

MHP CONSTRUCTION COST STUDY

November 2007

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Executive Summary:

Using actual construction data on 38 newly built multi-family housing developments in eastern Massachusetts in the years 2002 through 2006, MHP conducted a study of the range of construction costs for these projects and sought to identify the key determining factors on these costs.

Key Findings:

- The median (and also average) construction cost in the sample was \$177,000 unit. The weighted average construction cost in the sample was \$152,000/unit and \$127/sf. There was wide variability in construction costs among the projects, with a range of \$112,000 to \$289,000 per unit and \$96 to \$239 per square foot.
- We examined five variables that were believed to have an effect on construction costs: project size, building size, project location, wage rate requirements, and affordability. While the sample size was too small for a full-blown statistical analysis, a 6-dimensional chart was constructed that showed that projects built in urban locations, those consisting of smaller buildings and/or those with fewer units, and those with prevailing wage requirements were more expensive than those without these characteristics. Subsidized affordable projects did not appear to be significantly more expensive than unsubsidized projects when controlling for these other variables.
- We also consulted R. S. Means data, comparing Boston-area multi-family construction costs with those of selected other U.S. cities, and found Boston to be among the most expensive locations nationally for this type of building.

Background:

In the 1st quarter of 2006, MHP initiated a study seeking to determine how the construction costs for affordable housing developments in Massachusetts, which appeared to many observers to be unacceptably high, can be explained. Of particular interest was whether projects built for affordability for low- and moderate-income residents were more expensive to build per unit than those built for market-rate residents.

We determined that an analysis of construction cost based on actual data would enhance understanding of this issue. Therefore, we engaged Matthew Yarmolinsky, a professional construction consultant, to help design and implement such an analysis. We collected detailed, trade item data from more than 40 projects built in eastern Massachusetts in the last several years. We eliminated a few projects that had physical characteristics so unusual as to make them not relevant to the question being addressed, such as assisted living developments (with food service and other amenities built into project design) and a 9-unit project whose underground parking component made it unusually expensive compared to other projects in the database. The final count of projects in the database is 38, whose components are outlined under *Key Characteristics of the Database*, below.

These data came from as-complete hard cost information from projects financed by MHP, MassHousing, Massachusetts Housing Investment Corporation (MHIC), Bank of America, and Wainwright Bank. Our thanks to the following representatives of these organizations who assisted in providing construction cost data on projects in their portfolios: Joe Flatley and Bruce Ehrlich from MHIC, Nancy Andersen, Ray Johnson and Diane Georgopoulos at MassHousing, Nora Bloch and Sarah Kitterman at Wainwright Bank, and Mike Hatfield and Mike Rosenberg at Bank of America.

Specifically, the format of the data obtained for the study came either from final requisitions for payment on AIA Forms G-702 and G-703 (Application for Payment and Continuation Sheet), or from as-complete One-Stop reports submitted by developers to lenders as part of required cost certifications.

Within these 38 projects we discovered, as expected, a range of ways in which the developers, architects and builders of these projects organized their construction budgets. The AIA trade item breakdown system is designed to ensure comparable data across projects, but, even within that discipline, there is significant room for discretionary decisions about how certain costs in a project are categorized. For example, one schedule might place floor tile costs under "Tile Work", while another schedule might place this cost under "Resilient Flooring"; one schedule might lump Doors and Windows into a single line item, while another would keep them separate.

In response to this problem, consultant Yarmolinsky made adjustments in the raw data that improved comparability, by detecting "outlier" or illogical elements of the raw data and reconciling them according to his knowledge of trade item costs he has observed in his professional experience. With these adjustments, it is our judgment that the comparability of the data is satisfactory.

No soft cost information was gathered, as that was beyond the scope of this study. General Conditions and Contractor Overhead and Profit, on the other hand, were tracked in the study.

Upon the completion of data reconciliation, as described above, by consultant Yarmolinsky, we conducted an analysis of the determinants of costs. We selected four variables, or "attributes", which were both readily measurable and which we believed might have an impact on costs. These variables and our analysis of them are described under *Key Characteristics of the Database* below.

In presenting our conclusions, we are mindful of the limitations in analyzing data of this type and drawing clear conclusions regarding cause and effect. The sample size of 38 provides enough empirical evidence for us to draw conclusions about the factors influencing costs within this group of projects. It does not, on the other hand, allow us to make firm conclusions about relative construction costs in the multi-family housing industry at large. But we do believe the data does allow us to make some observations about the determinants of construction cost, and we hope this analysis will provoke thoughtful discussion about the issue of construction cost in both affordable and market-rate housing that may lead to improved information for housing developers and public policy makers.

Key Characteristics of the Database:

The database consists of 38 completed, new-construction projects in eastern Massachusetts, which we defined as Worcester and east, including the Cape. All the projects were completed and put into service not earlier than January 2001. There are no rehab projects included in the database. All the data, which we obtained from the final requisitions for completed projects, was adjusted into current 2006 dollars through the use of a conversion factor obtained from R.S. Means Company derived from a large regional database.

The 38 projects contain a total of 3,514 units in 219 buildings, for average project sizes across the database of 92 units per project and just less than 6 buildings per project.

See **Exhibit 1A** for summary data about the projects and **Exhibit 1B** for a list of the specific project attributes.

The 38 projects include projects of various locations, building sizes, market orientations, and wage rate characteristics. We categorized each project according to the following five sets of *attributes*, which are outlined below:

- **Location:** 19 projects are in urban locations, 19 in suburban locations. This designation was determined based on the characteristics of the site, rather than the legal jurisdiction in which the project is located. Sites with ample nearby space for staging purposes during construction, and with reasonably easy access, were designated “suburban”, while those located in densely built neighborhoods, thus providing minimal nearby staging space, were designated “urban”.
- **Building Size:** 18 projects consist of small buildings, 20 projects consist of large buildings. Small-building projects are defined as those with small footprints and consisting of 3 or fewer stories, while large-building projects have large footprints and/or a minimum of 4 stories.
- **Project Size:** The 38 projects range from 6 to 330 units (average is 92 units per project).
- **Targeting:** 24 projects were targeted primarily to households of low- and moderate-income; 14 projects were targeted primarily to market households. It should be noted that 40B projects meeting the minimum or near-minimum level of affordability were categorized as “market”, while projects financed

with tax credits and/or other affordability-related subsidies were categorized as “affordable”.

- **Wage Rates:** 28 projects were built by open shop contractors, 10 by contractors paying prevailing wages.

We selected these five attributes, after consultation with experts in multi-family construction and design, in that they represented attributes whose impact on cost we believed were important to analyze and in that the data covering these attributes was readily available. That being said, we are aware that these five attributes are by no means a complete list of the determinants of construction cost. It is the limitations inherent in data available to this study that has required us to limit our analysis to these five attributes.

