

Life Cycle Cost Analysis Framework for Sustainable Buildings

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By

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Abstract

Sustainability has been heightened to a new level of importance, due to the current global race for commodities and conservation of our environment. Sustainable Buildings are of particular interest since buildings are significant contributors to consumption of resources. Since the inception of the United States Green Building Council (USGBC) in 1993, USGBC has played a key role in providing guidance to the design and construction community in building “green” structures. The Leadership in Energy and Environmental Design (LEED) rating system is an industry accepted standard for the design/construction and measurement of green buildings. Although USGBC provides guidance on performance measurement, a streamlined process of performance tracking and measurement has not been formalized. This research focuses on identifying vital areas of required tracking and measurement; to allow for a systematic analysis of costs, over the life of sustainable buildings. A case-study based on the recently designed and constructed East Hall LEED-Gold Certified, dormitory building at Worcester Polytechnic Institute (WPI), was undertaken to create and assess a life cycle cost analysis framework. This research is aimed at understanding what the costs of building green at WPI truly are. Life Cycle Cost Analyses of the mechanical, electrical, plumbing and roof components were evaluated to generate percent savings or percent added cost. This research reviewed the various green and non-green costs of construction, consumption, and operations and maintenance costs providing a comparative analysis to leading researchers in the field of costs of building green.

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Table of Contents

ABSTRACT	i
ACKNOWLEDGEMENTS	ii
TABLE OF CONTENTS	iii
TABLE OF TABLES	ix
TABLE OF FIGURES	x
1.0 INTRODUCTION	1
2.0 BACKGROUND	6
2.1 WPI RESEARCHED SUSTAINABILITY PROJECTS BY IQP AND GRADUATE STUDENTS:.....	6
2.1.1 <i>Tracking and Reducing Greenhouse Gas Emissions at WPI (Haines et al., 2007):</i>	6
2.1.2 <i>Technically Green: Environmental Resource Website (Kucher et al., 2007):</i>	6
2.1.3 <i>Monitoring Electricity Consumption on the WPI Campus (O’Hara et al., 2007):</i>	7
2.1.4 <i>Feasibility of Green Building at WPI (Peyser, 2008):</i>	7
2.1.5 <i>East Hall-LEED Project Case Study (Cao & DiBenedetto, 2009):</i>	9
2.2 RELEVANT ASTM STANDARDS:	10
2.2.1 <i>ASTM E2114-08 Standard Terminology for Sustainability Relative to the Performance of Buildings</i>	10
2.2.2 <i>ASTM E 1991-05 Standard Guide for Environmental Life Cycle Assessment (LCA) of Building Materials/Products</i>	11
2.2.3 <i>ASTM E917-05 (Reapproved 2010) Standard Practice for Measuring Life-Cycle Costs of Buildings and Building Systems</i>	13
2.2.4 <i>ASTM E2129-10 Standard Practice for Data Collection for Sustainability Assessment of Building Products</i>	14
2.2.5 <i>ASTM E2432-05 Standard Guide for General Principles of Sustainability Relative to Buildings</i>	14
2.3 IMMEDIATE NEED FOR LIFE CYCLE COST ANALYSIS	15
3.0 METHODOLOGY	17
3.1 FRAMEWORK OF LIFE CYCLE COST ANALYSIS	17
3.2 ADJUSTMENT FACTORS	18
3.2.1 <i>Discount Rate</i>	18
3.2.2 <i>Escalation and De-Escalation Rates</i>	19
3.2.3 <i>Green Factor</i>	19
3.2.4 <i>Neutralization</i>	20
3.2.5 <i>Location and Size Factors:</i>	20
3.3 BUILDING LIFE	20
3.4 SENSITIVITY ANALYSIS	20
3.5 FRAMEWORK OF CONSTRUCTION COSTS.....	21
3.5.1 <i>Green and Non-Green Costs</i>	21
3.6 FRAMEWORK OF CONSUMPTION COSTS	22
3.6.1 <i>Green and Non-Green Costs</i>	22
3.6.1.1 <i>Mechanical Costs</i>	22
3.6.1.2 <i>Electrical Costs</i>	22

3.6.1.3 Water Costs	23
3.7 FRAMEWORK OF MAINTENANCE COSTS.....	24
3.7.1 <i>Green and Non-Green Costs</i>	24
3.7.2 <i>Mechanical Costs</i>	24
3.7.3 <i>Electrical Costs</i>	25
3.7.4 <i>Water (Plumbing) Costs</i>	25
3.8 FRAMEWORK OF OPERATIONS COSTS.....	26
3.8.1 <i>Green and Non-Green Costs</i>	26
3.9 FRAMEWORK OF ROOF COSTS	26
3.9.1 <i>Green and Non-Green Costs</i>	26
3.10 FRAMEWORK OF EAST HALL LCCA SURVEY	27
4.0 RESULTS	29
4.1 CONSTRUCTION COSTS.....	29
4.1.1 <i>Green and Non-Green Costs</i>	29
4.2 CONSUMPTION COSTS	31
4.2.1 <i>Green and Non-Green Costs</i>	31
4.2.1.1 Mechanical Costs	32
4.2.1.2 Electrical Costs	33
4.2.1.3 Water Costs.....	34
4.2.1.3.1-20% Reduction in the Actual Case Consumption and Costs:	36
4.2.1.3.2-25% Reduction in the Actual Case Consumption and Costs:	36
4.2.1.3.3-30% Reduction in the Actual Case Consumption and Costs:	37
4.2.2 <i>Summary of Consumption Costs</i>	38
4.3 OPERATIONS AND MAINTENANCE COSTS	39
4.3.1 <i>Green and Non-Green Costs</i>	39
4.3.1.1 Mechanical Costs	39
4.3.1.2 Electrical Costs	42
4.3.1.3 Water Costs.....	44
4.3.2 <i>Summary of Operations and Maintenance Costs</i>	47
4.4 LCCA AND SENSITIVITY ANALYSIS.....	48
4.4.1 <i>Case 1 Various Scenarios</i> :.....	48
4.4.2 <i>Case 2 Various Scenarios</i> :.....	50
4.5 ROOF COSTS	53
4.5.1 <i>Green and Non-Green Costs</i>	53
4.5.2 <i>Operations and Maintenance</i>	54
4.6 SURVEY	56
5.0 RECOMMENDATIONS	65
5.1 LCCA AND LEED	65
5.2 GREEN FACTOR RESEARCH AND APPLICABILITY.....	65
5.3 BUILDING INFORMATION MODELING (BIM) AND LCCA	66
5.4 O&M DATABASE CREATION (WBS) AND TRACKING.....	67
5.5 BUILDING ENERGY AUDITING	67
5.6 ANALYTICAL HIERARCHY PROCESS (AHP) USE IN MULTI-ATTRIBUTE DECISION ANALYSIS (MADA) OF INVESTMENTS (ASTM E1765-07)	68
5.7 CONSUMPTION TRACKING	69

6.0 CONCLUSIONS	71
7.0 FUTURE WORK.....	73
8.0 BIBLIOGRAPHY	74
APPENDICES	76
BASELINE DESIGN CASE AND PROPOSED DESIGN CASE PARAMETERS (LEED TEMPLATE)	77
<i>Appendix A-ME2 Detail Baseline Design Case and Proposed Design Case assumptions (Submitted LEED Template).....</i>	<i>78</i>
ENERGY AND ATMOSPHERE CREDIT 1-SUBMITTED LEED TEMPLATE.....	87
<i>Appendix A-ME1 Energy and Atmosphere Credit 1 (Submitted LEED Template).....</i>	<i>88</i>
MECHANICAL CONSUMPTION COSTS	104
<i>Appendix A-M1 Baseline Design Case and Proposed Design Case.....</i>	<i>105</i>
<i>Appendix A-M2 Actual Case versus Baseline Design Case and Proposed Design Case</i>	<i>109</i>
<i>Appendix A-M3 Natural Gas Consumption and Cost Data (WPI-East Hall)</i>	<i>111</i>
<i>Appendix A-M4 Graph: Natural Gas Consumption and Cost Comparison of Various Design Cases ...</i>	<i>113</i>
<i>Appendix A-M5 Pie Chart: Natural Gas Consumption of Various Design Cases.....</i>	<i>115</i>
ELECTRICAL CONSUMPTION COSTS	117
<i>Appendix A-E1 Baseline Design Case and Proposed Design Case</i>	<i>118</i>
<i>Appendix A-E2 Actual Case versus Baseline Design Case and Proposed Design Case.....</i>	<i>122</i>
<i>Appendix A-E3 Electrical Consumption and Cost Data (WPI-East Hall)</i>	<i>126</i>
<i>Appendix A-E4 Electrical Average Price Data (By State)</i>	<i>128</i>
<i>Appendix A-E5 Graph: Neutralized Cost Comparison of Various Design Cases.....</i>	<i>131</i>
<i>Appendix A-E6 Graph: Energy Consumption and Costs</i>	<i>133</i>
<i>Appendix A-E7 Pie Chart: Energy Use of Various Design Cases.....</i>	<i>135</i>
<i>Appendix A-E8 Graph: WPI East Hall-Energy Costs per Month.....</i>	<i>137</i>
WATER CONSUMPTION COSTS	139
<i>Appendix A-W1 Baseline Design Case and Proposed Design Case.....</i>	<i>140</i>
<i>Appendix A-W2 Actual Case versus Baseline Design Case and Proposed Design Case</i>	<i>144</i>
<i>Appendix A-W3 Pie Chart: Consumption Comparison of Various Design Cases.....</i>	<i>146</i>
<i>Appendix A-W4 Graph: Consumption and Costs of Various Design Cases.....</i>	<i>148</i>
<i>Appendix A-W5 Water Consumption and Cost Data (WPI-East Hall)</i>	<i>150</i>
<i>Appendix A-W6 Water Efficiency Credit 3: Water Use Reduction.....</i>	<i>152</i>
<i>Appendix A-W7 Water Costs over a 5 Year Period.....</i>	<i>160</i>
<i>Appendix A-W8 Articles from WDPW on Water Cost Increases.....</i>	<i>162</i>
<i>Appendix A-RW1 Actual Case (20% Reduction) v. BDC & PDC</i>	<i>166</i>
<i>Appendix A-RW2 Pie Chart: Water Consumption 20% Reduction Comparison of Various Design Cases</i>	<i>168</i>
<i>Appendix A-RW3 Graph: Water Consumption 20% Reduction and Costs of Various Design Cases..</i>	<i>170</i>
<i>Appendix A-RW4 Actual Case (25% Reduction) v. BDC & PDC</i>	<i>172</i>
<i>Appendix A-RW5 Pie Chart: Water Consumption 25% Reduction Comparison of Various Design Cases</i>	<i>174</i>
<i>Appendix A-RW6 Graph: Water Consumption 25% Reduction and Costs of Various Design Cases..</i>	<i>176</i>
<i>Appendix A-RW7 Actual Case (30% Reduction) v. BDC & PDC</i>	<i>178</i>
<i>Appendix A-RW8 Pie Chart: Water Consumption 30% Reduction Comparison of Various Design Cases</i>	<i>180</i>

<i>Appendix A-RW9 Graph: Water Consumption 30% Reduction and Costs of Various Design Cases..</i>	182
GREEN AND NON-GREEN CONSTRUCTION COSTS.....	184
<i>Appendix B-1 Construction Cost Comparison of East Hall to High-end Dormitory Facilities.....</i>	185
<i>Appendix B-2 Adjusted East Hall Cost Estimate (GBC).....</i>	187
<i>Appendix B-3 Graph: Non-Green versus Green Base Mechanical and Electrical Costs.....</i>	190
<i>Appendix B-4 Graph: Dormitory Square Foot Cost Comparison.....</i>	192
<i>Appendix B-5 Graph: Total Cost per Bed Comparison for All Components (MEP, Arch., Struc. etc...).....</i>	194
<i>Appendix B-6 RS Means Construction Cost Data</i>	196
<i>Appendix B-7 Construction Cost Estimate from GBC.....</i>	201
MECHANICAL MAINTENANCE COSTS	204
<i>Appendix C-M1 YPM Costs.....</i>	205
<i>Appendix C-M2 FMRR Costs.....</i>	215
<i>Appendix C-M3 Summary of Green versus Non-Green FMRR Costs</i>	244
<i>Appendix C-M4 Graph: Green versus Non-Green Yearly Preventative Maintenance Costs.....</i>	246
<i>Appendix C-M5 Graph: Frequency and Magnitude of Maintenance Repair and Replacement Costs.....</i>	248
<i>Appendix C-M6 RS Means Component Lists.....</i>	250
<i>Appendix C-M7 RS Means Crew Lists.....</i>	282
<i>Appendix C-LM1 LCCA 20% GF O&M</i>	289
<i>Appendix C-LM2 LCCA 15% GF O&M</i>	291
<i>Appendix C-LM3 LCCA 10% GF O&M</i>	293
<i>Appendix C-LM4 LCCA 5% GF O&M</i>	295
ELECTRICAL MAINTENANCE COSTS	297
<i>Appendix C-E1 YPM Costs.....</i>	298
<i>Appendix C-E2 FMRR Costs</i>	302
<i>Appendix C-E3 Summary of Green versus Non-Green Frequency Maintenance Repair and Replacement Costs.....</i>	308
<i>Appendix C-E4 Graph: Green and Non-Green Yearly Preventative Maintenance Costs.....</i>	310
<i>Appendix C-E5 Graph: Frequency and Magnitude of Maintenance Repair and Replacement Costs.....</i>	312
<i>Appendix C-E6 RS Means Component Lists.....</i>	314
<i>Appendix C-E7 RS Means Crew Lists.....</i>	325
<i>Appendix C-LE1 LCCA 20% GF O&M.....</i>	327
<i>Appendix C-LE2 LCCA 15% GF O&M.....</i>	329
<i>Appendix C-LE3 LCCA 10% GF O&M.....</i>	331
<i>Appendix C-LE4 LCCA 5% GF O&M.....</i>	333
WATER MAINTENANCE COSTS	335
<i>Appendix C-W1 YPM Costs.....</i>	336
<i>Appendix C-W2 FMRR Costs.....</i>	342
<i>Appendix C-W3 Summary of Green and Non-Green Frequency Maintenance Repair and Replacement Costs.....</i>	363
<i>Appendix C-W4 Graph: Green versus Non-Green Yearly Preventative Maintenance Costs.....</i>	365
<i>Appendix C-W5 Graph: Frequency and Magnitude Maintenance Repair and Replacement Costs.....</i>	367
<i>Appendix C-W6 RS Means Component Lists.....</i>	369
<i>Appendix C-LW1 LCCA 20% GF O&M</i>	377
<i>Appendix C-LW2 LCCA 15% GF O&M</i>	379
<i>Appendix C-LW3 LCCA 10% GF O&M</i>	381
<i>Appendix C-LW4 LCCA 5% GF O&M</i>	383

