPECIFICATIONS INSTITUTE

MAIN MASTERFORMAT CSI DIVISION:
04400 - Stone

MAIN MASTERFORMAT CSI SUBDIVISION:
044200 – Exterior Stone Cladding

BRIEF DESCRIPTION

The author will discuss how to measure quantity of limestone and other materials that go into a limestone veneer along with various factors that will affect the cost estimate including size of job, location, specifications, safety, and logistics. The author will also explain numerous mark-ups that will apply to a limestone veneer estimate including taxes, profit, overhead, escalation, mobilization, mockup, freight, and equipment rental. Instruction will be given on how to analyze the estimate and what ratios and rules of thumb to look for when reviewing a finished estimate along with possible reasons an estimate might vary from those rules of thumb. Lastly, the author will touch on the importance of historical data in estimating limestone and the appropriate steps that should be taken after a job is complete in order to become an accurate estimator.

Section 2: Measurements

Quantity take-offs for manufactured masonry units is ordinarily done on a per unit basis, but limestone veneer is not estimated in this way. Because limestone is a naturally occurring material and is cut to such a variety of different patterns and sizes of blocks, the take-off measurement is done in square feet (SF).

Other components included in a limestone veneer estimate are masonry ties (by EA), mortar net (by LF), cast stone (by LF), drip edge (by LF), termination bar (by LF), flashing (by LF), grout (by CF), rigid insulation (by SF), mortar (by CF), and weep holes (by EA). Information on the requirements for these components can be found in the plans and specifications. Once the quantity of limestone veneer has been determined, the quantities of all other components can be determined based on the requirements stated in the plans and specifications. For example: if the masonry ties are specified to be every 16 inches on center, the estimator can calculate the number of ties based on the square footage of wall. The estimator must analyze sections of the exterior wall in order to be sure all of the parts and pieces are accounted for, and then read the masonry specifications to make sure all of this information is included in the estimate.

When performing quantity take-off for limestone veneer it is vital that the estimator check the depth of the brick ledge below grade on the structural drawings. Often the correct depth below grade is not on the architectural sheets, and if a mistake is made here it will result in an inaccurate quantity of materials. The estimator should not rely solely on architectural sheets when performing quantity take-off.

Section 3: Specific Factors to Consider in Takeoff and Pricing

The estimator should evaluate on a case by case basis a number of factors that will affect the price of a limestone veneer wall.

QUANTITY OF LIMESTONE

The estimator must identify how large of a job the project is. A small patch job might require expensive equipment that is not offset by the size of the job overall causing the price per square foot of limestone to be very high. A large building with a high percentage of limestone on the building façade will be less expensive per square foot because the cost of mobilization and equipment will be spread out over more square footage of material and have less of an overall impact.

LOCATION OF QUARRY

The massive weight of stone causes the freight and shipping costs to be high. If the stone which is specified can be locally sourced the cost of the freight will be significantly less expensive than if the stone has to be shipped long distances. The estimator should always consider the distance the stone must be shipped and incorporate this into the estimate.

Additionally, different types of masonry ship differently; a limestone with split back will cost more to ship than a limestone with a sawn back. The material supplier is a resource in calculating what the costs of freight will be.

COLORS

Stones that are more dense are more expensive to process than less dense stones. The color of the stone effects the density, and the difference in material price for different colors can be as much as $4 per square foot of stone. It is vital that the estimator check this detail and make the appropriate adjustments. This is especially important in a conceptual estimate where the estimator is likely not provided with a specification and would be using historical material pricing rather than reaching out to a quarry for pricing. The estimator should clarify what color choices are included or excluded in the estimate.

FINISHES

Any extra handling or processing of the stone by the manufacturer will add to the cost of material. The specifications should be checked for things such as honed face or sawn back. Anything that causes the material to be handled again will impact the material pricing. In the case of a conceptual estimate the estimator must clarify what finishes are included.

HEIGHT OF WALLS

The height of walls affect the cost in more than one way.

The first thing to consider is that the most expensive components of the wall are at the bottom: the weeps, the mortar net, and water-proofing below grade. Productivity on the bottom three feet of wall is low because the mason has to incorporate all of these components into his work. Another battle with productivity on the bottom three feet of wall is simply that the mason has to do a lot of bending over, and this wears quickly on the installer.