Presentation of the Data:

We created a spreadsheet, for each project, consisting of the 52 line items under the AIA trade item system. **Exhibit 2** displays all this data, both for the entire 38-project portfolio, and for each of the four attribute groupings. It provides a reasonable set of trade item-specific data against which other projects may be usefully compared.

Based on this spreadsheet, we aggregated the data into the following combined categories for purposes of data presentation:

- “Building Costs (excluding General Conditions)” – includes all construction costs from foundation to completion, but excludes all costs related to the site;
- “Site Costs (excluding General Conditions)” – includes earthwork, site utilities, roads and walks, landscaping, geotechnical and environmental work, demolition, and other site improvements;
- “General Conditions” – includes the indirect construction costs; including costs such as fencing, utilities during construction, and contractor’s project management and site supervision costs;
- “Overhead and Profit” – contractor overhead and profit

We converted these data into separate presentations of cost/unit and cost/sf, in order to achieve a point of comparison across the projects. Exhibits 3A and 3B, respectively, display the per-unit and per-sf data on separate sheets, while Exhibits 4, 5, and 6 show the per-unit and per-sf data on the same sheet. The tables also show percentage variances data, usually in the form of variance off of the average.

We then grouped these data into four of the five attributes outlined above – Location (urban/suburban), Building Size (large buildings/small buildings), Targeting (affordable/market), and Wage Rates (prevailing wage / open shop). The Basic Results charts (**Exhibit 3A**, for cost/unit, and **Exhibit 3B**, for cost/sf) show these results by these four individual sets of categories.

As will be discussed in the Findings section below, we were not satisfied with these independent comparisons, as we felt they were concealing the relative impacts of the

four selected attributes. Therefore, we further broke the 38 projects into groupings of combined attributes. This allowed us, for example, to compare the costs for *urban affordable* projects with those for *suburban affordable* projects, or to compare the costs for *large-building market* projects with those for *large-building affordable* projects. The combined data are shown in **Exhibits 4 through 6**, as outlined below. In these tables the cost/unit and cost/sf data are shown on the same page for each group of combined attributes:

- **Exhibit 4** : Targeting (affordable/market) combined with Location (urban/suburban)
- **Exhibit 5**: Two sets of attributes combined – Targeting combined with Building Size; and Location combined with Building Size;
- **Exhibit 6**: Targeting combined with Wage Rate (prevailing wage / open shop).

Exhibit 7 presents, in color bubble chart form, a composite way of showing the impacts of multiple attributes on cost that illustrates patterns more clearly than do the individual tables. And **Exhibit 8** shows, from external R. S. Means data, the construction costs for a typical apartment building in Boston versus seven other cities around the U.S. All these exhibits will be referred to in the *Findings* section below.

Findings:

Before turning to our findings, an important comment about the nature of the data in this study is needed.

A Word on Methodology:

The key challenge in the interpretation of the data for any study seeking to determine the impact of multiple variables on a given outcome is to separate, to the best degree possible, the impacts on the outcome caused by the various attributes being studied. In this case, there is a risk that an apparent determinant of construction cost could actually be camouflaging the impact of a separate, independent determinant. The usual statistical method for separating these cause-and-effect relationships is regression analysis; but, unfortunately, that methodology requires a larger database than was available in this study.

As noted in the Background section above, we are particularly concerned here with learning what we can about the impact of affordability targeting on cost – that is, did the projects in this database that are targeted to low- and moderate-income tenants and buyers cost significantly more than those focused on market-rate tenants and buyers? While certain aspects of the data suggest, at first glance, that the affordable projects were more expensive – per unit and per square foot -- than the market-rate projects, we immediately wondered whether other factors common to these projects might be exercising an impact on cost that might have a stronger effect than the effect of affordability targeting.

Therefore, after displaying the information broken down solely by four of the five individual attributes, we have made an effort to separate these overlapping cause-and-effect relationships by drawing comparisons of cost figures between, for example, *affordable* suburban and *market* suburban projects. While even this analysis tool does not allow us to make statements applicable to multi-family construction in general, the cause-and-effect relationships observable among the subject 38 projects does at least suggest hypotheses that could be tested with further study of a larger database of projects.

Our Findings:

The data indicate that the 38 projects had a median cost of \$177,000 per unit and a weighted average cost of \$152,000/unit and \$127/sf. This differential, with the median cost being higher than the weighted average cost, reflects the fact that the larger projects in the study tended to be less expensive per unit to construct than the smaller projects.

NOTE: The weighted average figure was calculated by aggregating the costs for all the projects together and dividing by the aggregate number of units in the survey group. In this calculation, the larger projects will impact the result more heavily than the smaller projects.

The projects ranged widely around this average, from about \$112,000/unit to \$289,000/unit, and from \$96/sf to \$239/sf. Looked at independently, the five attributes do appear to have an impact on costs. Urban, affordable, small-building and prevailing wage projects in our sample are consistently more expensive than their opposite counterparts.

It goes beyond on the scope of this study to relate costs to the economics of providing affordable housing. It is worth noting, however, that, assuming that soft costs and acquisition costs add roughly one-third of the amount of a project's hard costs, it would take an average per-unit monthly rent of \$2000 to achieve coverage of expenses and debt service, assuming debt at 80% of costs and standard underwriting assumptions on operating costs and vacancy. A renter household income should not be less than \$72,000 to afford such a rent level without being unduly burdened by housing costs. To reach lower-income households, subsidy is clearly needed in order to make newly-constructed housing units affordable.

Returning to the results in the survey, the following points can be made about the individual attributes (*see Exhibits 3A and 3B*):

- Location: Urban projects appear to be more expensive than suburban (\$189,000/unit versus \$135,000; \$152/sf versus \$115/sf) – a 24% variance per unit and a 20% variance per square foot.
- Building Size: Small-building projects appear to be more expensive than large-building projects (\$180,000/unit versus \$144,000; \$154/sf versus \$120/sf). This amounts to a 19% premium per unit and a 21% premium per square foot for small-building projects.

- Wage Rates: Prevailing-wage projects appear to be more expensive than open-shop projects (\$204,000/unit versus \$144,000; \$177/sf versus \$120/sf). Here the variance is 34% on a per-unit basis and a 40% variance on a per-sf basis.
- Targeting: Affordable projects appear to be more expensive than market (\$167,000/unit versus \$143,000; \$164/sf versus \$110/sf). These data suggest a variance of 10% on a per-unit basis and a 29% variance on a per-sf basis.