SUMMARY OPERATIONS AND MAINTENANCE	385
<i>Appendix C-OM1 Summary Table of All Costs</i>	386
<i>Appendix C-OM2 Summary Table of All Costs-Assuming 30% of Total O&M Costs</i>	388
OPERATIONS COSTS	390
<i>Appendix C-O1 Yearly Operations Costs (Mechanical, Electrical and Plumbing)</i>	391
ROOF COSTS.....	393
<i>Appendix D-R1 Non-Green Built-Up Roof Cost Comparison to WPI East Hall Roof Costs</i>	394
<i>Appendix D-R2 Graph: WPI and Non-Green Built-Up Roof Construction Cost Comparison</i>	396
<i>Appendix D-R3 Yearly Preventative Maintenance and Frequency Maintenance Repair and Replacement Costs</i>	398
<i>Appendix D-R4 Graph: Frequency and Magnitude of Maintenance Repair and Replacement Costs</i>	402
<i>Appendix D-R5 RS Means Crew Lists</i>	404
<i>Appendix D-R6 Drawing: Roof Area Model</i>	406
<i>Appendix D-NR1 Neutralized Roof Cost Comparison</i>	408
<i>Appendix D-LR1 LCCA Yearly Preventative Maintenance and Frequency Maintenance Repair and Replacement</i>	411
<i>Appendix D-LR2 LCCA Yearly Preventative Maintenance, Frequency Maintenance Repair and Replacement and Operations</i>	413
SURVEY DATA	415
<i>Appendix E-S1 Survey Introductory Letter</i>	416
<i>Appendix E-S2 East Hall LCCA Survey Questions</i>	418
<i>Appendix E-S3 Survey Follow-Up Letter</i>	426
<i>Appendix E-S4 Summary of Survey Responses</i>	428
GREEN FACTOR SENSITIVITY ANALYSIS (MAINTENANCE PORTION ONLY)	447
<i>Appendix C-SM1 Graph: 5% Frequency Maintenance Repair and Replacement Costs and Yearly Preventative Maintenance Costs (Mechanical)</i>	448
<i>Appendix C-SM2 Graph: 10% Frequency Maintenance Repair and Replacement Costs and Yearly Preventative Maintenance Costs (Mechanical)</i>	451
<i>Appendix C-SM3 Graph: 15% Frequency Maintenance Repair and Replacement Costs and Yearly Preventative Maintenance Costs (Mechanical)</i>	454
<i>Appendix C-SM4 15% GF Analysis of YPM</i>	457
<i>Appendix C-SM5 15% GF Analysis of FMRRC</i>	467
<i>Appendix C-SM6 15% GF Summary of FMRRC</i>	496
<i>Appendix C-SM7 10% GF Analysis of YPM</i>	498
<i>Appendix C-SM8 10% GF Analysis of FMRRC</i>	508
<i>Appendix C-SM9 10% GF Summary of FMRRC</i>	537
<i>Appendix C-SM10 5% GF Analysis of YPM</i>	539
<i>Appendix C-SM11 5% GF Analysis of FMRRC</i>	549
<i>Appendix C-SM12 5% GF Summary of FMRRC</i>	578
<i>Appendix C-SE1 Graph: 5% Frequency Maintenance Repair and Replacement Costs and Yearly Preventative Maintenance Costs (Electrical)</i>	580
<i>Appendix C-SE2 Graph: 10% Frequency Maintenance Repair and Replacement Costs and Yearly Preventative Maintenance Costs (Electrical)</i>	583
<i>Appendix C-SE3 Graph: 15% Frequency Maintenance Repair and Replacement Costs and Yearly Preventative Maintenance Costs (Electrical)</i>	586
<i>Appendix C-SE4 15% GF Analysis of YPM</i>	589

<i>Appendix C-SE5 15% GF Analysis of FMRRC</i>	593
<i>Appendix C-SE6 15% GF Summary of FMRRC</i>	599
<i>Appendix C-SE7 10% GF Analysis of YPM</i>	601
<i>Appendix C-SE8 10% GF Analysis of FMRRC</i>	605
<i>Appendix C-SE9 10% GF Summary of FMRRC</i>	611
<i>Appendix C-SE10 5% GF Analysis of YPM</i>	613
<i>Appendix C-SE11 5% GF Analysis of FMRRC</i>	617
<i>Appendix C-SE12 5% GF Summary of FMRRC</i>	623
<i>Appendix C-SW1 Graph: 5% Frequency Maintenance Repair and Replacement Costs and Yearly Preventative Maintenance Costs (Plumbing)</i>	625
<i>Appendix C-SW2 Graph: 10% Frequency Maintenance Repair and Replacement Costs and Yearly Preventative Maintenance Costs (Plumbing)</i>	628
<i>Appendix C-SW3 Graph: 15% Frequency Maintenance Repair and Replacement Costs and Yearly Preventative Maintenance Costs (Plumbing)</i>	631
<i>Appendix C-SW4 15% GF Analysis of YPM</i>	634
<i>Appendix C-SW5 15% GF Analysis of FMRRC</i>	640
<i>Appendix C-SW6 15% GF Summary of FMRRC</i>	661
<i>Appendix C-SW7 10% GF Analysis of YPM</i>	663
<i>Appendix C-SW8 10% GF Analysis of FMRRC</i>	669
<i>Appendix C-SW9 10% GF Summary of FMRRC</i>	690
<i>Appendix C-SW10 5% GF Analysis of YPM</i>	692
<i>Appendix C-SW11 5% GF Analysis of FMRRC</i>	698
<i>Appendix C-SW12 5% GF Summary of FMRRC</i>	719
LCCA AND SENSITIVITY DATA	721
<i>Appendix F-L1 LCCA Green v. Non-Green Case 1 Scenario 1</i>	722
<i>Appendix F-L2 LCCA Green v. Non-Green Case 1 Scenario 2</i>	725
<i>Appendix F-L3 LCCA Green v. Non-Green Case 1 Scenario 3</i>	728
<i>Appendix F-L4 LCCA Green v. Non-Green Case 1 Scenario 4</i>	731
<i>Appendix F-L5 LCCA Green v. Non-Green Case 1 Scenario 5</i>	734
<i>Appendix F-L6 LCCA Green v. Non-Green Case 1 Scenario 6</i>	737
<i>Appendix F-L7 LCCA Green v. Non-Green Case 2 Scenario 1</i>	740
<i>Appendix F-L8 LCCA Green v. Non-Green Case 2 Scenario 2</i>	743
<i>Appendix F-L9 LCCA Green v. Non-Green Case 2 Scenario 3</i>	746
<i>Appendix F-L10 LCCA Green v. Non-Green Case 2 Scenario 4</i>	749
<i>Appendix F-L11 LCCA Green v. Non-Green Case 2 Scenario 5</i>	752
<i>Appendix F-L12 LCCA Green v. Non-Green Case 2 Scenario 6</i>	755
GLOSSARY	758

Table of Tables

TABLE 1-ADJUSTMENT FACTORS	29
TABLE 2-CONSTRUCTION COSTS.....	29
TABLE 3-NEUTRALIZED UNIT PRICING.....	31
TABLE 4-MECHANICAL CONSUMPTION COSTS.....	33
TABLE 5-ELECTRICAL CONSUMPTION COSTS	33
TABLE 6-WATER CONSUMPTION COSTS.....	35
TABLE 7-WATER CONSUMPTION COSTS (20% REDUCTION)	36
TABLE 8-WATER CONSUMPTION COSTS (25% REDUCTION)	36
TABLE 9-WATER CONSUMPTION COSTS (30% REDUCTION)	37
TABLE 10-MECHANICAL YPM COSTS.....	39
TABLE 11-MECHANICAL O&M COSTS	41
TABLE 12-ELECTRICAL YPM COSTS.....	42
TABLE 13-ELECTRICAL O&M COSTS	43
TABLE 14-WATER YPM COSTS.....	45
TABLE 15-WATER O&M COSTS	46
TABLE 16-ROOF YPM COSTS	54
TABLE 17-ROOF FMRR COSTS.....	54
TABLE 18-EAST HALL LCCA SURVEY QUESTIONS	56

Table of Figures

FIGURE 1-FLOW OF BUILDING MATERIALS/PRODUCTS INTO BUILDING LIFE CYCLE	12
FIGURE 2-LCCA FRAMEWORK	17
FIGURE 3-DETAILED COST BREAKDOWN OF LCCA FOR GREEN CONSTRUCTION VALUES (CASE SET 1 SCENARIO 1).....	51
FIGURE 4-SUMMARY COST BREAKDOWN OF LCCA FOR GREEN CONSTRUCTION VALUES (CASE SET 1 SCENARIO 1)	52
FIGURE 5-BYERLY HALL ONLINE DASHBOARD	69

1.0 Introduction

The ability of man to recognize natural connections, logical relationships and imagine the impact of specific actions implemented in a particular order is of fundamental importance to survival. The animal kingdom possesses this sense, and so do we as human beings. However, over time it has been lost to us and replaced by cheap convenience and minimal effort. Its importance has been elevated due to the environmental damage we have caused, and unnecessary monies expended in its maintenance. Sustainable engineering, a topic of ultra-importance today, has been quietly practiced since the birth of our planet. It can be seen all around us in nature and now we too must adopt it and return to our roots.

“Sustainability is the characteristic of a process or state that can be maintained at a certain level indefinitely. Based on its environmental usage it refers to the potential of longevity of vital human ecological support systems such as the planet’s environmental system, systems of agriculture, industry, forestry, fisheries and the systems on which they depend on. The emphasis of sustainability today has been on the anthropogenic problems such as climate change or depletion of fossil fuels.”¹

As the global population and demand increases; the depletion of our resources has started to have economic ramifications, resulting in scarcity of resources and increases in commodity costs. The United Nations forecasts a world population rise from today’s 6.7 billion to 9.2 billion in 2050. Based on an article in the New York Times Americans on average consume 32 times more than their fellow developing country counterparts. If these developing countries catch up at a faster rate, the depletion of our resources will be inevitable if we remain at the same consumption levels. Based on population projections alone there will be a shortage in commodities, and an increase in demand for energy, food, and water. The earth’s degradation due to human impact has also

¹ Wikipedia Definition of sustainability: <http://en.wikipedia.org/wiki/Sustainability>

contributed to phenomena's such as global warming, adversely affecting our environment and consequently our health.

Buildings are the largest contributors of energy consumption and pollution of our natural environment. Due to our need for controlled indoor spaces, the buildings we occupy are the source of 40 percent of CO₂ emissions in the United States, higher than any other country excluding mainland China (Kats,2006). Buildings currently account for 80 percent of electric expenditures and 72 percent of all electricity consumption² in the United States. These are significant percentages and need to be reduced; to ameliorate global warming, depletion of our global and local resources, and the increased cost of commodities. A big problem, however, need not have a big solution to be effectively addressed. For example if each building reduced its consumption, overall such reductions can have a significant impact. In recent years, "Green" (sustainable) buildings have gained popularity, to address these environmental and commodity consumption concerns. Based on the United States Green Building Council (USGBC), buildings account for: 39 percent of energy use, 40 percent of raw materials use, 30 percent of waste output (136 million tons annually), and 12 percent of potable water consumption. The USGBC is a non-profit organization, which developed a sustainable building rating system called Leadership in Energy and Environmental Design (LEED) (USGBC, 2010). There are four certification levels Certified, Silver, Gold and Platinum. LEED certification is based on six categories, Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, and Innovation and Design Process (USGBC, 2010). "Green" buildings incorporate sustainable features such as: efficient mechanical systems, green roofs, Forest Stewardship Council (FSC) certified wood, increased ventilation, photovoltaic cells, water saving features, gray water use, and other high performance features. Based on the USGBC "Green" buildings reduce CO₂ emissions, and they will also cause a reduction in the demand for energy, in turn,

² United States Department of Energy (2007 Data Book)

potentially reducing the cost of energy. Reduction in the demand for energy will also reduce potential blackouts, and power quality issues.

The key to attaining sustainable environments and lifestyles is held by creating indoor conditions which do not harm our outdoor environment. We have to minimize our overall impact, build smarter structures using renewable materials and use less energy in both construction and operations of our buildings. Colleges and universities are mini-communities/cities and hence their involvement in the “Green” movement is vital. Educational institutions serve as excellent laboratories for sustainability experimentation and technological advancement. Colleges and universities can serve as examples, which towns and cities can emulate and benefit from.

In recent years there has been an increase in sustainability efforts on college campuses around the world. The Masdar Initiative, in Abu Dhabi, is an integrated “Green Community” currently under construction with the aim of being the world’s first zero-carbon city. This city will have residential, commercial and educational facilities focusing on the research of sustainable resources and the sustainable way of life. Universities within the United States have also increased their sustainability focus. A report published by the Sustainable Endowments Institute, a non-profit organization developed “to advance sustainability in campus operations and endowment practices” (Endowment Institute, 2010); studied the sustainability status of 200 top schools. Some key findings were as follows:

- More than half of the schools have “Green” building projects, with 57 percent of schools having at least one LEED-certified green building or are in the process of constructing one
- 79 percent of schools have campus-wide “Green” building policies, with specified minimum performance levels such as achieving LEED Silver certification.
- The average grade for the green building category was a “B”.

WPI has recently witnessed an increase in sustainable developments on campus. WPI constructed two major new projects, the Bartlett Center (LEED-Certified); and the new dormitory, East Hall (LEED-Gold). According to the WPI Master Plan³ numerous new projects shall be “Green”, such as the new athletics and recreation center. The recreation center is currently under construction, with a projected completion date of August 2012. The new recreation center shall incorporate “green” features such as solar thermal panels and rainwater collection for cooling systems.

The Physical Facilities Committee chaired by Judith Nitsch, P.E. and LEED Accredited Professional, recently passed a resolution to be sustainable in all future construction and to aim for the highest level of LEED Certification possible (Peyser, 2008). A review of WPI’s sustainability track record based on the Sustainable Endowments Institute; indicates that WPI is committed to sustainability practices, with WPI’s yearly grades improving and on the rise from D- in 2008 to an impressive A- in 2011. WPI has taken an active role in developing tools, which will help meet its sustainability objectives. WPI must attain the knowledge required to ensure such investments truly benefit its sustainability philosophy and meet its three-part approach. The three-part approach is composed of achieving the goals of environmental preservation, economic prosperity, and social equity for all members of society⁴.