The second thing to consider regarding height of limestone walls is equipment and scaffolding requirements. The height of the limestone veneer will determine what kind of equipment is required and for how long. The estimator should determine based on the project schedule what pieces of equipment will be needed and for how long. It is more economical to utilize an 8000 pound 42 foot machine for the majority of the job and add a second lift of 10,000 pounds and 55 foot height as needed rather than renting the larger machine for the duration of the project.

CREW SIZE AND PRODUCTIVITY

Crew size and productivity are key factors in determining the cost of a masonry job. While it is true that increased productivity leads to lower costs, more masons does not equal higher productivity; unfortunately it is more complicated than that.

The size of the building, the length of the masonry runs, and the amount of wall that will be ready at once are all vital in selecting the appropriate crew size of for a job. It provides no benefit to have 10 masons on the job if there is only enough room for 5 to work at a time. Having two 5-person crews might be a good solution, but this will only work if there are two locations for the crews to work. On a congested site or a small masonry job, two crews will not be able to work simultaneously. Another factor to consider is cure time of mortar; the estimator must consider what the maximum number of lifts is per day is for the mortar specified. Productivity of crews is not one size fits all, but must be analyzed on a case by case basis taking into account job size, number of openings and breaks in masonry runs, and logistical constraints.

For example, a long blank wall of limestone on a building presents few challenges and the crew will have high productivity. If the limestone is broken up into many smaller pieces, or if the wall has multiple doors and windows to flash and detail, productivity will be less. The pattern in the block and the size of the block is another major factor in determining productivity. If the architect has shown a pattern that will involve the masons spending time hunting and picking through block in order to find pieces appropriate to fit the look, this will negatively affect productivity. If the pattern has blocks large enough to require two men to set, this will also significantly slow productivity.

Escalation will be determined based on the time-line of the job. If the job is not starting right away, or if the estimator anticipates an increase in material or labor rates during the job, it is smart to include this in the estimate.

WEATHER

Most construction trades are affected by weather in one way or another, and masonry is no different. The estimator must consider the time of year that the work will be completed and factor in winter weather protection as needed.

Section 4: Overview of costs and approach to mark-ups

Before performing take-off, some preliminary estimating components must be determined. Begin by setting up the tax rate, profit, overhead, escalation, mobilization, and mockup.

The tax rate can be determined by reviewing the request for bid. Some jobs will be tax exempt. In these instances, sales tax on materials can be omitted.

Profit and overhead may stay the same from job to job, but can be affected by certain factors. If the job or client is particularly difficult, an increase here might be necessary.

Escalation will be determined based on the time-line of the job. If the job is not starting right away, or if the estimator anticipates an increase in material or labor rates during the job, it is smart to include this in the estimate.

The specifications will indicate what the requirements are for a mock-up. Some jobs will only call for a small section of wall to be mocked-up for review by the design team; others will call for something much bigger. It is important to review this and be sure to include enough money in the estimate to meet the requirement.

Section 5: Special Risks

SAFETY

The estimator should always review safety requirements on a job specific bases. OSHA standards need to be met at a minimum, but a job specific safety plan will always need to be performed and incorporated into the estimate.

Some questions the estimator must evaluate are:

- Will fall protection be required?
- Are tie off points provided?
- Will masons be sharing scaffolding with another trade, and if so who is responsible for inspecting it?
- Does my lift meet OSHA safety measures, or will I need to plan on renting one?
- Will I need to build and remove temporary guardrail anywhere or will this be provided for me?
- Are safety nets needed?

It's a good idea to review these questions with the safety manager in order to be sure the proper dollars are allocated for safety in the estimate.

As a general rule of thumb 66% of the estimate will be labor and 33% will be material. The estimate should be checked at the end to verify that there are no huge discrepancies with this rule of thumb ratio.

Section 6: Ratios and Analysis

As a general rule of thumb 66% of the estimate will be labor and 33% will be material. The estimate should be checked at the end to verify that there are no huge discrepancies with this rule of thumb ratio. If this check does not yield approximately 66% labor and 33% material, there could potentially be a math error in the estimate.

Limestone veneer is typically $45-$55 per square foot, but there are many factors that could swing this cost up or down. The cost per square foot is calculated at the end, and in the event that it does not fall into that range, it must be determined what the cause is. Some possible reasons that an estimate may not follow the general rules of thumb are:

- Particularly large blocks require two masons to set, and this can drive labor costs up.
- A limestone veneer job that is only a wainscot will cost more per square foot than a full height wall because the most expensive components of the wall are in the bottom three feet. Mortar net, weeps, termination bar, and waterproofing all occur in the bottom three feet of wall.