However, we believe these measures of impact from the individual variables do not truly reflect the extent of their impacts, since the impacts of each attribute overlap to greater or lesser degrees with the impacts of other attributes. In order to discern more clearly what the relative impacts of these attributes on cost are, we then took the analysis further. As discussed above, given the size of the surveyed portfolio – 38 projects – we lack sufficient data to undertake a regression analysis that, with a larger database, would be of significant help in separating the impacts of each attribute upon cost. We did, however, note that it would be possible to compare market versus affordable costs holding other variables constant. And our findings are as follows:

- When we compare the eight (8) affordable projects built in the suburbs with the eleven (11) market projects built in the suburbs (see the figures in blue on **Exhibit 4**) – thus removing the impact of the location variable -- there is virtually no difference in weighted average cost/unit – the affordable and market projects both cost about \$135,000 per unit (see figures highlighted in blue). We could not meaningfully compare the *urban-located* market and affordable projects, since there were only three projects in the urban market group of projects – not enough to make a valid comparison.
- When we compare the ten (10) large affordable projects with the ten (10) large market projects – thus removing the impact of the project size variable (see the figures in blue on **Exhibit 5**) -- we find that the affordable projects cost only slightly more – about 5% -- than the market projects (\$149,000 vs \$142,000). We could not meaningfully compare the *small-building* market and affordable projects, since there were only four projects in the small-building market group – not enough to make a valid comparison.
- And when we compare the 13 open-shop affordable projects with the 15 open-shop market projects in the survey – thus removing the impact of the wage rate variable (see the figures in blue on **Exhibit 6**)-- we find that the affordable projects again cost only slightly more – about 5% -- than the market projects (also, \$149,000 vs \$142,000). We could not meaningfully compare the *prevailing-wage* market and affordable projects, since there was only one project in the prevailing-wage market group – not enough to make a valid comparison.

The comments above relate to cost-per-unit information. When cost-per-sf measures are used, there are much more significant differentials. The suburban group shows the affordable component to be 30% more expensive per square foot than the market component; the large-building group shows the affordable component to be 42% more expensive per square foot than the market component, and the prevailing wage group shows the affordable component to be 26% more expensive per square foot than the market component. These discrepancies can be partially explained by the difference in average unit size between affordable and market-rate projects. The units in the affordable projects surveyed were, on average, 21% smaller than the market rate units in the portfolio (1,296sf versus 1,020sf). Because of this size variance the affordable units have a higher proportion of their space taken with the components of housing – kitchens and bathrooms-- that are more expensive per square foot to build, which would explain the different variances between per-unit and per-sf costs.

What we believe to be the clearest way of distinguishing impacts among the four attributes is through a bubble chart that uses color and size to show relationships. We therefore constructed a multi-color bubble diagram (*Exhibit 7*), which combined building size data (size of each bubble) with combined pairs of attributes (location and target coded by color; prevailing wage projects identified with the initial "P"). on a chart with total units on the horizontal axis and cost per unit on the vertical axis. The median per-unit cost (\$177,000/unit) is shown with the horizontal gray line. We see several key conclusions from this chart:

- Regarding *Location*, the suburban projects (green-shaded bubbles) show cost/unit figures are primarily below the median \$177,000 line, while the urban projects (blue-shaded bubbles) show cost/unit figures that tend higher than suburban and higher than the median.
- Regarding *Building Size*: The larger bubbles, reflecting projects with larger buildings, for the most part tend to migrate to the lower end of the cost/unit spectrum.
- Regarding *Wage Rate*: The prevailing wage rate projects – those marked with the initial "P" – show cost-per-unit figures that are more expensive than the open-shop projects.
- Regarding *Affordability vs Market Targeting*: The affordable projects are shown in the lighter-shaded green and blue bubbles. From the diagram, it is evident that the affordable projects (the *lighter-shaded* blue and green bubbles) are, for the most part in the same cost range -- \$100,000 to \$225,000 per unit – as are the market projects (the *darker-shaded* blue and green bubbles) Looking at the light and dark *blue* bubbles, reflecting the urban-located projects, the lighter-shaded bubbles are for the most part not higher on the chart than the dark blue bubbles; those that are higher are prevailing-wage projects. And looking at the light and dark green bubbles, reflecting those with suburban locations, the costs reflected in these projects are clearly in the same general cost range (below \$200,000/unit).

In sum, we see this chart as further demonstration of the conclusions we feel are suggested by the earlier tables – that affordability targeting on its own does not appear in these 38 projects to be a factor that contributes to higher cost. The affordable projects that show up as being on the high side of the cost spectrum tend also to have the characteristics that clearly add to cost: urban locations, small building sizes, and prevailing wage labor requirements.

While we believe this is a useful observation, it is worth repeating here that we have looked only at five variables here to determine their impact on costs. Other factors – supply of building materials, regulatory requirements affecting design, labor market characteristics – will also impact cost. But, at least considering these attributes for which we have the data, we believe that the presence of affordability was not, on its own, the key factor in cost determination.

A Note on Regional Cost Differences:

We were interested, as part of this study, in learning something about costs in the Boston area as compared with other cities around the country. To do this we obtained data from R. S. Means showing a comparative set of costs, for both union and non-union projects, among eight urban areas, including large and medium-sized cities in several regions of the country, as of 2006, for a typical 20-unit 3-story wood-frame building with elevator. This is shown in **Exhibit 8**.

These data show Boston's costs are indeed higher than those for other urban areas. Comparing Boston to all the other cities combined, Boston projects cost 16% more for non-union projects and 15% more for union projects. These variances are wider for cities in the Sunbelt and the West and Midwest (Boston is 15-30% more expensive, on average), but even for the older industrial cities, like Detroit and Chicago, the variances are noticeable (2% to 8%).

**Exhibit 1A
PROJECTS INCLUDED IN DATABASE**

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Project Location (by Region)	# of Units	Attributes			
		<u>Location</u>	<u>Target</u>	<u>Labor</u>	<u>Building Size</u>
Metro Boston	64	Urban	Affordable	Prevailing	Small
Metro Boston	204	Urban	Market	Open	Large
Metro Boston	294	Urban	Market	Open	Large
Metro Boston	56	Urban	Affordable	Open	Large
Metro Boston	46	Urban	Affordable	Prevailing	Large
Metro Boston	19	Urban	Affordable	Prevailing	Small
Metro Boston	12	Urban	Affordable	Open	Small
Metro Boston	50	Urban	Affordable	Prevailing	Small
Metro Boston	34	Urban	Affordable	Open	Small
Metro Boston	41	Urban	Affordable	Open	Small
Metro Boston	26	Urban	Affordable	Open	Small
Metro Boston	67	Urban	Affordable	Open	Large
Metro Boston	26	Urban	Affordable	Prevailing	Large
Metro Boston	19	Urban	Market	Open	Large
Metro Boston	44	Urban	Affordable	Prevailing	Small
Metro Boston	15	Suburban	Market	Open	Small
Metro Boston	40	Urban	Affordable	Prevailing	Small
Metro Boston	24	Urban	Affordable	Prevailing	Large
Metro West	280	Suburban	Market	Open	Large
Metro West	156	Suburban	Market	Open	Large
Metro West	330	Suburban	Market	Open	Large
Metro West	40	Suburban	Market	Open	Small
Northeast	120	Suburban	Market	Open	Large
Northeast	60	Suburban	Market	Prevailing	Large
Northeast	24	Urban	Affordable	Open	Large
Northeast	192	Suburban	Market	Open	Large
Northeast	24	Urban	Affordable	Open	Large
Northeast	15	Suburban	Affordable	Open	Small
Northeast	18	Suburban	Market	Open	Small
Southeast	192	Suburban	Market	Open	Small
Southeast	304	Suburban	Market	Open	Large
Southeast	96	Suburban	Affordable	Open	Small
Southeast	47	Suburban	Affordable	Open	Small
Southeast	18	Suburban	Affordable	Open	Small
Southeast	6	Suburban	Affordable	Open	Small
Southeast	132	Suburban	Affordable	Open	Large
Southeast	79	Suburban	Affordable	Prevailing	Large
Southeast	300	Suburban	Affordable	Open	Large
38	3514				