WPI’s active involvement in spreading the message of sustainability can be fortified by having a true measure of the benefits of its sustainable facilities. This campus-wide effort will enhance WPI’s prestige and its social responsibility to the community. A university is a place filled with enthusiastic, open minds just waiting to learn and drive positive change. It is an ideal environment to promote and educate the benefits of sustainability. The objective of this research is to explore the life cycle cost analysis (LCCA) aspect of “green” investments. Sensitivity analysis of various parameters such as the discount-rate, provide a look at the impacts of potential deviations in the inputs on

³ <http://www.wpi.edu/Master/>

⁴ WPI Sustainability website: <http://www.wpi.edu/About/Sustainability/>

the outputs. The objective of the methodology was to identify key data and create a framework for the collection of the various inputs required to run an LCCA. Focusing on the various components of interest in this research, “green” and “non-green” electrical, mechanical and plumbing values were generated. This methodology resulted in inputs of base construction, consumption, operations and maintenance costs and mapping of an LCCA framework.

Amongst various projects that WPI has undertaken it is also currently undergoing an energy audit of its current buildings. The research proposed here in can be used in the selection process of proposed building systems designs.

Recently USGBC piloted new credits requiring the use of LCCA in the decision making process in material selection and project feasibility. The main aim of the inclusion of LCCA is to maximize the opportunities for an integrative cost-effective adoption of green design and construction, to encourage the use of environmentally preferable materials and assemblies.

The need for LCCA is becoming ever more prevalent as it provides the stakeholders an overall view of the cost impacts of their design decisions. This information can be used in new construction or in retrofitting older buildings.

2.0 BACKGROUND

2.1 WPI researched sustainability projects by IQP and Graduate Students:

Many students at WPI have taken an active role in promoting and exploring issues of sustainability, dedicating their Interactive Qualifying Projects (IQP) and Master's Theses to topics of sustainability directly related to WPI. Some of the reports with the highest level of relevance to this research are the following:

2.1.1 Tracking and Reducing Greenhouse Gas Emissions at WPI (Haines et al., 2007):

This report focused on the carbon emissions directly produced on campus, as a result of WPI's activities. It focused on the need to inventory the yearly greenhouse emissions, which could be used as a tool to measure environmental responsibility, and track where the sources of the largest emissions are located. Since detailed records have not been kept, an accurate in-depth analysis was not attainable and the analysis was done with few selected parameters. Based on their results from 2002 to 2006 the direct emissions from WPI decreased from 20 Million Kg CO₂ to 18 Million Kg CO₂. However, there was a rise in the emissions from 2005 to 2006 of 2 percent. No further data was collected from 2006 since the IQP data collection period terminated.

Most of the emissions were directly related to procured electricity and on-campus stationary heating fuels. They also found the reason for the decrease from 2004 to 2005 was due to the new boilers installed in 2005. The increased efficiency and combination-fuel use directly impacted the reduction of emissions. They concluded that over the interval from 2002 to 2006; there has been a 17 percent decrease in carbon emissions.

2.1.2 Technically Green: Environmental Resource Website (Kucher et al., 2007):

This project focused on the development of a sustainability philosophy and WPI's stance on the issue. It encouraged the development of a website devoted to sustainability and the creation of a committee to spearhead WPI's sustainability efforts. It provided helpful links to sustainability information.

A website was created, www.wpi.edu/~aminakya/, with a mock sustainability policy, annual report, committee, and links to other institutions, books and reading materials.

WPI has thus far created a website devoted to sustainability and has incorporated much of the information and additions the researchers of this IQP recommended. This project can help in tracking useful information to be incorporated into the Life Cycle Cost Analysis.

2.1.3 Monitoring Electricity Consumption on the WPI Campus (O'Hara et al., 2007):

The premise of this project was to evaluate, analyze and improve the electricity data collection system on the WPI campus. A campus electricity meter inventory was taken evaluating the present energy monitoring capabilities of each building. They also showed data from the existing meters for analysis. The analysis provided trends in the electricity consumption on campus. Based on the data collected, a plan for improved metering was provided. Based on their data collection efforts it was found that the level of information available was incomplete and inaccurate, therefore different sub-meters were read and the usage data from electricity bills were used. The project members deemed the data collected unsatisfactory and inaccurate.

Based on their findings a variety of improvements to the existing meters are required to accumulate accurate WPI electricity readings. Such upgrades would help WPI in tracking its actual consumption and projections of use in the future.

2.1.4 Feasibility of Green Building at WPI (Peyser, 2008):

This research addressed various sustainability parameters at WPI. The research discussed the use of the Green Building Balanced Score Card (GBBSC), its development and application. The Balanced Score Card was found to be the most useful tool in driving

change, linking the actions institutions take today to their future goals⁵. It can be used as a roadmap leading WPI to its future sustainability goals.

Costs and Benefits of building “Green” were also explored, from a general perspective in the reduction of energy use, operating costs, improvement in the value of assets, increased employee productivity, worker absenteeism and higher employee retention rates (RS Means, 2006). The costs and benefits of sustainable facilities were based on percentages developed on a national level (Kats, 2006).

The costs and benefits of the certification process were also explored. It was found that the LEED premium, which includes the soft costs and fees collected by the USGBC, may overlap with the green premium (cost of building green). The LEED premium added 0.6% to the total building cost, a relatively small increase.

The cost of building “Green” was developed by comparing the cost of conventional buildings to those with “Green” features. The conventional construction cost data were compiled from RS Means 2007. To determine the costs and benefits of green building, research done by Gregory Kats was used. Gregory Kats, a leading researcher in the arena of costs associated with sustainable design and development, performed a study on offices and school buildings in which a variety of cost and benefit percentages were developed.

Peyser’s research indicated a green premium of 2.6%, was estimated for East Hall and presented to WPI Trustees in a presentation in early 2007. Direct and Indirect benefits were researched. Some of the indirect benefits reviewed were the following: indirect energy savings, employment impact of recycling, and future earnings of students. Benefits which were not quantified in the research included the following: health benefits of green buildings, employee recruitment and retention, tax credits and

⁵ Kaplan, R and Norton, D. Putting the Balanced Score Card to Work. Harvard Business Review. Business Source Premier Database.

student retention. Another area discussed was the feasibility of LEED-Existing Building certification for WPI facilities.

2.1.5 East Hall-LEED Project Case Study (Cao & DiBenedetto, 2009):

This class project discussed the LEED credits that East Hall achieved with an emphasis on the energy and water consumption. Based on data obtained for a one-year period actual consumption was compared to the baseline design case as specified in the LEED templates submitted to the USGBC.

The project provided an overview of the credits attempted in the areas of sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality and innovation and design credits. The water and energy consumption was isolated and compared to the baseline design case. It was found that the water consumption was substantially higher than that of the proposed design case and baseline design case. Based on their conclusions it was hypothesized that the actual water usage data was 30% higher.

During the process of this research, John O'Neill P.E. provided an explanation for this increase in consumption. This substantial increase was due to the added water consumption of other building components not accounted for in the LEED template. The LEED template only included fixtures where a reduction was realized, it excluded various systems which contributed to water consumption.

In the consumption percent savings for the electrical and natural gas portion they found that there was a 59.13% savings in electrical costs and 56.09% savings in the natural gas portion. The percent savings reflect the comparison to the baseline design case and not the proposed design case. Since the data was compared to the baseline design case higher percent savings were realized. The billing data used in this project included the billing information up to June 2009. Based on a presentation to the board of trustees in early 2007 the green premium for LEED certification was estimated at 2.6% however the derivation of this percentage was not addressed.

2.2 Relevant ASTM Standards:

2.2.1 ASTM E2114-08 Standard Terminology for Sustainability Relative to the Performance of Buildings

This standard provided an overview of the industry accepted terminology as pertaining to sustainable development and sustainability in relation to the performance of buildings. Some of the terms with the highest relevance to this research were the following:

- Building: A shelter comprising a partially or totally enclosed space, erected by means of a planned process of forming and combining materials. (2) The act or process of building.
- Green Building: a building that provides the specified building performance requirements while minimizing disturbance to and improving the functioning of local, regional, and global ecosystems both during and after its construction and specified service life.
- Life-Cycle: (1) In economic impact management, the length of time over which an investment is analyzed. (2) In environmental impact management, consecutive and interlinked stages of a product system, from raw material acquisition or generation from natural resources to final disposal.
- Life-Cycle Assessment, LCA: A method of evaluating a product by reviewing the ecological impact over the life of the product. At each stage the product and its components are evaluated based upon materials and energy consumed, and the pollution and waste produced. Life stages include extraction of raw materials, processing and fabrication, transportation, installation, use and maintenance, and reuse/recycling/disposal. Based on ISO 14040, LCA is compilation and evaluation of the inputs, outputs, and the potential environmental impacts of a product system throughout its life cycle.

- Life-Cycle Cost (LCC) Method: A technique of economic evaluation that sums over a given study period the costs of initial investment (less resale value), replacements, operations (including energy use), and maintenance and repair of an investment decision (expressed in present or annual value terms).
- Sustainable Development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
- Sustainability: the maintenance of ecosystem components and functions for future generations.

2.2.2 ASTM E 1991-05 Standard Guide for Environmental Life Cycle Assessment (LCA) of Building Materials/Products

This standard provides a guide for the environmental Life Cycle Assessment (LCA) of materials/products, processes, and services produced and used in buildings and the built environment. However this standard should not be confused with the Life Cycle Cost Analysis, as this standard focuses only on the environmental LCA.

A key aspect of this standard is the establishment of a common framework and set of principles in the development of the environmental LCA. This type of LCA evaluates the ecological impact over the life of the material/product. Figure 1 depicts the various components accounted for in this type of LCA:

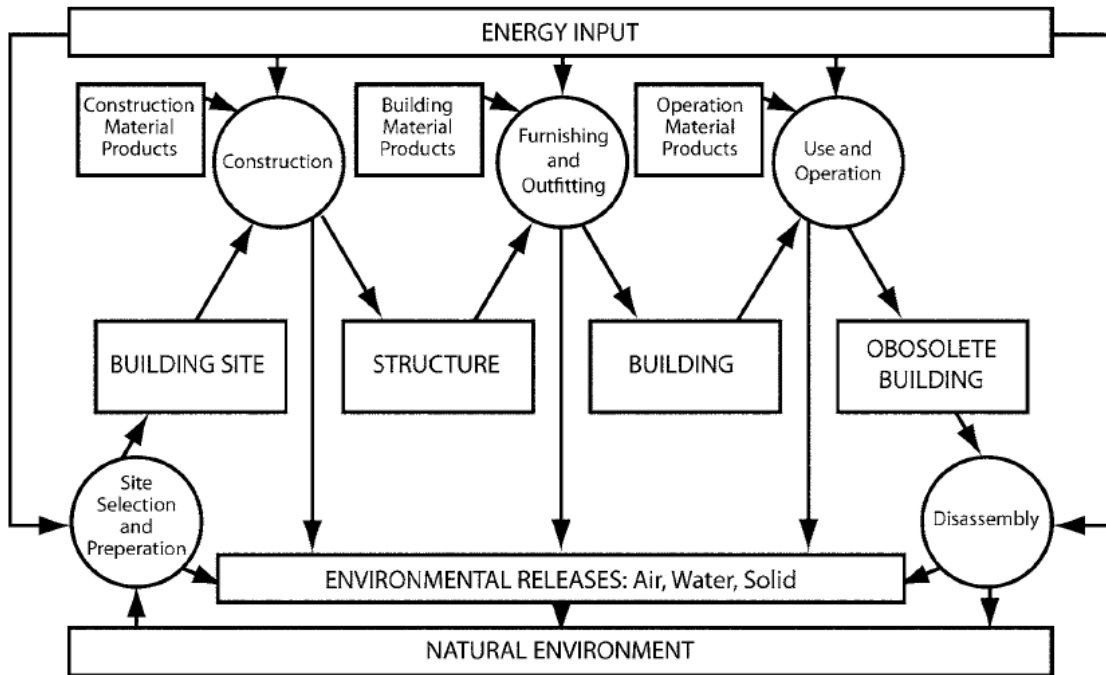


Figure 1-Flow of Building Materials/Products into Building Life Cycle

The definitions of some of the inputs seen in Figure 1 are as follows:

- Energy Input: All forms of energy necessary for the accomplishment of the particular building life cycle process under consideration.
- Environmental Releases: All air, water, and solid emissions, which are given off by the building life cycle process under the consideration that they return to the natural environment.
- Furnishing and Outfitting: The complete series of activities and actions that begins with a building structure and results in a complete building.
- Interior Furnishings: Those temporary and semi-permanent systems and components, which generally are required for the normal utilization of the building for its intended purpose including decorative components.
- Obsolete Building: A building that has reached the end of its useful life.

This type of LCA consists of four phases: goal definition and scoping, inventory analysis, impact assessment, and interpretation. These phases ensure that boundaries are set, and that the level of detail is in line with the objectives of the study.

2.2.3 ASTM E917-05 (Reapproved 2010) Standard Practice for Measuring Life-Cycle Costs of Buildings and Building Systems

This standard discusses the Life Cycle Cost Analysis (LCCA) method, providing guidance on how it should be performed. There are numerous methods of economic valuations such as Life Cycle Cost Analysis (LCCA), benefit-to-cost ratio, internal rate of return, net benefits, payback, multi-attribute decision analysis, and risk analysis. The LCCA method is performed in either present-value or annual-value terms, accounting for relevant costs associated with a building or building components over a specified time period.

The LCCA method is based on the premise that all future and present costs associated with the life of a building are important to the investor. LCCA includes but is not limited to: first, designing purchasing/leasing, construction/installing, operating, maintaining, repairing, replacing, and disposal costs of a building systems and components.

The LCCA method is particularly of importance if there are high first costs, it is a tool that can determine the economic justification of an investment. It can be used to compare building design and sub-system alternatives. Various inputs are required for an LCC analysis such as the study period, first costs, operating and maintenance costs, consumption costs, inflation factors, discount rate, cost data, income taxes, and salvage value. Other inputs may be included if they are deemed important in the analysis. For the purposes of this research some of the inputs specified in this standard, were not included as they were deemed negligible and/or beyond its scope.

Sensitivity, risk and uncertainty were also addressed in this standard. The technique recommended for risk analysis entails the Monte Carlo simulation technique. Risk analysis was not performed in this research. Sensitivity analysis was done on various parameters where uncertainty existed. Based on the standard sensitivity shows decision makers how the economic viability of a project fluctuates with changes to various parameters. These parameters can include discount rates, inflation rates, fuel price escalation, study periods, and other critical components.

The standard suggests that if alternative building designs result in different revenue streams and different benefits from overall performance then an LCCA is not recommended. In such cases economic evaluations that focus on benefits should be utilized. Examples of such analyses include net benefits, benefit-to-cost ratio, internal rate of return, and payback methods. It should also not be used for budget allocation among non-mutually exclusive projects.

2.2.4 ASTM E2129-10 Standard Practice for Data Collection for Sustainability Assessment of Building Products

This standard provides a guide for the collection of data, utilized in the assessment of the sustainability of building products in commercial and residential buildings. It focuses on the selection of products in the construction of a building along with various other features contributing to sustainability such as: overall efficiency of the design, impact on end-user habits, and building impact on micro-climate and macro-climate.