- A small job will have a higher unit price because line items like mobilization and mockup weigh more heavily in the estimate.

For example:
Job A comes to around a 60/40 ratio for labor and material, and the overall unit price of the veneer is $48/sf. Neither of these checks are cause for concern as they follow the general rules of thumb.

Job B comes to 75/22 ratio for labor and material, and the overall unit price of the veneer is $67/sf. This seems a little off, and the estimate should be checked for errors. Some possible reasons that the general rule of thumb might not apply to Job B include:

- This is a small job; the cost of mobilizing and doing a mock-up are weighing heavily on the cost per square foot
- Perhaps the blocks on this façade are large and require multiple masons to place. This might explain the expensive labor cost.

These rules of thumb can be useful when developing a conceptual estimate for limestone veneer. Generally applying $45 per square foot is a good assumption for the entire assembly including all parts and pieces, equipment, overhead, etc. All of the factors in Section 3 should be considered before submitting a conceptual square foot price for limestone veneer, and the estimator must always list assumptions and clarifications with a conceptual estimate in order to communicate the specifics of what is included in the estimate.

	Job A	Job B
Square Feet	21,000 sf	2,000 sf
Labor	Labor $600,000	Labor $100,000
Materials	Material $400,000	Material $30,000
Mobilization	Mobilization $2,000	Mobilization $2,000
Mock-Up	Mockup $1,500	Mockup $1,500
Total	**Total: $1,003,500**	**Total $133,500**
Cost / SF	$47.79	$66.75
Labor Percentage	60%	75%
Material Percentage	40%	22%

Section 7: Miscellaneous pertinent information

Methods of estimating limestone veneer are varied, but using a data-driven estimating program will enable fast and easy updates to the estimate and will ensure consistently accurate bids.

Data such as material costs, labor costs, crew size, and productivity are stored in the program, and once take-off is complete those costs and productivity are applied to the estimate automatically. It is important to check and update this data frequently.

Tracking data is an important part of the estimator's job, and this takes place at the end of the project. The costs of work need to be reviewed with the project team and any lessons learned need to be documented. This data is valuable to use for future estimates and should be stored accordingly. Some examples of valuable historical data include:

- Work for Client A routinely includes extra meetings, future estimates for Client A need extra time for a project manager to attend meetings.
- The price of limestone recently increased, adjustments to the data stored in the estimating software needs to be updated.
- A re-negotiation with the labor union has resulted in wage increases for hod carriers, data stored in the estimating software needs to be updated.
- An intricate pattern in a limestone wall took fewer man hours to create than were in the estimate, this data should be stored so that it can be referenced for future estimates.