Exhibit 1B

MHP CONSTRUCTION COST STUDY SUMMARY OF CONTENTS OF DATABASE

11/7/2007

Overall Characteristics		Broken Down By Single Variables		Broken Down By Groups of Dual Variables	
Number of Projects	38	Target	14	Size and Target	4
Number of Buildings	219	Number of Market-Rate Projects	24	Number of Small Market-Rate Projects	10
Number of Units	3,514	Number of Affordable Projects		Number of Large Market-Rate Projects	14
Average Buildings/Project	5.8	Location	19	Number of Small Affordable Projects	10
Average Units/Project	92.5	Number of Urban Projects	19	Number of Large Affordable Projects	38
		Number of Suburban Projects			
				Size and Location	
		Building Size	18	Number of Small Urban Projects	9
		Number of Projects with Small-Building Footprints	20	Number of Large Urban Projects	10
		Number of Projects with Large-Building Footprints		Number of Small Suburban Projects	9
		Wage Rate	10	Number of Large Suburban Projects	10
		Number of Projects with Prevailing Wage Req'ts	28		38
		Number of Projects with Open Shop Wages		Target and Location	
				Number of Affordable Urban Projects	16
				Number of Affordable Suburban Projects	8
				Number of Market Urban Projects	3
				Number of Market Suburban Projects	11
					38
				Wage Rate and Location	
				Number of Open Shop Urban Projects	11
				Number of Open Shop Suburban Projects	17
				Number of Prevailing Wage Urban Projects	8
				Number of Prevailing Wage Suburban Projects	2
					38