This standard does not provide guidance on the efficiency of the overall building design, site selection, building operations, or other features that influence sustainability. It provides a series of questions to inventory attributes of products used in the building. The standard is organized in the Construction Specifications Institute's (CSI) MasterFormat sections, to develop a streamlined method of data collection. MasterFormat version 1995 (16 Divisions) is used along with a cross-reference table provided for comparison to CSI MasterFormat 2004 (40 Divisions).

2.2.5 ASTM E2432-05 Standard Guide for General Principles of Sustainability Relative to Buildings

This standard provides guidance on the three principles of sustainability: environmental, economic, and social. It distinguishes between ideal sustainability and applied sustainability. Ideal sustainability is one in which trade-offs are not necessary between the three principles whilst applied sustainability requires the delicate balancing of the three principles.

One of the principles in particular is directly related to this research as it discusses the importance of quantifying the economic impacts of buildings to advance sustainability practices. This entails the quantification and optimization of the life cycle costs/benefits and external costs/benefits to the greatest extent possible. External costs are those associated with social and environmental impacts while promoting external benefits with social and environmental impacts. This standard highlights the importance of capturing the direct and indirect economic impacts associated with life-cycle costs/benefits of materials, land, and labor. Costs and benefits to be included and quantified are the first costs/benefits, operating costs/benefits, and end-use costs/benefits. This standard encourages a holistic approach to assess the possible impacts of materials throughout their life span.

2.3 Immediate need for Life Cycle Cost Analysis

The reports discussed above do not answer the important question of whether or not WPI's investment in "Green" technologies truly benefits WPI. It is apparent further work needs to be done in the area of data collection and analysis; for the purposes of an in-depth Life Cycle Cost Analysis (LCCA), directly related to WPI. To assess WPI's future and present sustainable investments this is a vital tool, needed to accurately measure the full scope of costs of sustainable investments. The cost data used in previous research was based on other institutions and national averages. Although that information is useful, it is not a true measure that WPI can rely on for future investment decisions.

There are still unanswered questions such as whether the consumption percent savings are accurate and if they are directly related to WPI. Would the benefits/costs be higher or lower than national averages? How well did the new sustainable facilities measure up in terms of consumption and base construction costs (green premium)? What parameters should be tracked and analyzed for operations and maintenance purposes? This research aims to resolve some of these questions as it is tailored to WPI, along with providing a template highlighting components and inputs required to paint an accurate

picture of economic benefits/costs. The objective of this thesis is to review the costs associated with the use of sustainable features in buildings, providing a framework which can be tracked and analyzed. The Life Cycle Cost Analysis (LCCA) framework includes a series of inputs both “green” and “non-green”, used to facilitate a comparative analysis of percent savings or percent added costs. This tool will aide WPI in its new construction or renovation decision-making process.

These costs and templates may be used in future rough order-of-magnitude cost estimates and Life Cycle Cost Analysis of future investment alternatives. This research also serves as a template for the collection of data and use in the Life Cycle Cost Analysis framework. With the various inputs reviewed the possibilities of analytical variations are endless. LCCA can be applied not only to entire building components, but on sub-components and sub-systems in question. Numerous matrices may be developed, providing WPI with the flexibility, to isolate various parts of the design to analyze their costs/benefits and alternatives.

The focus of this research was the analysis of the three main components Mechanical, Electrical and Plumbing. The sustainability “green” features incorporated in the design of the building and their impact on the building’s performance and monetary benefits.

Sensitivity analysis of different components was performed creating a range of possible results, enhancing deterministic values. Deterministic results were enhanced by changing one or more of the inputs and gauging the results based on the range of potential deviations. For example this maybe done for the discount rate, initial cost, energy costs etc. This provides a range of outputs for the range of inputs in question for which uncertainty exists. Applying the sensitivity of various components a series of scenarios were analyzed depicting worst and best case scenarios and the potential savings or added costs.

3.0 METHODOLOGY

3.1 Framework of Life Cycle Cost Analysis

Figure 2-LCCA Framework

Life cycle cost analysis (LCCA) is the total cost of constructing and operating a building over a selected time period or life of a building. There are various qualitative and quantitative components that can be used in an LCCA, referred to as inputs for the purposes of this report. To establish a point of comparison between East Hall, a Green dormitory facility, and a Non-Green dormitory facility various inputs were used in the LCCA.

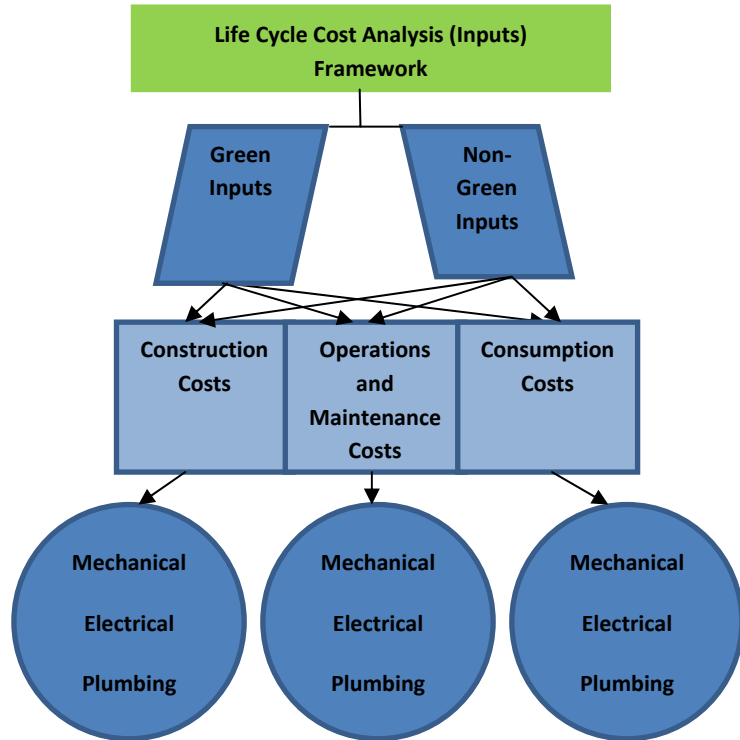


Figure 2-LCCA Framework outlines the series of inputs used in this analysis to generate a comparative cost basis. The first tier of inputs including the Green (Sustainable) and Non-Green (Traditional Construction) inputs are subdivided into various other inputs: construction, operations and maintenance, and consumption costs. These inputs are further sub-divided into mechanical, electrical and plumbing (water) inputs. This framework allowed for the establishment of 51 parameters per LCCA. The LCCA spreadsheets in Appendix F are structured to analyze inputs on a subsystem and project level.

In order to run this analysis a building lifespan and discount rate were selected to reflect current market trends and validity of the analysis. Further definition is provided below as to these parameters. To account for potential changes and uncertainty a sensitivity

analysis was done on some of the parameters. The sensitivity analysis allowed for worst-case and best-case scenario analysis of potential added cost or cost savings.

3.2 Adjustment Factors

In the preparation of inputs various adjustment factors were required to establish an appropriate baseline for the costs to be applied in the LCCA. Escalation and de-escalation factors were used to establish a uniform timeline to July 2009. This timeline was selected due to the information received from WPI's facilities department on the utilities billing cycle. Location and size factors were used to modify RS Means pricing, in order to reflect appropriate costing and size comparison conditions. A green factor was also applied to provide a comparative basis where hard data was not attainable. In some cases a need for cost neutralization was foreseen, therefore unit prices were neutralized to the unit pricing per measure of commodity WPI paid in order to allow for a true comparative analysis of benefits/costs.

3.2.1 Discount Rate

To find the present worth of future financial benefits or costs discounting was applied at a rate of 7% (Kats, 2006) accounting for the time value of money. Since the discount rate is the investor's opportunity cost of money over time and minimum acceptable rate of return this percentage may vary depending on the investor and current market conditions. For the purposes of this research a value of 7% was selected. The discount rate is the combination of the real interest rate plus the rate of inflation. Currently the real discount rate for a 20 year investment is 2.7% and was 2.9% for 2009⁶. Based on the CIA fact book the projected inflation rate is -0.3%⁷ with a 3.8% inflation rate in 2008⁸.

⁶ Office of Management and Budget Circular A-94 (2010 Real Interest Rate)
<http://www.whitehouse.gov/sites/default/files/omb/assets/a94/a094.pdf>

⁷ Inflation rate for 2009 (Est) <https://www.cia.gov/library/publications/the-world-factbook/fields/2092.html>

⁸ Inflation rate for 2008 (Est.) : <https://www.cia.gov/library/publications/the-world-factbook/fields/2092.html>

Assuming we select the 2008 inflation rate of 3.8% and the real discount rate of 2.9% the total discount rate would be 6.7% which is in line with the 7% selected discount rate. Due to the timeline selected for the LCCA inflation and real rates of 2009 are pertinent in this analysis.

3.2.2 Escalation and De-Escalation Rates

Based on industry standards and publications such as Global Insight and private industry journals such as PB Economic Forecast Review an escalation and de-escalation rate of 6% was used. This rate may vary quarterly depending on market conditions and supply/demand of various resources. Escalation and de-escalation factors were compounded and arrived at using the following equations:

$$\text{Escalation Factor} = 1.06^n$$

$$\text{De-Escalation} = 1 - ((1.06^n) - 1)$$

$$n = \text{period in years}$$

3.2.3 Green Factor

In the development of the maintenance costs little information was found on the maintenance costs of Green facilities, therefore a green factor was applied to encompass the potential increase in cost of maintaining new technologies and equipment. Since some of the components of a green building are relatively new there may be a learning curve in the process and therefore this cost needs to be captured. A 20% factor was initially selected however a sensitivity analysis was done on this percentage to gauge the impact of lower percentage applications on the overall maintenance costs. Other percentages applied were 5%, 10%, and 15%. Over the life of the building the green factor may become negative as the maintenance costs may actually decrease. A sensitivity analysis was done to gauge the impact of a variation on this factor, and changes it would reflect on the overall maintenance costs.

3.2.4 Neutralization

In the case of the electrical unit pricing and natural gas unit pricing there were discrepancies in the various unit pricing costs realized by the actual versus the various design cases. The LEED template unit costs differed from those realized by WPI; therefore the costs were neutralized to reflect the unit pricing paid by WPI to the various utility companies. This was done to project a real world scenario comparative case cost analysis.

3.2.5 Location and Size Factors:

In the development of the Green and Non-Green construction costs RS Means' unit pricing (RS Means SF Cost Guide, 2010) was used to develop the comparative data. The national averages provided in the RS Means Square Foot (SF) Cost Guide were adjusted for location using the weighted average for Worcester, Massachusetts. To adjust for sizing discrepancies the Square Foot Project Size Modifier was applied.

3.3 Building Life

In the case of selecting a time frame for analysis it is imperative the owner has realistic expectations of the life of the building. In the case of East Hall it has been assumed to be forever, since WPI is an academic institution less likely to sell its dormitory asset. A 25-40 (Dell'Isola, 1997) year assumption is typical for a building that is to last forever. In this analysis a 25 year period has been assumed.

3.4 Sensitivity Analysis

This research highlights the potential variation of several uncertain components as follows:

- Variability of the "Green Factor" on Maintenance Costs (Yearly Preventative Maintenance and Frequency Maintenance Repair and Replacement)
- Market Volatility impacts on the Discount Rate and Escalation Rates

These parameters were selected due to their uncertainty and potential impacts on the Life Cycle Cost Analysis results. Based on the above mentioned parameters two case sets were developed, case 1 and case 2, with six scenarios within each case set for a total of twelve scenarios.

3.5 Framework of Construction Costs

Based on the LCCA Flowchart described above a series of inputs in the analysis are the Green and Non-Green construction costs. To establish these costs information received from the builder was adjusted using various factors discussed in the previous section to reflect the conditions for this research analysis.

3.5.1. Green and Non-Green Costs

East Hall base construction costs were provided by Gilbane Building Company (GBC) and used in the establishment of comparisons between the base Green costs and the Non-Green costs. The construction costs provided were escalated and add-ons allocated to capture an “All-In” cost of construction. The work breakdown structure (WBS) of the construction cost estimate provided by GBC reflected pricing per bid package. A “Guaranteed Maximum Price (GMP)” cost and a “Current Amount (CA)” cost was provided. These costs were adjusted and below the line items allocated to provide the “All-In” cost of construction.

The below the line items added an additional 14.99% and 16.13% respectively to the GMP and CA. The reason for this differential in the add-ons was due to an increase in “CM Contingency Amount” from the original GMP costs. This estimate can be found in Appendix B-7 Construction Cost Estimate from GBC.

The allocated CA costs of the mechanical and electrical portions were isolated and compared to the RS Means mid-size (4-8 floors) high-end (3/4 percentile) dormitory mechanical and electrical square foot costs. Please refer to Appendix B-6 RS Means Construction Cost Data and Appendix B-1 Construction Cost Comparison of East Hall to High-end Dormitory Facilities for these costs. The cost per bed and dormitory square

foot costs were also compared to provide a ballpark sense of how much more was spent. This analysis generated the base Green and Non-Green construction cost inputs in the LCCA.

3.6 Framework of Consumption Costs

To generate the series of inputs required for yearly commodity consumption costs, three components mechanical, electrical and plumbing were analyzed. Green and Non-Green costs were developed for these three parameters for the purposes of this analysis.

3.6.1 Green and Non-Green Costs

3.6.1.1 Mechanical Costs

The mechanical portion of consumption costs were derived based on Appendix A-ME1 Energy and Atmosphere Credit 1, submitted to the USGBC for LEED certification. Based on this document the Baseline Design Case (BDC) consumption and Proposed Design Case (PDC) consumption was extracted and used in the analysis. The unit pricing was neutralized to reflect WPI billed rates. The actual case consumption was provided by WPI Facilities department found in Appendix A-M3 Natural Gas Data (WPI-East Hall). Consumption energy use and costs were compared and used as inputs in the LCCA.

3.6.1.2 Electrical Costs

The electrical portion of consumption costs were derived based on Appendix A-ME1 Energy and Atmosphere Credit 1, submitted to the USGBC for LEED certification. Based on this document the Baseline Design Case (BDC) consumption and Proposed Design Case (PDC) consumption was extracted and used in the analysis. The unit pricing was neutralized to reflect WPI billed rates. The actual case consumption was provided by WPI Facilities department found in Appendix A-E3 Electrical Data (WPI-East Hall). Consumption energy use and costs were compared and used as inputs in the LCCA.

3.6.1.3 Water Costs

The water (plumbing) portion of consumption costs were derived based on Appendix A-W6 Water Efficiency Credit 3: Water Use Reduction, submitted to the USGBC for LEED certification. Based on this document the Baseline Design Case (BDC) consumption and Proposed Design Case (PDC) consumption was extracted and used in the analysis. The unit pricing was already neutralized to reflect WPI billed rates. The actual case consumption was provided by WPI Facilities department found in Appendix A-W5 Water Data (WPI-East Hall).

