



## **Appendix B**

### **Activity Duration Calculations**

<b>Original Design</b>	SF	Production Rate	Days to complete
<b>Masonry Veneer</b>		sf/day	
Tech Theater & Black Box	2,800	145	20
Music Multimedia	3,344	145	24
Stair 1	1,122	145	8
South Façade of West Teaching Wing	4,382	145	31
West Façade of West Teaching Wing	4,064	145	29
North Façade of West Teaching Wing	4,780	145	33
<b>Curtain Wall</b>	-		
South Lobby and Vestibule	1,096	180	7
North Lobby & 2 floor offices	1,140	180	7
Stair 2 & West End Corridor	2,220	180	13
Stair 1	320	180	2
Light Monitors	480	180	3
North Lobby	480	180	3
Smith Theater Lobby	756	180	5
<b>Metal Panels</b>	-		
South Façade	2,376	250	10
West Façade	340	250	2
North Façade	3,328	250	14

<b>Alternative A</b>	SF	Production Rate	Days to complete
<b>Original Design, crew size x 2</b>		sf/day	
<b>Masonry Veneer, 2 crews</b>			
Tech Theater & Black Box	2,800.00	246.50	12.00
Music Multimedia	3,344.00	246.50	14.00
Stair 1	1,122.00	246.50	5.00
South Façade of West Teaching Wing	4,382.00	246.50	18.00
West Façade of West Teaching Wing	4,064.00	246.50	17.00
North Façade of West Teaching Wing	4,780.00	246.50	20.00
<b>Curtain Wall, 2 crews</b>	-		
South Lobby and Vestibule	1,096.00	306.00	4.00
North Lobby & 2 floor offices	1,140.00	306.00	4.00
Stair 2 & West End Corridor	2,220.00	306.00	8.00
Stair 1	320.00	306.00	2.00
Light Monitors	480.00	306.00	2.00
North Lobby	480.00	306.00	2.00
Smith Theater Lobby	756.00	306.00	3.00
<b>Metal Panels, 2 crews</b>	-		
South Façade	2,376.00	425.00	6.00
West Façade	340.00	425.00	1.00
North Façade	3,328.00	425.00	8.00



<b>Alternative B</b>			
<b>Original Design</b>	SF	Production Rate	Days to complete
<b>Masonry Veneer, 2 crews</b>		sf/day	
Tech Theater & Black Box	2,800.00	246.50	12.00
Music Multimedia	3,344.00	246.50	14.00
Stair 1	1,122.00	246.50	5.00
South Façade of West Teaching Wing	4,382.00	246.50	18.00
West Façade of West Teaching Wing	4,064.00	246.50	17.00
North Façade of West Teaching Wing	4,780.00	246.50	20.00
<b>Curtain Wall</b>	-		
South Lobby and Vestibule	1,096.00	180.00	7.00
North Lobby & 2 floor offices	1,140.00	180.00	7.00
Stair 2 & West End Corridor	2,220.00	180.00	13.00
Stair 1	320.00	180.00	2.00
Light Monitors	480.00	180.00	3.00
North Lobby	480.00	180.00	3.00
Smith Theater Lobby	756.00	180.00	5.00
<b>Metal Panels</b>	-		
South Façade	2,376.00	250.00	10.00
West Façade	340.00	250.00	2.00
North Façade	3,328.00	250.00	14.00

<b>Alternative D</b>			
<b>Redesign</b>	SF	Production Rate	Days to complete
<b>Masonry Veneer</b>		sf/day	
Tech Theater & Black Box	2,800.00	145.00	20.00
Music Multimedia	3,344.00	145.00	24.00
Stair 1	1,122.00	145.00	8.00
South Façade of West Teaching Wing	6,482.00	145.00	45.00
West Façade of West Teaching Wing	4,404.00	145.00	31.00
North Façade of West Teaching Wing	5,380.00	145.00	38.00
<b>Curtain Wall, 2 crews</b>	-		
South Lobby and Vestibule	1,096.00	180.00	7.00
North Lobby & 2 floor offices	1,140.00	180.00	7.00
Stair 2 & West End Corridor	2,220.00	180.00	13.00
Stair 1	320.00	180.00	2.00
Light Monitors	480.00	180.00	3.00
North Lobby	480.00	180.00	3.00
Smith Theater Lobby	756.00	180.00	5.00
<b>Metal Panels, 2 crews</b>	-		
South Façade	-	250.00	-
West Façade	-	250.00	-
North Façade	3,004.00	250.00	13.00



## Production Rate Calculations

### One Crew:

Production rates and the associated labor for each system is the following, based on one crew.

Masonry: 145 square feet daily output = 141 days = 28 weeks

Curtain Wall: 180 square feet daily output = 36 days = 8 weeks

Aluminum Panels: 250 square feet daily output = 25 days = 5 weeks

The curtain wall and aluminum panels are scheduled to start after 85% of the masonry was is complete. For one crew on the job 85% completion will be at about week 24.

This will cause an estimated overlap of four weeks. With this four week overlap the total duration of the façade erection is 37 weeks.

**General conditions costs** = \$13,544 / wk x 37 wks = \$ 501,128

Man hours:

Masonry = 5 man crew x 8 hr work day x 142 days = 5,680 man hours

Curtain Wall = 4 man crew x 8 hr work day x 37 days = 1,184 man hours

Aluminum Panels = 4 man crew x 8 hr work day x 25 days = 800 man hours

Labor Costs:

Masonry = 5,680 man hours x \$48.62 / mh = \$276,162

Curtain Wall = 1,184 man hours x \$59.08 / mh = \$69,951

Aluminum Panels = 800 man hours x \$46.31 / mh = \$37,048

**Total labor costs** = \$383,160

**Total cost** (general conditions + labor costs) = \$884,288



### **Two Crews:**

Production rates and the associated labor for each system is the following, based on two crews each. A 15% loss of productivity is applied to all output.