**Exhibit 2
DETAILED TRADE LINE-ITEM BREAKDOWNS for ALL PROJECTS and BY ATTRIBUTE**

	BUILDING SIZE										TARGET			LOCATION			WAGE RATES		
	ALL PROJECTS		ALL SMALL		ALL LARGE		ALL AFFORDABLE		ALL MARKET		ALL URBAN		ALL SUBURBAN		ALL OPEN SHOP		ALL PREVAILING WAGE		
	Average Cost/Project	% of Total	Average Cost/Project	% of Total	Average Cost/Project	% of Total	Average Cost/Project	% of Total	Average Cost/Project	% of Total	Average Cost/Project	% of Total	Average Cost/Project	% of Total	Average Cost/Project	% of Total	Average Cost/Project	% of Total	
Concrete	\$6,314	4.2%	\$9,351	5.2%	\$5,452	3.8%	\$7,797	4.7%	\$5,454	3.8%	\$6,353	3.4%	\$6,296	4.7%	\$5,841	4.1%	\$9,520	4.7%	
Masonry	\$2,868	1.9%	\$7,504	4.2%	\$2,470	1.7%	\$3,350	2.0%	\$2,949	1.8%	\$6,837	3.6%	\$302	0.2%	\$2,185	1.5%	\$6,743	3.3%	
Metals	\$3,575	2.4%	\$3,653	1.8%	\$3,633	2.5%	\$3,769	2.3%	\$3,476	2.4%	\$3,483	1.8%	\$3,615	2.7%	\$3,027	2.1%	\$7,957	3.9%	
Rough Carpentry	\$20,001	13.2%	\$30,505	16.9%	\$16,952	11.8%	\$21,676	13.0%	\$19,003	13.3%	\$26,621	14.1%	\$16,849	12.5%	\$18,657	12.9%	\$30,500	14.9%	
Finish Carpentry	\$5,489	3.6%	\$6,355	3.5%	\$5,220	3.6%	\$7,054	4.2%	\$4,851	3.4%	\$6,801	3.6%	\$4,505	3.6%	\$5,459	3.8%	\$5,676	2.8%	
Waterproofing	\$772	0.5%	\$1,706	0.9%	\$537	0.4%	\$1,594	1.0%	\$470	0.3%	\$1,120	0.6%	\$388	0.3%	\$552	0.4%	\$1,806	0.9%	
Insulation	\$1,977	1.3%	\$2,095	1.2%	\$1,940	1.3%	\$2,620	1.6%	\$1,684	1.2%	\$1,991	1.1%	\$1,970	1.5%	\$2,034	1.4%	\$1,602	0.8%	
Roofing	\$2,763	1.8%	\$2,689	1.5%	\$2,784	1.9%	\$4,712	2.8%	\$1,646	1.2%	\$2,613	1.4%	\$2,833	2.1%	\$2,639	1.8%	\$3,597	1.8%	
Sheet Metal & Flashing	\$295	0.2%	\$541	0.3%	\$220	0.2%	\$1,020	0.6%	\$177	0.1%	\$674	0.4%	\$137	0.1%	\$177	0.1%	\$1,020	0.5%	
Exterior Siding	\$3,592	2.4%	\$3,640	1.9%	\$3,640	2.5%	\$4,812	2.9%	\$3,031	2.1%	\$3,422	1.8%	\$3,693	2.7%	\$3,458	2.4%	\$4,746	2.3%	
Doors	\$3,015	2.0%	\$3,718	2.1%	\$2,815	2.0%	\$3,347	2.0%	\$2,822	2.0%	\$3,125	1.7%	\$2,963	2.2%	\$2,931	2.0%	\$3,579	1.8%	
Windows	\$2,187	1.4%	\$3,111	1.7%	\$1,873	1.3%	\$2,877	1.7%	\$1,855	1.3%	\$2,503	1.3%	\$2,001	1.5%	\$1,985	1.4%	\$3,330	1.6%	
Glass	\$1,196	0.8%	\$1,384	0.8%	\$761	0.5%	\$1,196	0.7%	\$761	0.5%	\$1,467	0.8%	\$493	0.4%	\$649	0.5%	\$2,124	1.0%	
Lathe & Plaster																			
Drywall	\$11,287	7.4%	\$12,716	7.1%	\$10,864	7.6%	\$12,494	7.5%	\$10,587	7.4%	\$11,514	6.1%	\$11,182	8.3%	\$10,030	7.0%	\$19,799	9.7%	
Tile Work	\$1,290	0.8%	\$1,645	0.9%	\$1,266	0.9%	\$942	0.6%	\$1,338	0.9%	\$1,700	0.9%	\$1,049	0.8%	\$1,168	0.8%	\$2,788	1.4%	
Acoustical	\$306	0.2%	\$226	0.1%	\$315	0.2%	\$216	0.1%	\$380	0.3%	\$207	0.1%	\$331	0.2%	\$331	0.2%	\$42	0.1%	
Wood Flooring	\$5,866	3.9%	\$6,495	3.6%	\$4,733	3.2%	\$4,733	2.8%	\$6,273	4.6%	\$4,667	2.5%	\$6,495	4.8%	\$5,866	4.1%	\$3,612	1.8%	
Resilient Flooring	\$1,948	1.3%	\$2,336	1.3%	\$1,808	1.3%	\$3,137	1.9%	\$1,215	0.8%	\$2,492	1.3%	\$1,736	1.2%	\$1,736	1.2%	\$3,088	1.5%	
Carpet	\$2,302	1.5%	\$2,424	1.3%	\$2,275	1.6%	\$2,357	1.4%	\$2,288	1.6%	\$2,332	1.2%	\$2,286	1.7%	\$2,217	1.5%	\$3,088	1.5%	
Paint & Decorating	\$2,379	1.6%	\$3,064	2.0%	\$1,986	1.4%	\$3,116	1.9%	\$2,111	1.3%	\$2,736	1.5%	\$2,198	1.6%	\$2,147	1.5%	\$3,850	1.9%	
Specialties	\$934	0.6%	\$934	0.6%	\$902	0.6%	\$846	0.5%	\$982	0.7%	\$820	0.4%	\$984	0.7%	\$910	0.6%	\$1,113	0.5%	
Special equipment	\$570	0.4%	\$570	0.4%	\$570	0.4%	\$451	0.3%	\$668	0.5%	\$570	0.3%	\$668	0.5%	\$478	0.3%	\$1,345	0.7%	
Cabinets	\$2,496	1.6%	\$2,872	1.6%	\$2,238	1.6%	\$2,533	1.5%	\$2,418	1.7%	\$3,096	1.6%	\$2,702	1.6%	\$2,375	1.6%	\$2,953	1.4%	
Appliances	\$1,903	1.3%	\$1,698	0.9%	\$1,976	1.4%	\$1,763	1.1%	\$1,983	1.4%	\$1,879	1.0%	\$1,918	1.4%	\$1,970	1.4%	\$1,635	0.7%	
Blinds & Shades	\$274	0.2%	\$317	0.2%	\$263	0.2%	\$238	0.1%	\$291	0.2%	\$313	0.2%	\$253	0.2%	\$277	0.2%	\$48	0.1%	
Modular/manufactured																			
Special construction	\$1,018	0.7%	\$2,068	1.1%	\$892	0.6%	\$375	0.2%	\$1,149	0.8%	\$305	0.2%	\$1,269	0.9%	\$1,017	0.7%	\$1,108	0.5%	
Elevators/conveying Syst.	\$1,905	1.3%	\$3,062	1.7%	\$1,710	1.2%	\$2,785	1.7%	\$1,492	1.0%	\$2,259	1.2%	\$1,408	1.0%	\$1,650	1.1%	\$2,692	1.3%	
Plumbing/Hot Water	\$9,276	6.1%	\$10,152	5.6%	\$9,028	6.3%	\$10,613	6.4%	\$8,501	5.9%	\$9,098	4.8%	\$9,359	6.9%	\$8,866	6.2%	\$12,068	5.9%	
Heating & Ventilation	\$6,969	4.6%	\$8,333	4.6%	\$6,614	4.6%	\$9,503	5.7%	\$5,573	3.9%	\$8,417	4.5%	\$6,323	4.7%	\$6,404	4.4%	\$11,252	5.5%	
Air Conditioning	\$4,844	3.2%	\$4,844	2.7%	\$4,844	2.7%	\$4,844	2.7%	\$4,844	2.7%	\$4,844	2.7%	\$4,844	2.7%	\$4,844	2.7%	\$17,737	8.7%	
Fire Protection	\$3,111	2.0%	\$3,024	2.0%	\$2,994	2.1%	\$3,558	2.1%	\$2,870	2.0%	\$3,751	2.0%	\$2,870	2.1%	\$2,828	2.0%	\$4,933	2.4%	
Electrical	\$8,650	5.7%	\$9,405	5.2%	\$8,436	5.9%	\$10,094	6.0%	\$7,813	5.5%	\$10,046	5.3%	\$8,003	5.9%	\$8,094	5.6%	\$12,421	6.1%	
Accessory Bldgs	\$14,935	9.8%	\$2,641	1.5%	\$16,149	11.2%	\$2,641	1.6%	\$16,149	11.3%	\$3,973	18.0%	\$3,843	2.9%	\$15,113	10.5%	\$8,403	4.1%	
Other	\$12,097	8.0%	\$16,827	9.3%	\$9,999	7.0%	\$13,848	8.3%	\$10,335	7.2%	\$19,888	10.5%	\$9,345	6.9%	\$10,331	7.2%	\$19,546	9.6%	
Subtotal	\$111,538	73.5%	\$135,175	75.1%	\$104,828	72.9%	\$125,836	75.4%	\$103,245	72.2%	\$143,690	76.2%	\$96,615	71.7%	\$104,100	72.3%	\$161,929	79.3%	
Earthwork	\$11,495	7.6%	\$10,803	6.0%	\$11,689	8.1%	\$13,581	8.1%	\$10,288	7.2%	\$9,333	4.9%	\$12,487	9.3%	\$11,409	7.9%	\$12,065	5.9%	
Site Utilities	\$7,540	5.0%	\$6,757	3.8%	\$7,825	5.4%	\$4,892	2.9%	\$8,535	6.0%	\$5,327	2.8%	\$8,973	6.7%	\$8,015	5.6%	\$3,873	1.9%	
Roads and walks	\$2,344	1.5%	\$2,249	1.2%	\$2,383	1.7%	\$2,404	1.4%	\$2,324	1.6%	\$2,413	1.3%	\$2,298	1.7%	\$2,406	1.7%	\$1,643	0.8%	
Site Improvements	\$2,336	1.5%	\$2,109	1.2%	\$2,418	1.7%	\$1,976	1.2%	\$2,502	1.7%	\$2,018	1.1%	\$2,518	1.9%	\$2,405	1.7%	\$1,989	1.0%	
Lawns and Plantings	\$2,368	1.6%	\$2,926	1.6%	\$2,185	1.5%	\$2,255	1.4%	\$2,443	1.7%	\$1,946	1.0%	\$2,586	1.9%	\$2,476	1.7%	\$1,686	0.8%	
Geotechnical Conditions	\$1,544	1.0%	\$1,280	0.7%	\$1,730	1.2%	\$1,544	0.9%	\$1,544	0.9%	\$1,544	0.8%	\$1,544	0.8%	\$1,493	1.0%	\$1,384	0.8%	
Environmental Remediation	\$2,730	1.8%	\$2,710	1.5%	\$3,840	2.7%	\$540	0.3%	\$4,171	2.9%	\$3,840	2.0%	\$2,829	2.0%	\$2,829	2.0%	\$1,330	0.7%	
Demolition	\$1,092	0.7%	\$1,092	0.6%	\$2,153	1.5%	\$1,092	0.7%	\$2,153	1.5%	\$1,041	0.8%	\$1,610	1.1%	\$1,610	1.1%	\$1,485	0.7%	
Other	\$3,276	2.2%	\$2,169	1.2%	\$3,589	2.5%	\$3,722	2.2%	\$2,654	1.9%	\$5,283	2.8%	\$2,496	1.9%	\$3,530	2.4%	\$1,607	0.8%	
Subtotal Site Work	\$23,005	15.2%	\$23,667	13.1%	\$22,817	15.9%	\$22,217	13.3%	\$23,462	16.4%	\$21,868	11.6%	\$23,533	17.5%	\$23,485	16.3%	\$19,751	9.7%	
Total Improvements	\$134,543	88.6%	\$158,842	88.2%	\$127,645	88.8%	\$148,053	88.7%	\$126,707	88.6%	\$165,559	87.7%	\$120,147	89.2%	\$177,585	88.6%	\$181,680	89.0%	
General Conditions	\$9,355	6.2%	\$11,642	6.5%	\$8,701	6.1%	\$10,802	6.5%	\$8,508	5.9%	\$13,378	7.1%	\$7,519	5.6%	\$8,710	6.0%	\$13,697	6.7%	
Subtotal	\$143,847	94.7%	\$170,484	94.7%	\$136,286	94.8%	\$158,855	95.1%	\$135,142	94.5%	\$178,708	94.7%	\$127,666	94.8%	\$136,241	94.6%	\$195,378	95.7%	
Builders Overhead	\$3,598	2.4%	\$4,083	2.3%	\$3,515	2.4%	\$3,457	2.1%	\$3,638	2.5%	\$4,114	2.2%	\$3,241	2.4%	\$3,486	2.4%	\$4,927	2.4%	
Builders Profit	\$6,014	4.0%	\$8,406	4.7%	\$5,360	3.7%	\$6,925	4.1%	\$5,474	3.8%	\$7,079	3.8%	\$5,522	4.1%	\$5,839	4.1%	\$7,181	3.5%	
Total	\$151,821	100.0%	\$180,067	100.0%	\$143,803	100.0%	\$166,989	100.0%	\$143,024	100.0%	\$188,684	100.0%	\$134,711	100.0%	\$144,082	100.0%	\$204,248	100.0%	