Since the water consumption comparison of the BDC and PDC included only the comparison of low flow fixtures to those which were traditionally used, a reduction factor was used (range of 20%-30%)⁹ to reduce the WPI East Hall consumption quantities. The reduction was applied to analyze the low-flow fixtures only, which were accounted for in the LEED template. The LEED template calculations did not include all the water used in the building but only specific fixtures¹⁰.

WPI East Hall's water usage included water required for the following items, which were excluded from the LEED Comparison:

- HVAC make-up water¹¹
- Washing Machines
- Drinking Fountains
- Service Sinks (Mechanical Rooms)
- Hose Bibbs (Mechanical Rooms and Public Toilets)
- Wall Hydrants (Building Perimeter and in Parking Lot)

⁹ Currently there is a research project underway by Canon Design to confirm this range and isolate the additional water consumption from the sources indicated. This range was provided by engineer John O'Neill, P.E. as a rough ballpark percentage for this analysis.

¹⁰ Based on correspondence with John O'Neill (Canon Design), PE.

¹¹ Based on correspondence with John O'Neill this could be a significant load on the consumption.

Since these components in aggregate may have added a significant load on the consumption values the adjusted values were compared to the BDC and PDC, to reflect a more accurate comparative analysis. Consumption energy use and costs were then compared and used as inputs in the LCCA.

3.7 Framework of Maintenance Costs

3.7.1 Green and Non-Green Costs

To generate the series of inputs required for maintenance costs two major parameters were used: Yearly Preventative Maintenance (YPM) and Frequency of Maintenance Repair and Replacement (FMRR). All three components of mechanical, electrical and water (plumbing) were subdivided into the YPM and FMRR. Green and Non-Green costs were developed for these three parameters for the purposes of this analysis by applying the green factor (5%, 10%, 15% & 20%).

3.7.2 Mechanical Costs

Using RS Means Operations and Maintenance CostWorks 2010 the YPM and FMRR mechanical costs were generated. For the case of the non-green costs two adjustment factors were applied: de-escalation to July 2009 prices (0.97) and a location factor (1.095). To create the green costs an additional adjustment factor was applied of 5%, 10%, 15% and 20% respectively allowing the analysis of four scenarios.

Within the range of FMRR costs not all costs were assumed at a 100% rather a variation of percentages 20%, 30%, and 50% were used to collect the total costs. These percentages need to be further explored for their applicability to WPI East Hall. Appendices C-M1 YPM, C-M2 FMRR, and C-M3 Summary of Green versus Non-Green FMRR; outline the various costs and application of the aforementioned percentages accordingly. The frequency time intervals for major repair and replacement are: 0.5, 1, 2, 3, 5, 6, 7, 8, 10, 12, 14, 15, 20, 25, 30 and 50 years. For the purposes of this analysis only FMRR up to 25 years was considered based on the building life assumption stated above.

Annualized YPM costs were used as inputs in the LCCA. The annualized method converts initial, recurring and non-recurring preventative maintenance costs to an annual series of payments (Dell'Isola, 1997).

3.7.3 Electrical Costs

Using RS Means Operations and Maintenance CostWorks 2010 the YPM and FMRR electrical costs were generated. For the case of the non-green costs two adjustment factors were applied: de-escalation to July 2009 prices (0.97) and a location factor (1.095). To create the green costs an additional adjustment factor was applied of 5%, 10%, 15% and 20% respectively allowing the analysis of four scenarios.

Within the range of FMRR costs all costs were assumed at a 100% to generate the total FMRR costs. This percentage requires further study to determine its applicability to WPI East Hall. Appendices C-E1 YPM, C-E2 FMRR, C-E3 Summary of Green versus Non-Green FMRR; outline the various costs and application of the aforementioned percentages accordingly. The frequency time intervals for major repair and replacement are: 0.5, 1, 3, 5, 10, 15, 20, 25, 30 years. For the purposes of this analysis only FMRR up to 25 years was considered based on the building life assumption previously stated.

Annualized YPM costs were used as inputs in the LCCA. The annualized method converts initial, recurring and non-recurring preventative maintenance costs to an annual series of payments (Dell'Isola, 1997).

3.7.4 Water (Plumbing) Costs

Using RS Means Operations and Maintenance CostWorks 2010 the YPM and FMRR plumbing costs were generated. For the case of the non-green costs two adjustment factors were applied: de-escalation to July 2009 prices (0.97) and a location factor (1.095). To create the green costs an additional adjustment factor was applied of 5%, 10%, 15% and 20% respectively allowing the analysis of four scenarios.

Within the range of FMRR costs all costs were assumed at a 100% to generate the total FMRR costs. This percentage requires further study to determine its applicability to WPI

East Hall. Appendices C-W1 YPM, C-W2 FMRR, C-Y3 Summary of Green versus Non-Green FMRR; outline the various costs and the application of the aforementioned percentages accordingly. The frequency time intervals for major repair and replacement are: 0.5, 1, 3, 4, 5, 7, 10, 12, 15, 20, 25, 40 and 50 years. For the purposes of this analysis only FMRR up to 25 years was considered based on the building life assumption. Annualized YPM costs were used as inputs in the LCCA. The annualized method converts initial, recurring and non-recurring preventative maintenance costs to an annual series of payments (Dell'Isola, 1997).

3.8 Framework of Operations Costs

3.8.1 Green and Non-Green Costs

For the purposes of this analysis Green and Non-Green operations costs were considered to be the same. The information was provided by WPI facilities department and an assumption was made as to the percentage breakout of the operations budget as pertaining to the three components: mechanical, electrical and plumbing. This information may require further study and analysis to ensure its applicability to WPI East Hall and the establishment of a true Non-Green operational cost for the various components. Please refer to Appendix C-O1 Yearly Operations Costs for MEP.

3.9 Framework of Roof Costs

3.9.1 Green and Non-Green Costs

East Hall's composite (Green and Non-Green) roof was analyzed separately to allow for ease of cost analysis. The details of East Hall's composite roof may be found in Appendix D-R6 Roof Area Model. The total roof area is 24,920 square feet; with roughly 5,123 square feet being Green. The area under the Green roof is built-up Non-Green roof.

In order to develop a framework for this analysis several costs were generated: Non-Green Roof Costs¹², Green Roof Costs¹³, YPM¹⁴(Cost Est. & Planning for Facilities Maintenance, 1996) and FMRR¹⁵ costs, Neutralized Roof Costs¹⁶. Adjustments such as de-escalation and green factors were applied to reflect the conditions of this research. A green factor of 20% was applied for this analysis; this percentage was selected due to the specialized work required in maintaining the roofing system. Please refer to Appendices D-R1 Non-Green Built-Up Roofing Cost Comparison to WPI East Hall, and D-R3 Yearly Preventative Maintenance and Frequency Major Repair Replacement Costs, D-NR1 Neutralized Roof Cost Comparison for a detailed listing of these costs and assumptions.

The operations cost for the roof was assumed to require ¼ of yearly manpower, assuming an employee at \$50,000/ year resulting in an operations cost of \$12,500/year.

The yearly operations and maintenance costs along with the base construction costs were then used as inputs in the LCCA.

3.10 Framework of East Hall LCCA Survey

A survey titled “East Hall LCCA” was compiled for the residents of East Hall, to comprehend the end-users perspective on the green features integrated in the dormitory’s design. The survey was subdivided into three sections accounting for the mechanical, electrical and plumbing components. The survey was composed of a total of 31 multiple choice questions with a select few allowing for additional commentary. The survey was generated using surveymonkey, an online surveying tool, and was

¹² Based on RS Means Built-up roofing costs and Previous Project Experience (New Haven Rail Yard Facilities) estimated at \$17/sf

¹³ Based on Construction cost estimate from GBC with adjustments and add-ons allocated.

¹⁴ Costs were escalated and adjusted to reflect the conditions of this research.

¹⁶ This allowed for the comparison of East Hall to High-End dormitory comparison when both roofs are Non-Green.

distributed on 11/15/2010 and re-distributed on 11/19/2010 to the residents, by Naomi Carton. The “East Hall LCCA” survey provided a two week window for completion. A survey introductory and follow-up letter outlining instructions, were provided to the residents to ensure their responses were directly related to their activities and opinions of East Hall only. Please refer to Appendices E-S1 Survey Introductory Letter, E-S2 East Hall LCCA Survey Questions, and E-S3 Survey Follow-Up Letter for details of the information request provided to the East Hall residents.

4.0 RESULTS

4.1 Construction Costs

Since RS Means was used to develop the non-green construction costs, it was required to adjust the information for location and size. Table 1-Adjustment Factors, indicates the various parameters selected for this analysis.

Adjustment	Value
Location-Weighted Average	109.5
Square Foot Project Size Modifier	0.95

Table 1-Adjustment Factors

4.1.1. Green and Non-Green Costs

A comparison of the ¾ percentile of RS Means' dormitory facilities to East Hall yielded the following results indicated in Table 2-Construction Costs:

Type of Comparison	RS Means	East Hall	Comparison
Dormitory¹⁷ -\$/sf	\$217.04/sf	\$230.72/sf	WPI Costs were 5.9% higher
Per Bed Total¹⁸ Cost	\$110,539.93/bed	\$161,507.38/bed	WPI Costs were 31.6% higher
Electrical-\$/sf	\$21.70/sf	\$19.20/sf	WPI Costs were

¹⁷ This cost is inclusive of other components such as structural, architectural, MEP etc...

¹⁸ This cost is inclusive of other components such as structural, architectural, MEP etc...

Mechanical & Electrical-\$/sf			13.02% lower
	\$81.26/sf	\$65.29/sf	WPI Costs were 24.46% lower

Table 2-Construction Costs

For further details to the above mentioned table please refer to Appendices B-1 Construction Cost Comparison of East Hall to High-end Dormitory Facilities and B-2 Adjusted East Hall Cost Estimate (GBC). For graphical representation of the Non-Green costs versus the Green baseline Mechanical and Electrical costs please refer to Appendix B-3.

In Non-Green construction the mechanical and electrical costs encompass 37.50% of the total cost; in the case of East Hall this was a total of 27.97%. Interpolating between the percent of total costs and adjusting for the percentage decrease in our expenditure for mechanical and electrical items WPI paid roughly \$0.57 on every \$1.00 that was spent in a Non-Green application on mechanical and electrical items. The total cost per bed comparison indicated a much higher percent added cost of 46.11%, but based on the square foot cost the percent added cost was 5.9%. The cost per bed seemed unusually high and this differential could be due to scope differences between East Hall and RS Means data. If the green roof costs are replaced with traditional roof costs the square foot cost of East Hall is reduced from \$230.72 to \$229.36, resulting in a 5.37% percent added cost or an additional \$12.32 per square foot. The neutralized costs may be found in Appendix D-NR1 Neutralized Roof Cost Comparison.

Based on the dormitory (Current Amount) square foot costs East Hall is 5.90% higher in cost, indicating that for every \$1.00 that was spent in traditional construction WPI spent \$1.06. The green premium (added cost for building “green”) based on the results indicated above is \$13.68 per square foot (5.9%). A leading researcher in the area of costs and benefits of green buildings, Gregory Kats, performed a study (Kats, 2006) on the costs and benefits of building green offices and schools (constructed between 1994

and 2004) for the California Sustainable Building Task Force. One of his findings was that the green cost premium ranged from 0.66 to 6.5 percent of the total cost of the facility. Based on the LCCA research presented here in, 5.9% and 5.37% (neutralized roof costs) fall within that range. The green premium of East Hall as presented to the Board of Trustees (Peyser, 2008) in early 2007 of 2.6%, a value 2.3 times less. The green premium presented to the Board of Trustees, accounted for the gift donation of the green roof therefore reducing the construction cost this research did not deduct the gift value.

For graphical representation please refer to Appendices B-4 Dormitory SF Costs and B-5 Total Cost per Bed. For raw data please refer to Appendices B-6 RS Means Construction Cost Data and B-7 Construction Cost Estimate from Gilbane Building Company.

4.2 Consumption Costs

4.2.1 Green and Non-Green Costs

In order to understand the consumption costs and energy usage per component information retrieved from Appendices A-ME1 Energy and Atmosphere Credit 1, and A-W6 Water Efficiency Credit 3: Water Use Reduction were used in the development of the following costs.

For the neutralization of unit costing information Table 3-Neutralized Unit Pricing, outlines the various unit costs selected for this analysis

Input	Type of Energy	Unit of Measure	LEED Template U/P	WPI U/P	Other U/P	Selected U/P
Mechanical	Natural	therms	\$1.30	\$0.23	N/A	\$0.23
	Gas			(Nstar Gas)		

Electrical	Electricity	kWh	\$0.14	\$0.13 (National Grid)	\$0.16 ¹⁹	\$0.13
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Table 3-Neutralized Unit Pricing

4.2.1.1 Mechanical Costs

The baseline design case (BDC) and proposed design case (PDC) projected an annual energy usage (natural gas) of 76,641.20, and 42,803.90 therms respectively; providing a percent savings of 44.15%. In the actual case (AC) WPI’s East Hall residents consumed 33,665.00 therms, with a percent savings of 56.07% to the BDC and 21.35% to the PDC in costs and energy use. Please refer to Appendices A-M1 BDC and PDC Comparison, A-M2 AC v. BDC and PDC, A-M3 Natural Gas Data (WPI-East Hall), A-M4 Graph: Gas Consumption and Cost Comparison of Various Design Cases, for detailed information on these numbers.

Based on a detailed view of 60 LEED rated buildings (Kats, 2003), green buildings result in a 25%-30% savings in energy, compared to non-green buildings. Comparing East Hall to this range we fall short by 3.65%. Even though we experienced lower savings, we still saved \$0.01/sf/year. Table 4-Mechanical Consumption Costs, below indicates the percent savings metrics per year and over a 25 year period at a 7% discount rate.

Table 4-Mechanical Consumption Costs

Case Comparison	Percent Savings ²⁰	Comments	Savings/ yr	25yr ²¹ 7% ²²
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¹⁹ Cost based on the EIA-DOE Spreadsheet for Average Price Per State 2009, in this case the cost for residential Full Service Providers has been used. http://www.eia.doe.gov/emeu/steo/pub/contents.html#Electricity_Markets

²⁰ Percent savings based on neutralized costs.

²¹ Based on building life assumption as discussed in this report.

²² Based on Discount rate assumption, values have been calculated using standard present worth of annuity calculations.

AC v. BDC	56.07%	BDC was 56.07% higher	\$0.06/sf/yr	\$0.70 savings
AC v. PDC	21.35%	PDC was 21.35% higher	\$0.01/sf/yr	\$0.12 savings

4.2.1.2 Electrical Costs

The baseline design case (BDC) and the proposed design case (PDC) projected an annual electricity consumption of 2,606,107.80 and 2,076,781.60 kWh respectively generating a percent savings of 20.31%. In the actual case (AC) WPI’s East Hall residents consumed 1,102,800.00 kWh, a 57.68% savings to the BDC and 46.90% savings to the PDC in costs.