Masonry:	247 square feet daily output = 83 days	= 17 weeks
Curtain Wall:	306 square feet daily output = 21 days	= 4 weeks
Aluminum Panels:	425 square feet daily output = 14 days	= 3 weeks

The curtain wall and aluminum panels are scheduled to start after 85% of the masonry was is complete. For one crew on the job 85% completion will be at about week 15.

This will cause an estimated overlap of two weeks. With this two week overlap the total duration of the façade erection is 22 weeks.

**General conditions costs** = \$13,544 / wk x 22 wks = \$ 297,968

Man hours:

Masonry = 10 man crew x 8 hr work day x 83 days	=	6,650 man hours
Curtain wall = 8 man crew x 8 hr work day x 21 days	=	1,357 man hours
Aluminum Panels = 8 man crew x 8 hr work day x 14 days	=	910 man hours

Labor Costs:

Masonry = 6,640 man hours x \$48.62 / mh	=	\$323,350
Curtain wall = 1,344 man hours x \$59.08 / mh	=	\$80,219
Aluminum Panels = 896 man hours x \$46.31 / mh	=	\$42,149

**Total labor costs** = \$445,718

**Total cost** (general conditions + labor costs) = \$743,686

### **Conclusion:**

Additional cost of labor for two crews: \$ 62,558

Savings from general conditions: \$ 203,160

Total Savings: \$140,602 and 15 weeks on the construction schedule



## Cost Calculations

<b>Original Sequence</b>									
Crew Size		Total	Daily output	\$/Mh	Duration		ManHours	\$	G. Conditions @ \$13,544 / wk x 37 wks
					days	wks			
5	Masonry	20,492	145	\$ 48.62	142.00	28.00	5,680.00	\$ 276,162	
4	Curtain Wall	6,492	180	\$ 59.08	37.00	8.00	1,184.00	\$ 69,951	
4	Aluminum Panels	6,044	250	\$ 46.31	25.00	5.00	800.00	\$ 37,048	
								\$ 383,160	\$ 501,128

<b>Alternative A</b>									
Crew Size		Total	Daily output	\$/Mh	Duration		ManHours	\$	G. Conditions @ \$13,544 / wk x 22 wks
					days	wks			
10	Masonry	20,492	247	\$ 48.62	84.00	17.00	6,720.00	\$ 326,726	
8	Curtain Wall	6,492	306	\$ 59.08	22.00	4.00	1,408.00	\$ 83,185	
8	Aluminum Panels	6,044	425	\$ 46.31	15.00	3.00	960.00	\$ 44,458	
								\$ 454,369	\$ 297,968

<b>Alternative B</b>									
Crew Size		Total	Daily output	\$/Mh	Duration		ManHours	\$	G. Conditions @ \$13,544 / wk x 25 wks
					days	wks			
10	Masonry	20,492	247	\$ 48.62	84.00	17.00	6,720.00	\$ 326,726	
4	Curtain Wall	6,492	180	\$ 59.08	37.00	4.00	1,184.00	\$ 69,951	
4	Aluminum Panels	6,044	250	\$ 46.31	25.00	3.00	800.00	\$ 37,048	
								\$ 433,725	\$ 338,600

<b>Alternative D</b>									
Crew Size		Total	Daily output	\$/Mh	Duration		ManHours	\$	G. Conditions @ \$13,544 / wk x 39 wks
					days	wks			
5	Masonry	23,532	145	\$ 48.62	163.00	33.00	6,520.00	\$ 317,002	
4	Curtain Wall	6,492	180	\$ 59.08	37.00	8.00	1,184.00	\$ 69,951	
4	Aluminum Panels	3,004	250	\$ 46.31	13.00	3.00	416.00	\$ 19,265	
								\$ 406,218	\$ 528,216



## Assembly Estimate Summary

Howard Community College  
Arts & Humanities Instructional Building  
Assemblies Estimate Breakdown  
April 3, 2006

Noah J. Ashbaugh  
Construction Management

Comparison Table					
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ORIGINAL DESIGN				Costs		
	No. of Units			Mat.	Inst.	Total
Curtain Wall	6,492 sf	Total	\$	101,794.6	\$ 43,171.8	\$ 144,966.4
Masonry Wall	20,492 sf	Total	\$	135,247.2	\$ 342,216.4	\$ 477,463.6
Prefinished Aluminum Panels	6,044 sf	Total	\$	20,428.7	\$ 26,291.4	\$ 46,720.1
<b>Total Cost</b>				<b>\$</b>	<b>257,470.5</b>	<b>\$ 411,679.6</b>

REDESIGN				Costs		
	No. of Units			Mat.	Inst.	Total
Curtain Wall	6,492 sf	Total	\$	101,794.6	\$ 43,171.8	\$ 144,966.4
Masonry Wall	23,532 sf	Total	\$	155,311.2	\$ 392,984.4	\$ 548,295.6
Prefinished Aluminum Panels	3,004 sf	Total	\$	10,153.5	\$ 13,067.4	\$ 23,220.9
<b>Total Cost</b>				<b>\$</b>	<b>267,259.3</b>	<b>\$ 449,223.6</b>

	Total Cost	Difference
Original Design	\$ 669,150	\$ (47,333)
Redesign	\$ 716,483	