**Exhibit 3A
BASIC RESULTS IN COSTS PER UNIT**

MHP CONSTRUCTION COST STUDY

11/07/07

All figures in \$/unit

	All Projects		By Size		By Target	
	\$	%	All Small 18	All Large 20	All Affordable 24	All Market 14
	\$	%	\$	\$	\$	\$
COSTS PER UNIT						
Building Costs ⁽¹⁾ without G.C. ⁽²⁾	\$111,538	73.5%	\$135,175	\$104,828	\$125,836	\$103,245
Site Costs without G.C.	\$23,005	15.2%	\$23,667	\$22,817	\$22,217	\$23,462
G.C.	\$9,355	6.2%	\$11,642	\$8,701	\$10,802	\$8,508
Building + Site Costs including G.C.	\$143,847	94.7%	\$170,484	\$136,286	\$158,855	\$135,142
Overhead and Profit	\$7,974	5.3%	\$9,583	\$7,517	\$8,133	\$7,881
Total Construction Costs, incl. OH & Pft	\$151,821	100.0%	\$180,067	\$143,803	\$166,989	\$143,024
Percent Variance from the All-Project Average:			18.6%	-5.3%	10.0%	-5.8%

	By Location		By Wage Rate	
	All Urban 19	All Suburban 19	All Prevailing Wage 28	All Open Shop 10
	\$	\$	\$	\$
COSTS PER UNIT				
Building Costs ⁽¹⁾ without G.C. ⁽²⁾	\$143,690	\$96,615	\$161,929	\$104,100
Site Costs without G.C.	\$21,868	\$23,533	\$19,751	\$23,485
G.C.	\$13,378	\$7,519	\$13,697	\$8,710
Building + Site Costs including G.C.	\$178,708	\$127,666	\$195,378	\$136,241
Overhead and Profit	\$9,975	\$7,045	\$8,870	\$7,842
Total Construction Costs, incl. OH & Pft	\$188,684	\$134,711	\$204,248	\$144,082
Percent Variance from the All-Project Average:	24.3%	-11.3%	34.5%	-5.1%

Exhibit 3B
BASIC RESULTS IN COSTS PER SQUARE FOOT

MHP CONSTRUCTION COST STUDY

11/07/07

All figures in \$/sf

All Projects	By Size			By Target		
	All Small	All Large	All Market	All Affordable	All Market	
38	18	20	24	14		
\$	\$	\$	\$	\$	\$	\$
%	%	%	%	%	%	%
\$93	\$116	\$87	\$123	\$80	\$80	72.2%
\$19	\$20	\$19	\$22	\$18	\$18	16.4%
\$8	\$10	\$7	\$11	\$7	\$7	5.9%
\$120	\$146	\$113	\$156	\$104	\$104	94.5%
73.5%	75.1%	72.9%		75.4%		
15.2%	13.1%	15.9%		13.3%		
6.2%	6.5%	6.0%		6.5%		
94.7%	94.7%	94.8%		95.1%		
5.3%	5.3%	5.2%		4.9%		
\$7	\$8	\$6	\$8	\$6	\$6	5.5%
\$127	\$154	\$120	\$164	\$110	\$110	100.0%
100.0%	100.0%	100.0%	28.8%	100.0%		
	21.2%	-5.9%				
						-13.2%

COSTS PER SQUARE FOOT

Building Costs ⁽¹⁾ without G.C. ⁽²⁾

Site Costs without G.C.

G.C.

Building + Site Costs including G.C.