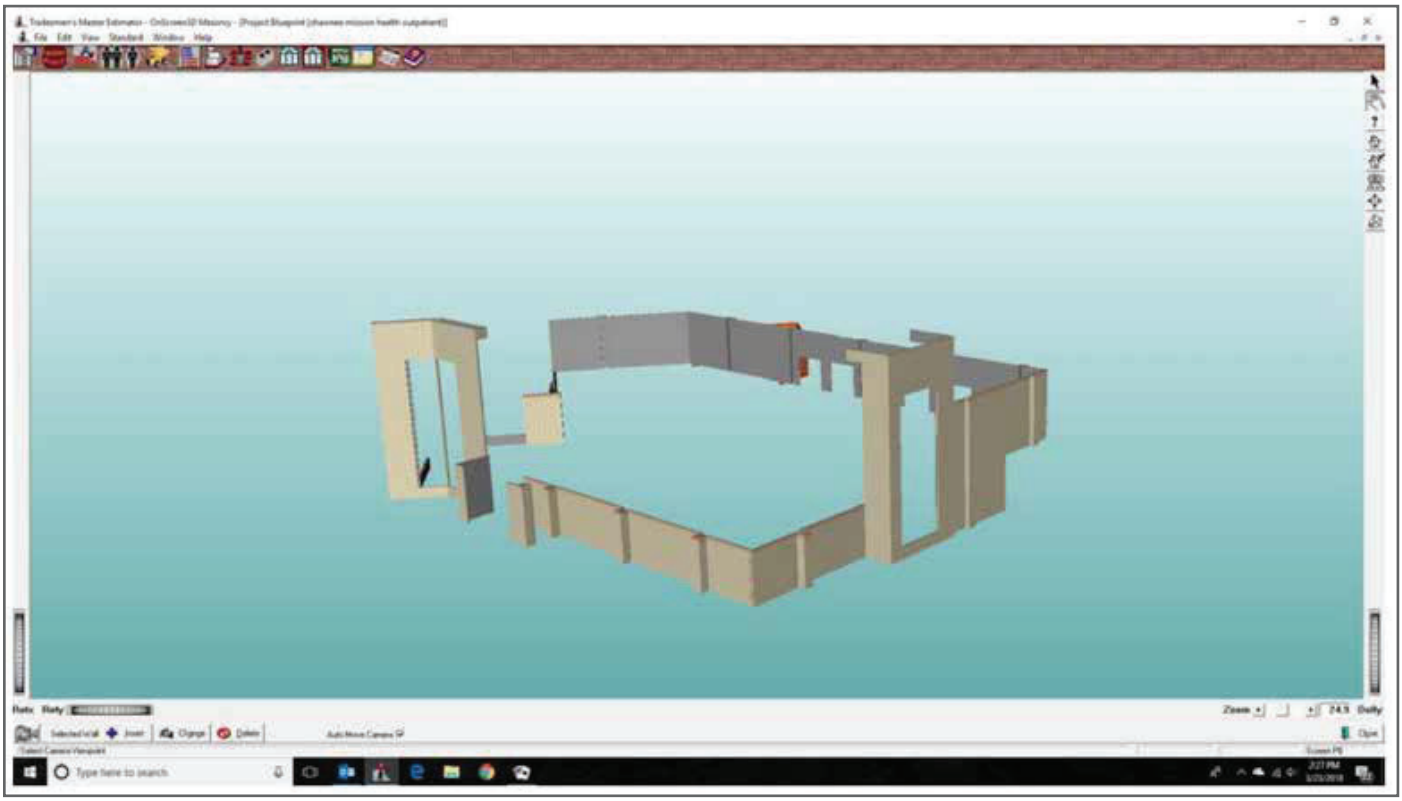
Historical costs are invaluable when putting together an estimate. Anyone can do the take-off and get material pricing from a supplier, but knowing how long it will take to complete a job is not an exact science; it is something that comes with experience. This experience is easier to share with others if historical costs are kept in an organized spreadsheet. The estimator should have a spreadsheet that tracks, on every project, the following:

- Project Name
- Brief Description
- Quantity of material
- Material Price - estimated
- Material Price - actual
- Man hours - estimated
- Man hours – actual
- Bid amount
- Actual Cost
- Actual Cost – escalated to today's dollars
- Embedded link or path to where the estimate is saved