Please refer to Appendices A-E1 BDC and PDC Comparison, A-E2 AC v. BDC and PDC, A-E3 Electrical Data (WPI-East Hall), A-E4 Average Price Data (by state), A-E5 Graph: Neutralized Cost Comparison of Various Design Cases, A-E6 Graph: Energy Consumption and Costs, A-E7 Pie Chart: Energy use of Various Designs, and A-E8 Graph: WPI East Hall Monthly Energy Costs, for detailed information on these numbers.

Based on a detailed view of 60 LEED rated buildings (Kats, 2003), green buildings result in a 25%-30% savings in energy, compared to non-green buildings. Comparing East Hall to this range we surpass it by 16.90%. 46.90% is a substantial percent savings above the 25%-30% range, resulting in \$0.81/sf/yr in savings. Table 5-Electrical Consumption Costs, indicates the percent savings metrics per year and over a 25 year period at a 7% discount rate.

Case Comparison	Percent Savings ²³	Comments	Savings/ yr	25yr ²⁴ 7% ²⁵
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²³ Percent savings based on neutralized costs.

²⁴ Based on building life assumption as discussed in this report.

AC v. BDC	57.68%	BDC was 57.68% higher	\$1.25/sf/yr	\$14.57 savings
AC v. PDC	46.90%	PDC was 46.90% higher	\$0.81/sf/yr	\$9.44 savings

Table 5-Electrical Consumption Costs

4.2.1.3 Water Costs

The baseline design case (BDC) and the proposed design case (PDC) projected an annual water consumption of 320,639.60 CF/yr and 221,609.55 CF/yr respectively, generating a 30.89% percent savings in consumption. In actuality WPI’s East Hall residents consumed 436,900 CF resulting in a 36.26% underestimation to the BDC and 97.15% underestimation to the PDC.

Please refer to Appendices A-W1 BDC and PDC Comparison, A-W2 AC v. BDC and PDC, A-W3 Pie Chart-Water Consumption comparison of Various Design Cases, A-W4 Graph: Consumption & Costs of Various Design Cases, A-W5 Water Data (WPI-East Hall), and A-W7 Water Costs over a 5 year Period, for detailed information on these numbers.

This analysis resulted in no percent savings but percent added costs; a finding not supported by the claims of the USGBC and the work of Gregory Kats. Table 6-Water Consumption Costs, indicates the percent added cost metrics per year and over a 25 year period at a 7% discount rate.

²⁵ Based on Discount rate assumption, values have been calculated using standard present worth of annuity calculations.

Case Comparison	Percent Savings	Comments	Added Cost/ yr ²⁶	25yr ²⁷ 7% ²⁸
AC v. BDC	-36.26%	BDC was 36.26% lower	\$0.05/sf/yr	\$0.58 added cost
AC v. PDC	-97.15%	PDC was 97.15% lower	\$0.10/sf/yr	\$1.17 added cost

Table 6-Water Consumption Costs

Based on further investigation of the unusually high water consumption; it was found that East Hall actual water consumption included values excluded from the LEED template calculations. The LEED template calculations did not include: HVAC make-up water²⁹, washing machines, drinking fountains, service sinks (mechanical rooms), hose bibbs (mechanical rooms and Public Toilets) and wall hydrants (building perimeter and in parking lot). In contacting Canon Design to further investigate this increase of consumption based on excluded components, it was suggested that a 20%-30% range reduction factor be applied. An analysis with 20%, 25% and 30% reduction in the actual consumption was generated for a more accurate comparative analysis between the LEED assumptions and the Actual Case. The tables and charts below indicate the results from the various percentage reduction applications:

4.2.1.3.1-20% Reduction in the Actual Case Consumption and Costs:

If the Actual Case is reduced by 20% the yearly consumption would be 349,520 CF generating a yearly cost of \$24,718.47 versus the original 436,900 CF and \$30,583.

²⁶ The formula used to arrive at this added cost per year is as follows: ((Actual Cost Total-Design Case Total)/Total Building Square Footage)

²⁷ Based on building life assumption, as discussed in this report.

²⁸ Based on Discount rate assumption, values have been calculated using standard present worth of annuity calculations.

²⁹ Based on correspondence with John O'Neill this could be a significant load on the consumption.

However the consumption is still higher than both the BDC and PDC. Table 7-Water Consumption Costs (20% Reduction), summarizes the percent savings and added cost values based on these findings:

Case Comparison 20% Reduction	Percent Savings	Comments	Added Cost/ yr ³⁰	25yr 7%
AC v. BDC	-9.01%	BDC was 9.07% lower	\$0.01 /sf/yr	\$0.12 added cost
AC v. PDC	-57.72%	PDC was 57.72% lower	\$0.06/sf/yr	\$0.70 added cost

Table 7-Water Consumption Costs (20% Reduction)

4.2.1.3.2-25% Reduction in the Actual Case Consumption and Costs:

When the Actual Case is reduced by 25%, the BDC and PDC are still lower in their assumptions and therefore there are no savings realized. In the case of the BDC the added cost is too low therefore assumed to be negligible.

Table 8-Water Consumption Costs, summarizes the percent savings and added cost values based on the findings:

Case Comparison 25% Reduction	Percent Savings	Comments	Added Cost/ yr	25yr 7%
AC v. BDC	-2.19%	BDC was 2.19% lower	\$0.00/sf/yr	\$0.00 added cost

³⁰ The formula used to arrive at this added cost per year is as follows: ((Actual Cost Total-Design Case Total)/Total Building Square Footage)

AC v. PDC	-47.86%	PDC was 47.86% lower	\$0.05/sf/yr	\$0.58 added cost
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Table 8-Water Consumption Costs (25% Reduction)

4.2.1.3.3-30% Reduction in the Actual Case Consumption and Costs:

In the case where a 30% reduction was assumed a positive percent savings was achieved of \$0.01/sf/yr and \$0.12 over the life of the building, only when compared to the BDC. There was still a rather large gap between the Actual Case and the Proposed Design Case. Table 9-Water Consumption Costs (30% Reduction), outlines the findings based on this percent decrease in consumption.

Case Comparison	Percent Savings	Comments	Added Cost/ yr	25yr 7%
30% Reduction				
AC v. BDC	4.62%	BDC was 4.62% higher	\$0.01/sf/yr Savings per year	\$0.12 Savings
AC v. PDC	-38.00%	PDC was 38% lower	\$0.04/sf/yr	\$0.47 added cost

Table 9-Water Consumption Costs (30% Reduction)

For further details to the above mentioned information of various percent reduction factors of the Actual Case please refer to the following Appendices: A-RW1 Actual Case (20% Reduction) v. BDC & PDC, A-RW2 Pie Chart: Water Consumption 20% Reduction Comparison of Various Design Cases, A-RW3 Graph: Consumption (AC 20% R) & Costs of Various Design Cases, A-RW4 Actual Case (25% Reduction) v. BDC & PDC, A-RW5 Pie Chart: Water Consumption 25% Reduction Comparison of Various Design Cases, A-RW6 Graph: Consumption (AC 25% R) & Costs of Various Design Cases, A-RW7 Actual Case

(30% Reduction) v. BDC & PDC, A-RW8 Pie Chart: Water Consumption 30% Reduction Comparison of Various Design Cases, A-RW9 Graph: Consumption (AC 30% R) & Costs of Various Design Cases.

Based on these findings there were no savings per year in the area of water saving features. However this requires further study as Canon Design is currently trying to isolate the various water consuming features, to better gauge the performance of water saving features designed. In a class project mentioned previously done by DiBenedetto and Cao, East Hall's water consumption was found to be substantially higher, than that of the proposed design case and baseline design case. Based on their conclusions it was hypothesized that the real time usage data was 30% higher, if the fixtures were conventional.

4.2.2 Summary of Consumption Costs

Comparing the percent savings to the percent savings as indicated in Kats' 2003 report \$0.05/sf/yr was not realized in the area of water (assuming the 25% reduction in water consumption case); in fact there was an added cost of \$0.05/sf/yr. the electrical and natural gas combined contributed to a \$0.82/sf/yr savings versus the \$1.03/sf/yr savings as indicated in Peyser's research a 20.39% differential. In comparing overall percent savings WPI realized a \$0.77/sf/yr savings in the area of water, electricity and natural gas consumption. This results in a yearly savings of \$125,051.08, a substantial amount of money. Over a 25 year period at a 7% discount rate, the overall savings are in the range of \$1,457,300, if the discount rate is lowered to 3%, the savings over the life of the building would increase to roughly \$2,177,600.

4.3 Operations and Maintenance Costs

4.3.1 Green and Non-Green Costs

The yearly maintenance costs and frequency maintenance repair and replacement costs were developed based on RS Means CostWorks 2010 and all adjustment factors applied to arrive at the timeline required for the LCCA. The operations costs for the three components were derived by assuming a percentage breakout of the total yearly

operations budget. The electrical and mechanical operations Green and Non-Green costs were assumed at \$100,000 per year per component and the water operations Green and Non-Green costs were assumed at \$50,000 per year. For details on these numbers please refer to Appendix C-O1 Yearly Operations Costs for MEP. These costs require further study to ensure their applicability to WPI’s East Hall. The validation of these numbers is beyond the scope of this research however this work provides a template of the relevant inputs required to be tracked.

4.3.1.1 Mechanical Costs

Based on the previous stated assumptions the following was derived for yearly preventative maintenance (YPM) and frequency maintenance repair and replacement costs (FMRR) based on the various green factors (GF). The application of various green factors of 5%, 10%, 15% and 20% resulted in a percent difference of 4.76%, 9.09%, 13.04% and 16.67% respectively in total costs.

Table 10-Mechanical YPM Costs below, provides the various YPM costs realized based on the various green factors applied. Please note that the FMRR values are not reflected in this table as they occur in variable time frames. The LCCA discussed later shall depict the YPM and FMRR costs accounting their frequency and magnitude. In the case of the mechanical maintenance the majority of the FMRR costs occurred up to the 25th year mark therefore majority costs were captured for the purposes of this analysis.

Type of Application	Type of Construction	Total Cost	Percent Difference	Comments
YPM-GF 20%	Green	\$22,414.02	16.67%	Green
YPM-GF 20%	Non-Green	\$18,678.35		Costs were 16.67% higher
YPM-GF 15%	Green	\$21,480.11	13.04%	Green

YPM-GF 15%	Non-Green	\$18,678.35		Costs were 13.04% higher
YPM-GF 10%	Green	\$20,546.19	9.09%	Green
YPM-GF 10%	Non-Green	\$18,678.35		Costs were 9.09% higher
YPM-GF 5%	Green	\$19,612.27	4.76%	Green
YPM-GF 5%	Non-Green	\$18,678.35		Costs were 4.76% higher

Table 10-Mechanical YPM Costs

Due to the application of the green factor the YPM and FMRR costs were higher than the non-green costs. This may not be true if a database of historical data is created and maintained to provide an accurate projection of these costs. For a detailed view of this information please refer to the following Appendices: C-M1 YPM, C-M2 FMRR, C-M3 Summary Green v. Non-Green FMRR, C-M4 Graph: Green v. Non-Green YPM, C-M5 Graph: FMRR, C-M6 RS Means Component List, and C-M7-RS Means Crew Lists.

The major FMRR costs occur in the 25 year building life interval therefore capturing the highest maintenance costs incurred. The YPM and FMRR costs were entered into the LCCA to generate present worth values factoring in the time-value of money and the significance of their periodic occurrence. For details as to how the numbers in the table below were generated please refer to the following Appendices: C-LM1 LCCA 20% GF O&M, C-LM2 LCCA 15% GF O&M, C-LM3 LCCA 10% GF O&M and C-LM4 LCCA 5% GF O&M. The findings may be found in Table 11-Mechanical O&M Costs.

Type of Application	Type of Construction	Green Factor (GF)	Cost Per SF
Mechanical Operations and Maintenance	Non-Green	20%	\$23.95/sf
	Green		\$26.01/sf
	Non-Green	15%	\$23.95/sf
	Green		\$25.50/sf
	Non-Green	10%	\$23.95/sf
	Green		\$24.98/sf
	Non-Green	5%	\$23.95/sf
	Green		\$24.47/sf

Table 11-Mechanical O&M Costs

For graphs of the green factor impact on YPM and FMRR costs please refer to the following Appendices: C-SM1 Graph: 5% GF FMRRC & YPM, C-SM2 Graph: 10% GF FMRRC & YPM, C-SM3 Graph: 15% FMRRC & YPM. For additional details as to how the numbers were generated please refer to the following Appendices: C-SM4 15% GF Analysis of YPM, C-SM5 15% GF Analysis of FMRRC, C-SM6 15% GF Summary FMRRC, C-SM7 10% GF Analysis of YPM, C-SM8 10% Analysis of FMRRC, C-SM9 10% GF Summary of FMRRC, C-SM10 5% GF Analysis of YPM, C-SM11 5% GF Analysis of FMRRC, C-SM12 5% GF Summary FMRRC.

4.3.1.2 Electrical Costs

Based on the previous stated assumptions the following was derived for yearly preventative maintenance (YPM) and frequency maintenance repair and replacement costs (FMRRC) based on the various green factors (GF). The application of various green

factors of 5%, 10%, 15% and 20% resulted in a percent difference of 4.76%, 9.09%, 13.04% and 16.67% respectively in total cost.

Table 12-Electrical YPM Costs below, provides the various YPM costs realized based on the various green factors applied. Please note that the FMRRC values are not reflected in this table as they occur in variable time frames. The LCCA discussed later shall depict the YPM and FMRR costs accounting their frequency and magnitude. In the case of the electrical maintenance, the major costs occurred beyond the 25 year interval and therefore were not included for the purposes of this analysis as it extended the assumed building life of 25 years.

Type of Application	Type of Construction	Total Cost	Percent Difference	Comments
YPM-GF 20%	Green	\$23,129.83	16.67%	Green
YPM-GF 20%	Non-Green	\$19,274.86		Costs were 16.67% higher
YPM-GF 15%	Green	\$22,166.09	13.04%	Green
YPM-GF 15%	Non-Green	\$19,274.86		Costs were 13.04% higher
YPM-GF 10%	Green	\$21,202.34	9.09%	Green
YPM-GF 10%	Non-Green	\$19,274.86		Costs were 9.09% higher
YPM-GF 5%	Green	\$20,238.60	4.76%	Green
YPM-GF 5%	Non-Green	\$19,274.86		Costs were 4.76% higher

higher

Table 12-Electrical YPM Costs

Due to the application of the green factor the YPM and FMRR costs were higher than the non-green costs. This may not be true if a database of historical data is created and maintained to provide an accurate projection of these costs.