Overhead and Profit

Total Construction Costs, incl. OH & Pft

Percent Variance from the All-Project Average:

All Projects	By Location			By Wage Rate		
	All Urban	All Suburban	All Open Shop	All Prevailing Wage	All Open Shop	
19	19	10	10	10		
\$	\$	\$	\$	\$	\$	\$
%	%	%	%	%	%	%
\$116	\$82	\$141	\$87	\$87	\$87	72.3%
\$18	\$20	\$17	\$20	\$20	\$20	16.3%
\$11	\$6	\$12	\$7	\$7	\$7	6.0%
\$144	\$109	\$170	\$113	\$113	\$113	94.6%
76.2%	71.7%	79.3%	79.3%			
11.6%	17.5%	9.7%	9.7%			
7.1%	5.6%	6.7%	6.7%			
94.7%	94.8%	95.7%	95.7%			
5.3%	5.2%	4.3%	4.3%			
\$8	\$6	\$8	\$8	\$7	\$7	5.4%
\$152	\$115	\$177	\$120	\$120	\$120	100.0%
19.6%	-9.6%	39.6%	39.6%			
						-5.6%

COSTS PER SQUARE FOOT

Building Costs ⁽¹⁾ without G.C. ⁽²⁾

Site Costs without G.C.

G.C.

Building + Site Costs including G.C.

Overhead and Profit

Total Construction Costs, incl. OH & Pft

Percent Variance from the All-Project Average:

(1) "Building Costs" refers to all construction costs unrelated to sitework -- i.e., foundation and structure.

(2) G.C. -- General Conditions

**Exhibit 4
MULTIPLE ATTRIBUTES: TARGET and LOCATION**

MHP CONSTRUCTION COST STUDY
11/07/07

	Average Costs Per UNIT					
	By Single Attribute		By Combination of Two Attributes (Target, Location)			
	All Affd	All Mkt	Affd Urban	Affd Suburban	Mkt Urban	Mkt Suburban
All Projects	24	14	16	8	3	11
AVERAGE COST/UNIT						
Building Costs ⁽¹⁾ without G.C. ⁽²⁾	\$111,538	\$103,245	\$156,352	\$99,548	\$129,069	\$95,424
Site Costs without G.C.	\$23,005	\$23,462	\$22,018	\$22,387	\$21,695	\$23,998
G.C.	\$9,355	\$8,508	\$14,730	\$7,418	\$11,757	\$7,560
Building + Site Costs including G.C.	\$143,847	\$135,142	\$193,101	\$129,353	\$162,089	\$126,981
Overhead and Profit	\$7,974	\$7,881	\$10,726	\$5,900	\$9,107	\$7,510
Total Construction Costs, incl. OH & Pft	\$151,821	\$143,024	\$203,827	\$135,253	\$171,196	\$134,491
<i>Percent Variance from the All-Project Average:</i>	10.0%	-5.8%	34.3%	-10.9%	12.8%	-11.4%

	Average Costs Per SQUARE FOOT					
	By Single Attribute		By Combination of Two Attributes (Target, Location)			
	All Affd	All Mkt	Affd Urban	Affd Suburban	Mkt Urban	Mkt Suburban
All Projects	24	14	16	8	3	11
AVERAGE COST/SF						
Building Costs ⁽¹⁾ without G.C. ⁽²⁾	\$93	\$80	\$145	\$102	\$90	\$76
Site Costs without G.C.	\$19	\$18	\$20	\$23	\$15	\$19
G.C.	\$8	\$7	\$14	\$8	\$8	\$6
Building + Site Costs including G.C.	\$120	\$104	\$179	\$133	\$113	\$101
Overhead and Profit	\$7	\$6	\$10	\$6	\$6	\$6
Total Construction Costs, incl. OH & Pft	\$127	\$110	\$189	\$139	\$120	\$107
<i>Percent Variance from the All-Project Average:</i>	28.8%	-13.2%	49.0%	9.6%	-5.9%	-15.7%

(1) "Building Costs" refers to all construction costs unrelated to sitework -- i.e., foundation and structure.
(2) G.C. -- General Conditions

**Exhibit 5
MULTI-ATTRIBUTE RESULTS: SIZE vs TARGET; SIZE vs LOCATION**

MHP CONSTRUCTION COST STUDY
11/07/07

All Projects	Average Costs Per Unit											
	By Single Attribute			By Combinations of Two Attributes (Size and Target, Size and Location)								
	All Small	All Large	All	Small Affd	Small Mkt	Large Affd	Large Mkt	Small Urban	Small Suburban	Large Urban	Large Suburban	
38	18	20	14	4	10	10	9	9	9	10	10	
\$111,538	\$135,175	\$104,828	\$149,681	\$107,147	\$110,144	\$102,717	\$175,649	\$105,294	\$130,239	\$94,628		
\$23,005	\$23,667	\$22,817	\$21,875	\$27,130	\$22,442	\$22,966	\$21,356	\$25,373	\$22,084	\$23,111		
\$9,355	\$11,642	\$8,701	\$12,339	\$10,296	\$9,791	\$8,263	\$15,061	\$9,119	\$12,652	\$7,153		
\$143,847	\$170,484	\$136,286	\$183,895	\$144,573	\$142,377	\$133,867	\$212,065	\$139,786	\$164,668	\$124,892		
\$7,974	\$9,583	\$7,517	\$10,051	\$8,679	\$6,871	\$7,774	\$11,034	\$8,512	\$9,529	\$6,709		
\$151,821	\$180,067	\$143,803	\$193,946	\$153,252	\$149,248	\$141,640	\$223,099	\$148,298	\$174,197	\$131,601		
	18.6%	-5.3%	27.7%	0.9%	-1.7%	-6.7%	46.9%	-2.3%	14.7%	-13.3%		

Percent Variance from the All-Project Average:

All Projects	Average Costs Per SQUARE FOOT											
	By Single Attribute			By Combinations of Two Attributes (Size and Target, Size and Location)								
	All Small	All Large	All	Small Affd	Small Mkt	Large Affd	Large Mkt	Small Urban	Small Suburban	Large Urban	Large Suburban	
38	18	20	14	4	10	10	9	9	9	10	10	
\$93	\$116	\$87	\$136	\$83	\$114	\$79	\$147	\$92	\$103	\$80		
\$19	\$20	\$19	\$20	\$21	\$23	\$18	\$18	\$22	\$18	\$20		
\$8	\$10	\$7	\$11	\$8	\$10	\$6	\$13	\$8	\$10	\$6		
\$120	\$146	\$113	\$167	\$111	\$147	\$103	\$177	\$122	\$131	\$106		
\$7	\$8	\$6	\$9	\$7	\$7	\$6	\$9	\$7	\$8	\$6		
\$127	\$154	\$120	\$176	\$118	\$155	\$109	\$186	\$129	\$138	\$112		
	21.2%	-5.9%	38.3%	-7.0%	21.6%	-14.0%	46.6%	1.6%	8.8%	-12.1%		

Percent Variance from the All-Project Average:

- (1) "Building Costs" refers to all construction costs unrelated to sitework -- i.e., foundation and structure.
- (2) G.C. -- General Conditions