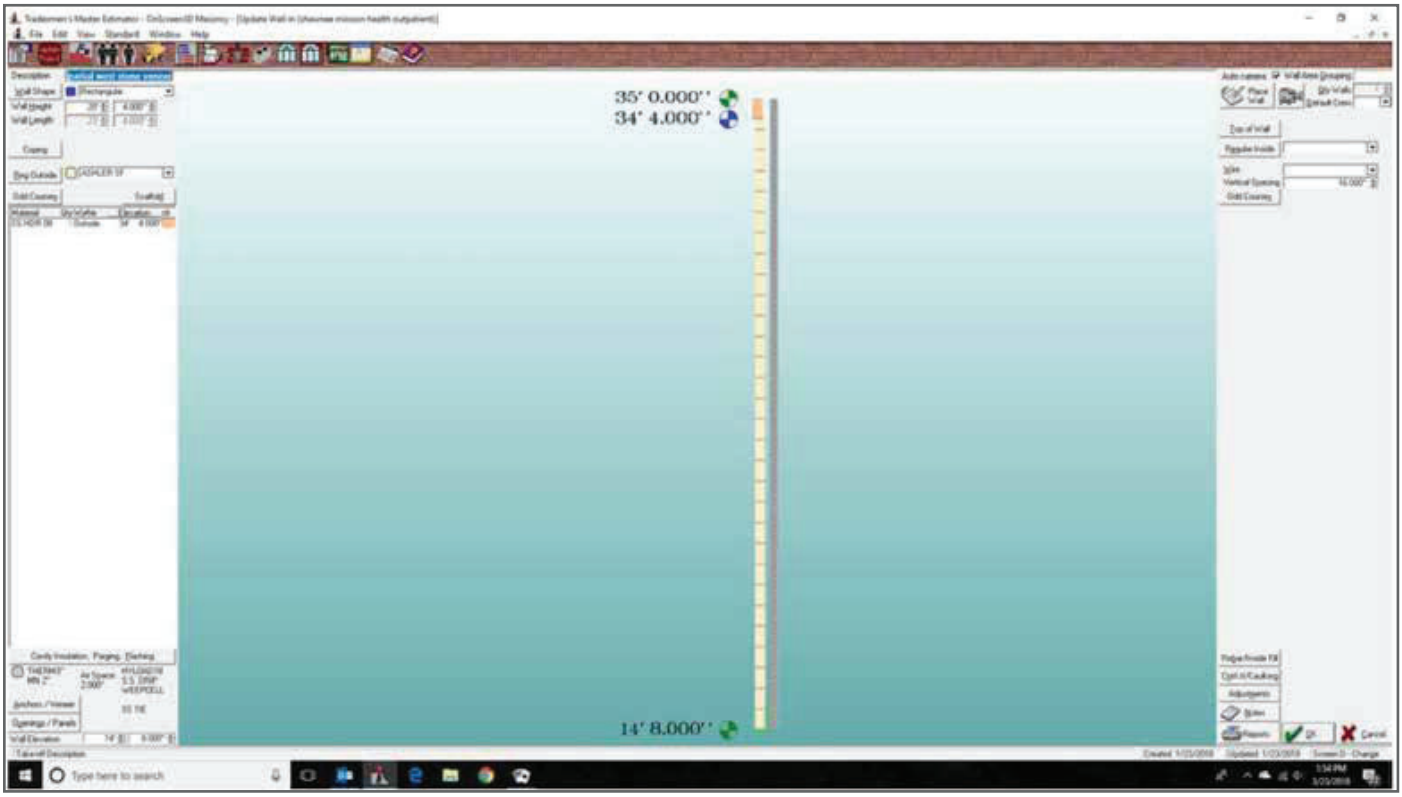
The organization of historical data and of old estimates is vital to the growth of the estimator. Referencing previous estimates and going back to similar projects to determine things such as crew size and productivity will make for more accurate estimates.

Section 8: Sample Sketch

Isometric View:



Wall Section:



Section 9: Sample Takeoff and Pricing Sheet

Take-Off

Material	Take-Off	Units	Quantity including waste
Stainless Steel Masonry Ties	3,519	EA	3,519
2" Mortar Net	276	LF	276
Cast Stone 8"	212	LF	212
Stainless Steel Drip + Term Bar	276	LF	276
Hyload 18" Flashing	276	LF	276
2500 PSI Grout	57	CF	57
Thermal 3" Rigid Insulation	6,179	SF	6,179
Limestone in Sq Ft (1% Waste)	6,181	SF	6,243
Mortar	56	CF	56
Cell Vent Weep Holes	138	EA	138

Material:Unit Pricing

Material		Units	$/Unit
Stainless Steel Masonry Ties		EA	$ 0.90
2" Mortar Net		LF	$ 2.90
Cast Stone 8"		LF	$ 20.00
Stainless Steel Drip + Term Bar		LF	$ 1.50
Hyload 18" Flashing		LF	$ 3.50
2500 PSI Grout		CF	$ 5.80
Thermal 3" Rigid Insulation		SF	$ 0.25
Limestone in Sq Ft (1% Waste)		SF	$ 10.00
Mortar		CF	$ 6.22
Cell Vent Weep Holes		EA	$ 0.45

Equipment

Equipment	Cost/Day	Days	Cost
Lull	150.00	22	$ 3,300.00

Labor: Crew Hourly Costs Breakdown

Crew	Base Salary	Fringe Benefits	Labor Burden	Total Cost Per Hour
Brick Foreman	$ 37.74	$ 19.56	$ 9.42	$ 66.72
Brick Layer	$ 34.74	$ 19.56	$ 8.67	$ 62.97
Labor Foreman	$ 32.64	$ 14.93	$ 6.58	$ 54.15
Laborer	$ 30.09	$ 14.93	$ 6.07	$ 51.09
Engineer	$ 34.61	$ 12.97	$ 6.94	$ 54.52