For a detailed view of this information please refer to the following Appendices: C-E1 YPM, C-E2 FMRR, C-E3 Summary Green v. Non-Green FMRR, C-E4 Graph: Green v. Non-Green YPM, C-E5 Graph: FMRR, C-E6 RS Means Component List, and C-E7-RS Means Crew Lists.

The information detailed above was run through the LCCA to generate present worth values factoring in the time-value of money. The findings may be found Table 13-Electrical O&M Costs.

Type of Application	Type of Construction	Green Factor (GF)	Cost Per SF
Electrical Operations and Maintenance	Non-Green	20%	\$16.32/sf
	Green		\$16.85/sf
	Non-Green	15%	\$16.32/sf
	Green		\$16.72/sf
	Non-Green	10%	\$16.32/sf
	Green		\$16.59/sf
	Non-Green	5%	\$16.32/sf
	Green		\$16.45/sf

Table 13-Electrical O&M Costs

For details as to how the above numbers were generated please refer to the following Appendices: C-LE1 LCCA 20% GF O&M, C-LE2 LCCA 15% GF O&M, C-LE3 LCCA 10% GF O&M and C-LE4 LCCA 5% GF O&M. For graphs of the green factor impact on YPM and FMRR costs please refer to the following Appendices: C-SE1 5% GF FMRRC & YPM, C-SE2 10% GF FMRRC & YPM, C-E3 15% FMRRC & YPM.

For additional details as to how the numbers were generated please refer to the following Appendices: C-SE4 15% GF Analysis of YPM, C-SE5 15% GF Analysis of FMRRC, C-SE6 15% GF Summary FMRRC, C-SE7 10% GF Analysis of YPM, C-SE8 10% Analysis of FMRRC, C-SE9 10% GF Summary of FMRRC, C-SE10 5% GF Analysis of YPM, C-SE11 5% GF Analysis of FMRRC, C-SE12 5% GF Summary FMRRC.

4.3.1.3 Water Costs

Based on the previous stated assumptions the following was derived for yearly preventative maintenance (YPM) and frequency maintenance repair and replacement costs (FMRRC) based on the various green factors (GF). The application of various green factors of 5%, 10%, 15% and 20% resulted in a percent difference of 4.76%, 9.09%, 13.04% and 16.67% respectively in total cost.

Table 14-Water YPM Costs, provides the various YPM costs realized based on the various green factors applied. Please note that the FMRRC values are not reflected in this table as they occur in variable time frames. The LCCA discussed later shall depict the YPM and FMRR costs accounting their frequency and magnitude. In the case of the electrical maintenance, the major costs occurred beyond the 25 year interval and therefore were not included for the purposes of this analysis as it extended the assumed building life of 25 years.

Table 14-Water YPM Costs

Type of Application	Type of Construction	Total Cost	Percent Difference	Comments
YPM-GF 20%	Green	\$3,718.80	16.67%	Green
YPM-GF 20%	Non-Green	\$3099.00		Costs were 16.67% higher
YPM-GF 15%	Green	\$3,563.85	13.04%	Green
YPM-GF 15%	Non-Green	\$3099.00		Costs were 13.04% higher
YPM-GF 10%	Green	\$3408.90	9.09%	Green
YPM-GF 10%	Non-Green	\$3099.00		Costs were 9.09% higher
YPM-GF 5%	Green	\$3253.95	4.76%	Green
YPM-GF 5%	Non-Green	\$3099.00		Costs were 4.76% higher

Due to the application of the green factor the YPM and FMRR costs were higher than the non-green costs. This may not be true if a database of historical data is created and maintained to provide an accurate projection of these costs.

For a detailed view of this information please refer to the following Appendices: C-W1 YPM, C-W2 FMRR, C-W3 Summary Green v. Non-Green FMRR, C-W4 Graph: Green v. Non-Green YPM, C-W5 Graph: FMRR, and C-W6 RS Means Component List.

The information detailed above was run through the LCCA to generate present worth values factoring in the time-value of money. The findings may be found in the Table 15-Water O&M Costs.

Type of Application	Type of Construction	Green Factor (GF)	Cost Per SF
Plumbing Operations and Maintenance	Non-Green	20%	\$8.51/sf
	Green		\$8.86/sf
	Non-Green	15%	\$8.51/sf
	Green		\$8.77/sf
	Non-Green	10%	\$8.52/sf
	Green		\$8.69/sf
	Non-Green	5%	\$8.52/sf
	Green		\$8.60/sf

Table 15-Water O&M Costs

For details as to how the above numbers were generated please refer to the following Appendices: C-LW1 LCCA 20% GF O&M, C-LW2 LCCA 15% GF O&M, C-LW3 LCCA 10% GF O&M and C-LW4 LCCA 5% GF O&M. For graphs of the green factor impact on YPM and FMRR costs please refer to the following Appendices: C-SW1 5% GF FMRRC & YPM, C-SW2 10% GF FMRRC & YPM, C-W3 15% FMRRC & YPM.

For additional details as to how the numbers were generated please refer to the following Appendices: C-SW4 15% GF Analysis of YPM, C-SW5 15% GF Analysis of FMRRC, C-SW6 15% GF Summary FMRRC, C-SW7 10% GF Analysis of YPM, C-SW8 10% Analysis of FMRRC, C-SW9 10% GF Summary of FMRRC, C-SW10 5% GF Analysis of YPM, C-SW11 5% GF Analysis of FMRRC, C-SW12 5% GF Summary FMRRC.

4.3.2 Summary of Operations and Maintenance Costs

Based on the information presented above the consumption, construction, operations, yearly preventative maintenance and frequency maintenance repair and replacement costs were totaled to provide a percent of total analysis for the maintenance portion to be compared to findings in the work of Gregory Kats (Kats, 2003) and standardized cost distributions³¹.

For the purposes of this research values corresponding to the 10% GF were selected for the maintenance portion. The actual water costs used reflected the 25% reduction based on the range (20%-30%) guidance from Canon Design. The cost distribution three major category (Capital, operations and maintenance, and functional) costs are compiled to generate percent of total values. Typically functional costs account for 66%, capital costs 29% and operations and maintenance costs 5% of total. Comparing the LCCA research to the percentages of the cost distribution in the area of operations and maintenance it was found that the operations and maintenance was 17.82% of the total costs for green construction and 18.19% of total costs for the non-green construction components based on the values generated above. These are rather high percentages when compared to the 5% operations and maintenance costs of the cost distribution. If the operations and maintenance is reduced by 70% then the percent of total numbers are more in line with the cost distribution at 5.35% green costs and 5.46% non-green costs. For further details on the generation of these values please refer to Appendices C-SOM1 Summary Table of All Costs and C-SOM2 Summary Table of All Costs-Assuming 30% of Total O&M Costs.

This area requires further study and tracking to fully document the scope of maintenance requirements and the actual percentage application of the operations costs to develop accurate percent of total operations and maintenance figures. The cost

³¹ WPI Class Lecture CE535. Integration of Design and Construction: LCCA and Risk Lecture Presentation Slides.

distribution indicates that the typical percentage is 5% and of that 5% based on the work of Kats there should be a 16% (Kats, 2003) reduction if the building is green. These claims cannot be validated as of yet as they are beyond the scope of this research, however it is an area of great importance to ensure appropriate and accurate costs are captured.

4.4 LCCA and Sensitivity Analysis

In the development of the various costs thus far the projected numbers have all been deterministic in that they are a specific value. In the case of the Operations and Maintenance portion the only number which was analyzed with more than one variation was the green factor that was applied.

To gain insight as to the impact of various inputs on the results of the LCCA two case sets were developed using variations in the discount rate, escalation rate, Operations and Maintenance costs (70% reduction to achieve 5% overall maintenance threshold) and the selection of the 10% green factor.

4.4.1 Case 1 Various Scenarios:

Scenario 1: discount rate at 7%, consumption costs based on Actual and PDC, (total maintenance costs are assumed) maintenance costs with 20% green factor applied, roof O&M with 20% green factor. This analysis resulted in a 0.12% savings even though the assumptions were conservative. The total non-green cost was \$310.50/sf and green cost was \$310.13/sf over the life of the building resulting in a \$0.38/sf in savings.

Scenario 2: discount rate 4%, consumption costs based on Actual and PDC, (total maintenance costs are assumed) maintenance costs with 20% green factor applied, roof O&M with 20% green factor. This analysis resulted in a 2.38% savings, the total non-green cost was \$337.09/sf and green cost was \$329.07/sf over the life of the building resulting in an \$8.01/sf in savings.

Scenario 3: discount rate 3%, consumption costs based on Actual and PDC, (total maintenance costs are assumed) maintenance costs with 20% green factor applied, roof O&M with 20% green factor. This analysis resulted in a 3.32% savings, the total non-green cost was \$349.57/sf and green cost was \$337.97/sf over the life of the building resulting in an \$11.60/sf in savings.

Scenario 4: discount rate 6%, consumption costs based on Actual and PDC, (total maintenance costs are assumed) maintenance costs with 20% green factor applied, roof O&M with 20% green factor. This analysis resulted in a 0.79% savings, the total non-green cost was \$317.89/sf and green cost was \$315.39/sf over the life of the building resulting in a \$2.50/sf in savings.

Scenario 5: discount rate 4%, escalation rate 3%, consumption costs based on Actual and PDC, (total maintenance costs are assumed) maintenance costs with 20% green factor applied, roof O&M with 20% green factor. This analysis resulted in a 0.10% savings, the total non-green cost was \$310.32/sf and green cost was \$310.00/sf over the life of the building resulting in a \$0.32/sf in savings.

Scenario 6: discount rate 7%, escalation rate 3%, consumption costs based on Actual and PDC, (total maintenance costs are assumed) maintenance costs with 20% green factor applied, roof O&M with 20% green factor. This analysis resulted in a -1.50% savings, the total non-green cost was \$293.85/sf and green cost was \$298.26/sf over the life of the building resulting in a negative \$4.41/sf in savings.

4.4.2 Case 2 Various Scenarios:

Scenario 1: discount rate at 7%, consumption costs based on Actual and PDC, (30% of total maintenance costs are assumed) maintenance costs with 10% green factor applied, roof O&M with 20% green factor. This analysis resulted in a 0.27% savings, total non-green cost was \$308.64/sf and green cost was \$307.81/sf over the life of the building resulting in a \$0.83/sf in savings.

Scenario 2: discount rate at 6%, consumption costs based on Actual and PDC, (30% of total maintenance costs are assumed) maintenance costs with 10% green factor applied, roof O&M with 20% green factor. This analysis resulted in a 0.95% savings, total non-green cost was \$315.79/sf and green cost was \$312.78/sf over the life of the building resulting in a \$3.01/sf in savings.

Scenario 3: discount rate at 4%, consumption costs based on Actual and PDC, (30% of total maintenance costs are assumed) maintenance costs with 10% green factor applied, roof O&M with 20% green factor. This analysis resulted in a 2.59% savings, total non-green cost was \$334.37/sf and green cost was \$325.70/sf over the life of the building resulting in an \$8.67/sf in savings.

Scenario 4: discount rate at 3%, consumption costs based on Actual and PDC, (30% of total maintenance costs are assumed) maintenance costs with 10% green factor applied, roof O&M with 20% green factor. This analysis resulted in a 3.57% savings, total non-green cost was \$346.45/sf and green cost was \$334.10/sf over the life of the building resulting in a \$12.36/sf in savings.

Scenario 5: discount rate at 4%, escalation rate at 3%, consumption costs based on Actual and PDC, (30% of total maintenance costs are assumed) maintenance costs with 10% green factor applied, roof O&M with 20% green factor. This analysis resulted in a 0.25% savings, total non-green cost was \$308.45/sf and green cost was \$307.68/sf over the life of the building resulting in a \$0.77/sf in savings.

Scenario 6: discount rate at 7%, escalation rate at 3%, consumption costs based on Actual and PDC, (30% of total maintenance costs are assumed) maintenance costs with 10% green factor applied, roof O&M with 20% green factor. This analysis resulted in a negative 1.40% savings, total non-green cost was \$292.51/sf and green costs was \$296.60/sf over the life of the building resulting in a negative \$4.09/sf in savings.

For the above information please refer to the following Appendices: F-L1 LCCA Green v. Non-Green Case 1 Scenario 1, F-L2 LCCA Green v. Non-Green Case 1 Scenario 2, F-L3

LCCA Green v. Non-Green Case 1 Scenario 3, F-L4 LCCA Green v. Non-Green Case 1 Scenario 4, F-L5 LCCA Green v. Non-Green Case 1 Scenario 5, F-L6 LCCA Green v. Non-Green Case 1 Scenario 6, F-L7 LCCA Green v. Non-Green Case 2 Scenario 1, F-L8 LCCA Green v. Non-Green Case 2 Scenario 2, F-L9 LCCA Green v. Non-Green Case 2 Scenario 3, F-L10 LCCA Green v. Non-Green Case 2 Scenario 4, F-L11 LCCA Green v. Non-Green Case 2 Scenario 5, F-L12 LCCA Green v. Non-Green Case 2 Scenario 6.

In the typical LCCA breakdown looking at case set 1 scenario1, the cost distribution of the green various components (base construction cost, consumption costs, operations and maintenance costs) can be seen in Figure 3-Detailed Cost Breakdown of LCCA for Green Construction Values (Case Set 1 Scenario 1).