Exhibit 6
MULTI-ATTRIBUTE RESULTS: WAGE RATE and TARGET

MHP CONSTRUCTION COST STUDY
11/7/07

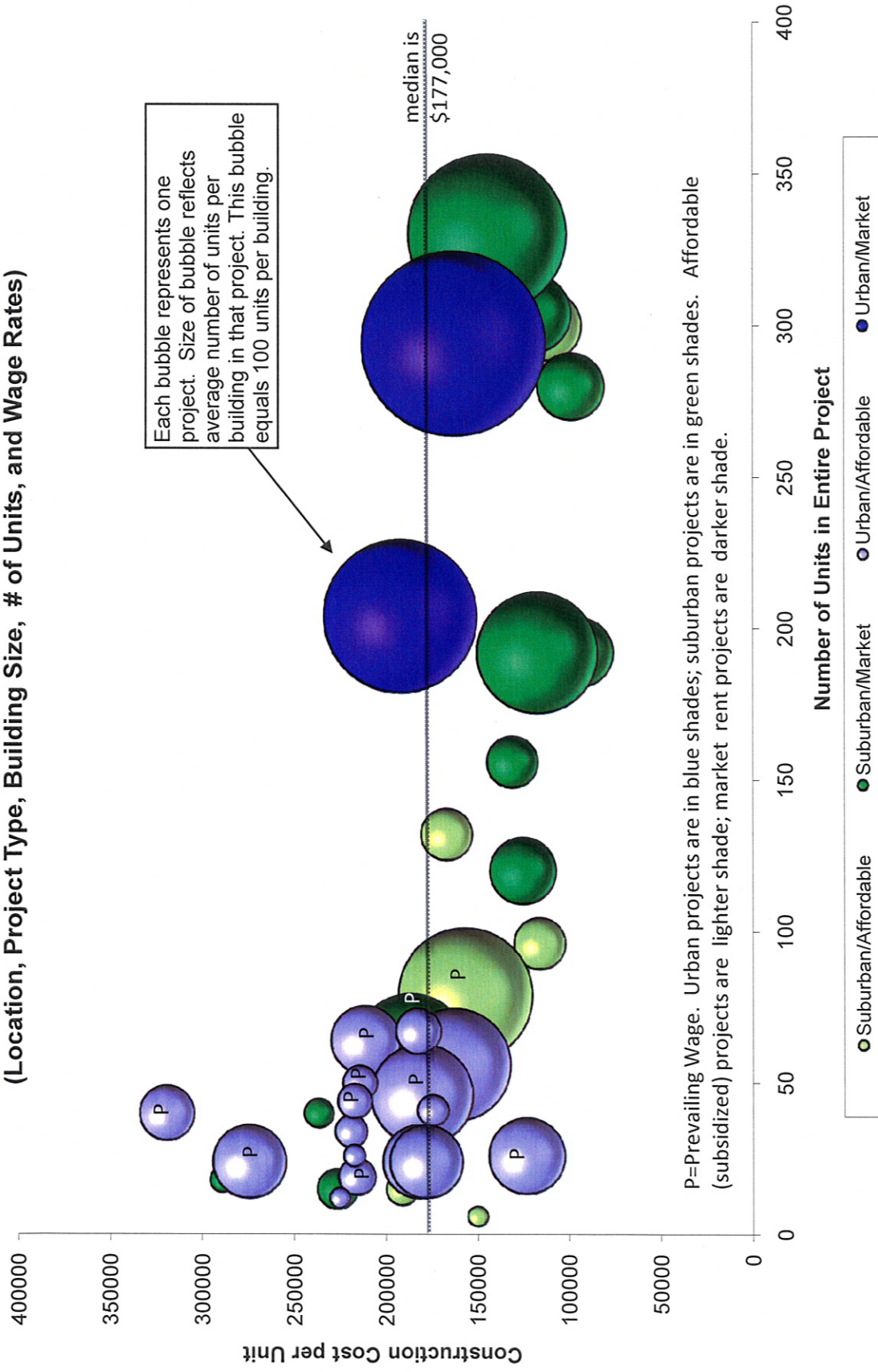
All Projects	Average Costs Per UNIT					
	By Single Attribute		By Combination of Two Attributes (Wage Rate, Target)			
	All Open Shop	All Prevailing Wage	Open Market	Open Affordable	Prevailing Market	Prevailing Affordable
38	28	10	13	15	1	9
AVERAGE COST/UNIT						
Building Costs ⁽¹⁾ , without G.C. ⁽²⁾	\$104,100	\$161,929	\$102,121	\$108,870	\$143,805	\$164,704
Site Costs without G.C.	\$23,485	\$19,751	\$23,552	\$23,325	\$20,231	\$19,677
G.C.	\$8,710	\$13,697	\$8,284	\$9,727	\$16,512	\$13,267
Building + Site Costs including G.C.	\$136,241	\$195,378	\$133,884	\$141,921	\$180,548	\$197,647
Overhead and Profit	\$7,842	\$8,870	\$7,937	\$7,613	\$5,892	\$9,326
Total Construction Costs, incl. OH & Pft	\$144,082	\$204,248	\$141,820	\$149,534	\$186,440	\$206,974
<i>Percent Variance from the All-Project Average:</i>	-5.1%	34.5%	-6.6%	-1.5%	22.8%	36.3%

All Projects	Average Costs Per SQUARE FOOT					
	By Single Attribute		By Combination of Two Attributes (Wage Rate, Target)			
	All Open Shop	All Prevailing Wage	Open Market	Open Affordable	Prevailing Market	Prevailing Affordable
38	28	10	13	15	1	9
AVERAGE COST/SF						
Building Costs ⁽¹⁾ , without G.C. ⁽²⁾	\$87	\$141	\$79	\$110	\$90	\$152
Site Costs without G.C.	\$20	\$17	\$18	\$23	\$13	\$18
G.C.	\$7	\$12	\$6	\$10	\$10	\$12
Building + Site Costs including G.C.	\$113	\$170	\$104	\$143	\$113	\$182
Overhead and Profit	\$7	\$8	\$8	\$6	\$9	\$5
Total Construction Costs, incl. OH & Pft	\$120	\$177	\$110	\$151	\$117	\$191
<i>Percent Variance from the All-Project Average:</i>	-5.6%	39.6%	-13.3%	18.5%	-8.0%	50.4%

(1) "Building Costs" refers to all construction costs unrelated to sitework -- i.e., foundation and structure.

(2) G.C. -- General Conditions

**Exhibit 7:
Determinants of Construction Cost
(Location, Project Type, Building Size, # of Units, and Wage Rates)**



**Exhibit 8:
Multi-City Comparison of Building Costs
(Prototypical 3-Story Wood Frame 20-Unit Building with Elevator)**