Productivity

Material	Lay-Rate Units/Day)	$/Units
Stainless Steel Masonry Ties	200	$ 3.89
2" Mortar Net	4,000	$ 0.16
Cast Stone 8"	80	$ 10.49
Stainless Steel Drip + Term Bar	2,000	$ 0.40
Hyload 18" Flashing	400	$ 2.10
2500 PSI Grout	96	$ 8.60
Thermal 3" Rigid Insulation	0	—
Limestone in Sq Ft (1% Waste)	40	$ 21.18
Mortar	0	—
Cell Vent Weep Holes	2,400	$ 0.30

Estimate

Material	Take-Off	Units	Qty including Waste	Lay-Rate (Units/Day)	Labor		Material		Days
					$/Unit	$ Total	$/Unit	$ Total	
Stainless Steel Masonry Ties	3,519	EA	3,519	200	$ 3.89	$ 13,689.00	$ 0.90	$ 3,167.00	17.60
2" Mortar Net	276	LF	276	4000	$ 0.16	$ 44.00	$ 2.90	$ 800.00	0.10
Cast Stone 8"	212	LF	212	80	$ 10.49	$ 2,224.00	$ 20.00	$ 4,240.00	2.70
Stainless Steel Drip + Term Bar	276	LF	276	2000	$ 0.40	$ 110.00	$ 1.50	$ 414.00	0.10
Hyload 18" Flashing	276	LF	276	400	$ 2.10	$ 580.00	$ 3.50	$ 966.00	0.70
2500 PSI Grout	57	CF	57	96	$ 8.60	$ 490.00	$ 5.80	$ 331.00	0.60
Thermal 3" Rigid Insulation	6,179	SF	6,179	0	$ 0.00	$ 0.00	$ 0.25	$ 1,545.00	0.00
Limestone in Sq Ft (1% Waste)	6,181	SF	6,243	40	$ 21.18	$ 130,914.00	$ 10.00	$ 62,428.00	154.50
Mortar	56	CF	56	0	$ 0.00	$ 0.00	$ 6.22	$ 348.00	0.00
Cell Vent Weep Holes	138	EA	138	2400	$ 0.30	$ 41.00	$ 0.45	$ 62.00	0.10
				TOTALS		**$ 148,092.00**		**$ 74,301.00**	

SUMMARY

Material		Overhead	Profit	Total including OH&P
Material Costs	$ 74,301.00			
Taxes (0%)	$ —	20%	10%	
Material Total	$ 74,301.00	$ 14,860.27	$ 7,430.14	$ 96,591.78
Labor		**Overhead**	**Profit**	**Total including OH&P**
Base Salary	$ 84,211.00			
Fringe Benefits	$ 44,235.00			
Labor Burden	$ 19,647.00	20%	10%	
Crew Labor Cost	$ 148,092.00	$ 29,618.50	$ 14,809.25	$ 192,520.24
Equipment		**Overhead**	**Profit**	**Total including OH&P**
Lull	$ 3,300.00	15%	10%	
Equip Total	$ 3,300.00	$ 495.00	$ 330.00	$ 4,125.00
Miscellaneous		**Overhead**	**Profit**	**Total including OH&P**
Mobilization	$ 2,000.00			
Mock-Up	$ 1,000.00			
Freight	$ 14,000.00	15%	10%	
Misc. Total	$ 17,000.00	$ 2,550.00	$ 1,700.00	$ 21,250.00
		15%	10%	**Bid Price**
Grand Total	**$ 242,694.00**	***$47,523.77***	**$ 24,269.39**	**$ 314,487.00**

CHECKS

Average Cost Per Square Foot		Without Misc or OH&P	With Misc and OH&P	Total Square Feet
		$ 36.00	$ 49.59	6,342.22
Percent Labor	61%			
Percent Material	31%			

Section 10 – Glossary

Brick Ledge – A Brick ledge is part of the concrete foundation of the building where masonry veneer is intended to rest.

Escalation – Escalation is the anticipated increase in price as a result of inflation and levels of market construction activity.

Hod Carrier – A Hod Carrier is a laborer who carries materials for masons.

Mock-Up – A mock-up is a small model or sample of something large that has not yet been built.

Take-Off – material take-off refers to generating a material list by analyzing the building plans and doing a quantitative measure or count of each item required for construction.

Wainscot – A wainscot in masonry refers to a short wall which is usually about four feet tall and typically has some sort of cap at the top.