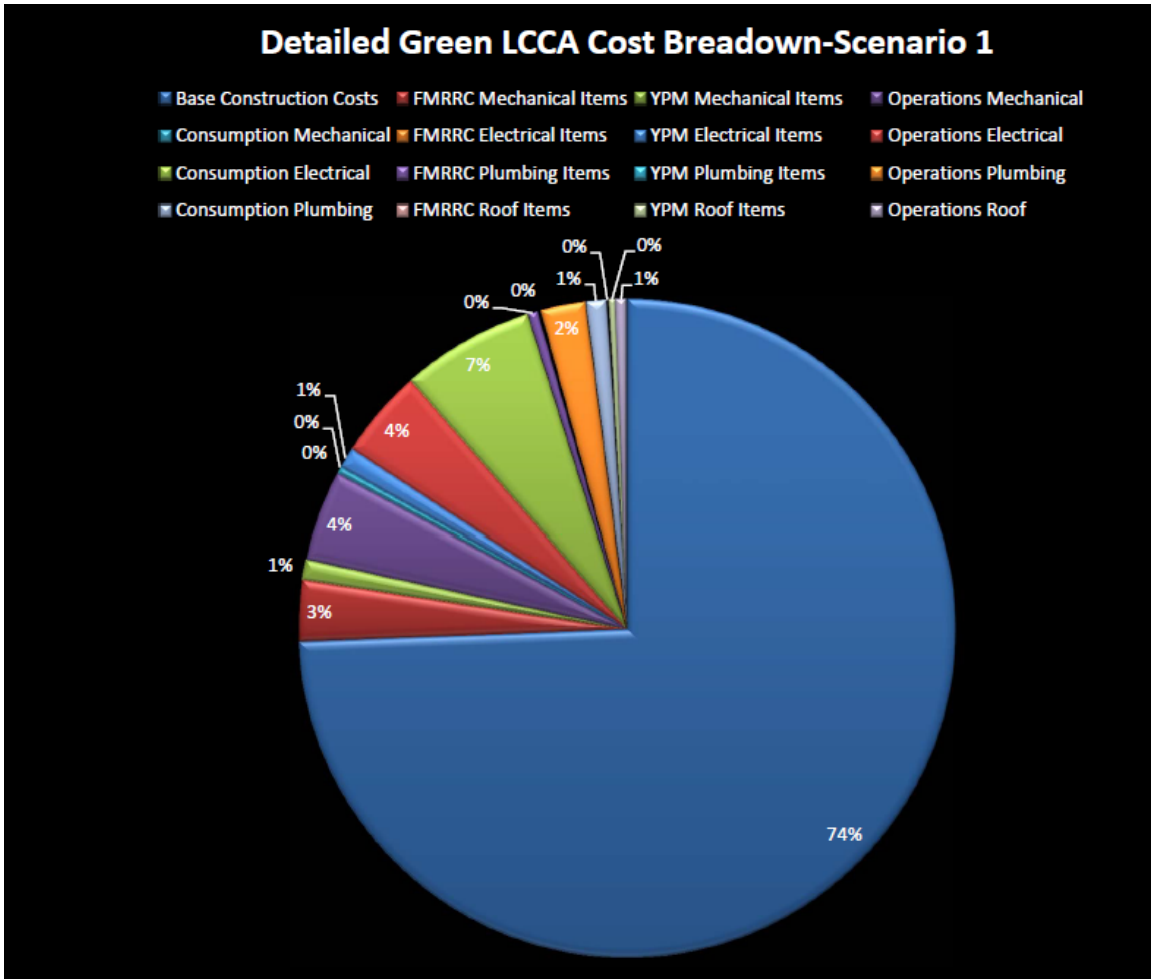


Figure 3-Detailed Cost Breakdown of LCCA for Green Construction Values (Case Set 1 Scenario 1)

The detailed pie-chart above depicts the various percentage breakdowns of the inputs entered into the LCCA spreadsheet based on the inclusion of all the operations and maintenance costs. The summary level of these inputs can be seen in the pie-chart below Figure 4-Summary Cost Breakdown of LCCA for Green Construction Values (Case Set 1 Scenario 1).

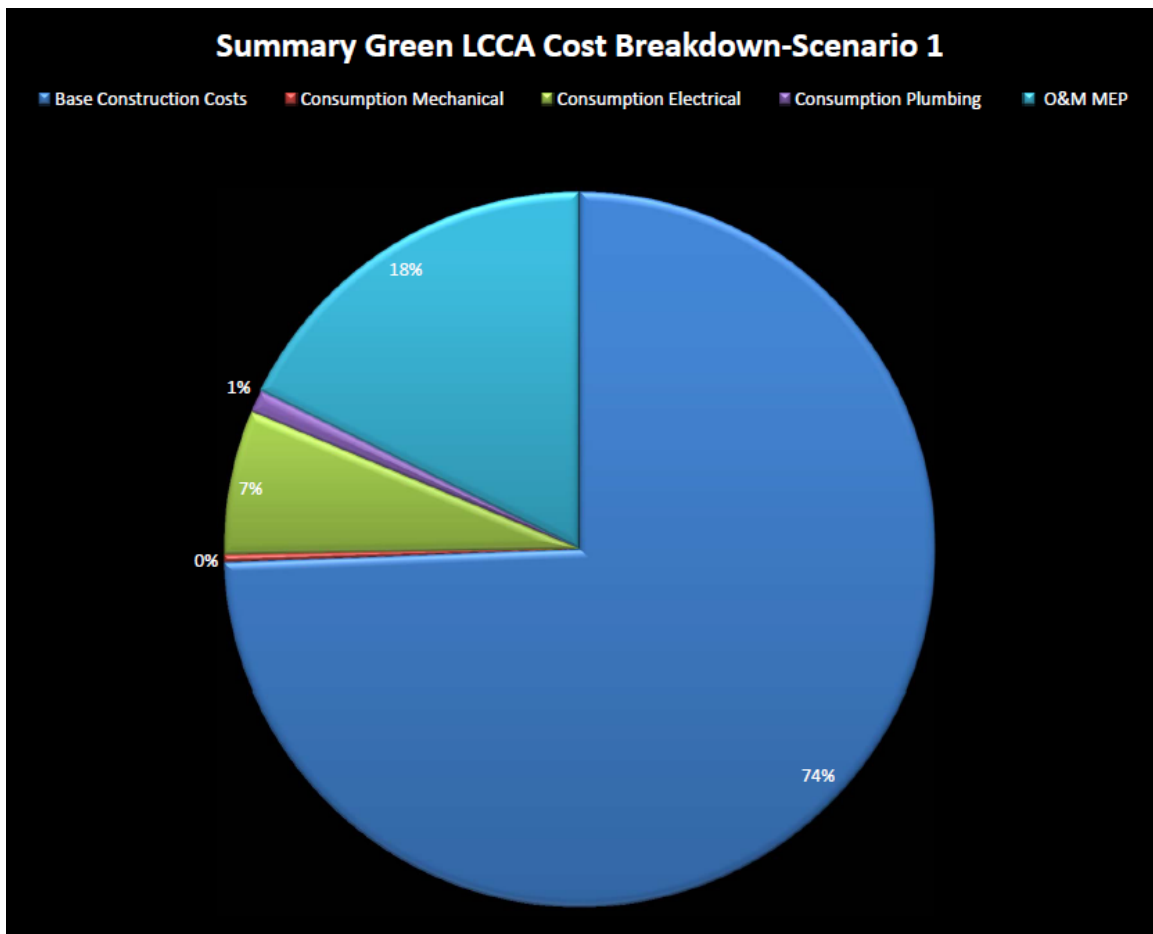


Figure 4-Summary Cost Breakdown of LCCA for Green Construction Values (Case Set 1 Scenario 1)
Majority of the costs lie in the base construction costs while 18% fall in the area of operations and maintenance, in this scenario the overall savings were \$0.38/sf which equate to \$61,714.

4.5 Roof Costs

4.5.1 Green and Non-Green Costs

Using project historical data of \$17/sf³² for a Non-Green roof a total of \$423,634.68 was calculated. The cost of WPI East Hall's roof was \$645,071.17 a -52.27% percent difference on the roofing costs. Based on the previous section entitled 'Construction Costs' the square foot cost of East Hall in comparison to RS Means with the green composite roof yielded a -6.30 percent difference.

If the roof costs are neutralized to reflect a Non-Green Roof (\$17/sf) the construction cost comparison between East Hall and a Non-Green dormitory based on RS Means yields only a -5.67 percent difference on the square foot costs.

Based on the neutralized values it was determined that if East Hall was designed with a Non-Green Roof we would have paid \$1.05 for every \$1 per square foot spent in the Non-Green construction case. Based on the green roof costing we paid \$1.06 for every \$1 per square foot spent in the Non-Green construction case. Please refer to Appendix D-NR1 Neutralized Roof Cost Comparison for further details.

For further details on the values indicated please refer to Appendices: D-R1 Non-Green Built-Up Roofing Cost Comparison to WPI East Hall, D-R2 Graph: WPI & Non-Green Built-Up Roof Construction Cost Comparison.

4.5.2 Operations and Maintenance

Based on RS Means CostWorks and RS Means O&M Facilities Management guide the yearly preventative maintenance (YPM) and Frequency Maintenance Repair and Replacement costs (FMRRC) are indicated in Table 16-Roof YPM Costs and Table 17-Roof FMRR Costs.

³² Based on previous work experience, working on the cost estimation of the New Haven Rail Yard Facilities Buildings.

Type of Application	Type of Construction	Total Cost	Cost per SF LCCA PW ³³	Percent Difference on Total Cost
YPM-GF 20%	Non-Green	\$7,766.83	\$0.85 /SF	-24.70%
YPM-GF 20%	Green	\$6,229.92	\$1.06 /SF	

Table 16-Roof YPM Costs

Type of Application	Type of Construction	Total Cost	Cost per SF LCCA PW ³⁴	Percent Difference on Total Cost
Roof FMRRRC-GF 20%	Green	\$58,404.00	\$0.36/sf	-2.86%
	Non-Green	\$56,130.00	\$0.35/sf	

Table 17-Roof FMRR Costs

For a detailed view of the information provided above please refer to Appendices D-LR1 LCCA YPM and FMRRRC and D-LR2 LCCA YPM, FMRRRC and Operations.

Based on the findings listed in the tables above the total Non-Green roof maintenance cost per square foot is \$1.20 and \$1.42 for Green dormitories. Comparing this cost data to the yearly maintenance expenditures on roofs of \$0.25³⁵ per square foot, the

³³ These numbers reflect the present worth of the yearly preventative maintenance over a 25 year period at a 7% discount rate.

³⁴ These numbers reflect the present worth of the yearly preventative maintenance over a 25 year period at a 7% discount rate.

³⁵ RS Means: Cost Planning and Estimating for Facilities Maintenance. Values have been escalated from 1996 to July 2009 at a rate of 6% (compounded) previously discussed to reflect conditions within this research.

numbers generated are 5 to 6 times higher. This could be the result of a couple of variables. One variable could be that further study is required to document and track the actual maintenance expenditures in order to paint a more realistic picture of these costs, and the second variable is that costing information from RS Means is based on national averages and since we are located in New England our costs may be generally a lot higher due to the extreme weathering.

4.6 Survey

A total of 60 East Hall residents responded to the survey posted. The response rate of 26%³⁶ indicates students are engaged however more involvement is required. Ongoing feedback about end-user consumption and satisfaction is required to improve the involvement process and design/construction of future sustainable projects at WPI. Out of the 60 students whom took part, 41.7% of them were residents for longer than 10 months. This survey provided a good litmus test as to how longer term residents felt about East Hall’s sustainable features. The questions and results (60 students) are indicated below in Table 18-East Hall LCCA Survey Questions.

Table 18-East Hall LCCA Survey Questions

Category	Question	Type of Response	Key Responses
General	1. How Long have you lived in East Hall?	Multiple Choice	41.7% Longer than 10 Months
	2. Do you consider East Hall to be an energy efficient building?		75% Responded “Yes”
	3. Are you a lowerclassmen or Upperclassmen		60% Seniors
	4. On average how much of your time do you spend in East Hall per day?		43.3% spend 75% of their time in East Hall
Mechanical	5. During the summer months do you normally run the	Multiple Choice	78.3% said “Yes”

³⁶ 60 residents out of 232

AC in your room?		
6. If you answered Yes to the above questions, how many hours a day do you run the AC in the summer in your room?		60.4% said "All Day"
7. When you turn on the Air Conditioning is it noisy?		50% said "No"
8. At what temperature do you feel cool in the summer?		61.7% said at "66"
9. Is your space sufficiently heated/warm in the winter?	Multiple Choice with Additional Commentary	53.3% said "Yes"
10. At what temperature do you feel warm in the winter?		35% said at "72°"
11. When you turn on the heat is it noisy?	Multiple Choice	61.7% said "No"
12. Do you wish to have better control of the temperature in your space (better thermostat temperature variations instead of the 2 degrees up or		83.3% said "Yes"

Electrical	down)?		
	13. Does the water heat up sufficiently to the temperature which you desire?		81.7% said "Yes"
	14. How long does it take for the water to heat up to your desired temperature?	Multiple Choice	86.7% said "up to 3 minutes"
	15. Is there sufficient interior lighting in your room?		76.3% said "Yes"
	16. Do you feel the need to use additional lighting (i.e.: plug in additional lighting devices into the receptacles) in your room?		44.1% said "No" While 30.5% said "sometimes"
	17. Is the lighting in the garage adequate? (Please skip this question if it does not apply to you!)	Multiple Choice	77.8% said "Yes"
	18. How many appliances do you plug into the receptacles (in your room and common areas)?		45.8% said "4-6" while 44.1% said "too many to count"
	19. What type of	Multiple Choice with	52.5% said

Plumbing/Water	appliances do you plug into the receptacles?	Additional Commentary	“computer related” While 20.3% said “other”
	20. How many times do you wash your hands per day?	Multiple Choice	45.8% said “more than 4 times”
	21. How Long Do You Run The Water While Washing Your Hands in East Hall?	Multiple Choice with Additional Commentary	89.8% said “less than 2 minutes”
	22. Do You Shave Every day?	Multiple Choice	89.8% said “No”
	23. How Long Do You Run The Water When You Are Shaving?	Multiple Choice with Additional Commentary	52.5% said “less than 10 minutes”
	24. How Many Times Do You Shower?	Multiple Choice	71.2% said “Everyday”
	25. How long do you take in the Shower?	Multiple Choice with Additional Commentary	62.7% said “15 minutes”
	26. How Many Times Do You Use The Watercloset (Toilet)?		45.8% said “Three times a day”
	27. How Many Times Do You Use The Full Flush Of The Toilet?	Multiple Choice	49.2% said “once a day”
28. How Frequently Do You Wash Dishes?		54.2% said “Everyday”	

General	29. How Long Does It Take You To Wash Dishes?		67.8% said "Less than 15 minutes"
	30. Are you more aware of your electrical, mechanical and water consumption because you live in an energy efficient building?	Multiple Choice with Additional Commentary	49.2% said "No" while 35.6% said "sometimes"
	31. If you could view your consumption in real time would it aid in minimizing your energy consumption?		35.6% said "Yes" while 37.3% said "Maybe"

For the detailed survey results please refer to Appendix E-S4 Summary of Survey Responses.

This survey provided an insight into the experience of the end-users. Based on the results of this survey the major point of contention was in the temperature controls. Some of the key comments provided by the residents were as follows when asked if they felt their space was sufficiently heated in the winter:

- "Windows have poor insulation, shouldn't have walls made of glass"
- "Haven't had winter yet...and air conditioner did not work for the first month I was here when it was still hot. When it cooled down the ambient temperature was fine."
- "I never want ac to be on in the winter and would love to be able to control this"

- “We have no control over it! The heat obeys the whim of an occupancy sensor and nobody else”
- “The building does not let me set the heat lower than 70 which I don’t like. I would be happier if I could set the heat to about 67 and our room is usually above 76 degrees if not closer to 80.”
- “I get very cold during the winter months and this affects my studies and health, especially last year. Winter hasn’t fully come this year yet but I expect to get sick.”
- “It is way too warm sometimes. And there is no way to control it besides opening the windows, but there are no windows in the living room. It gets up to 77 degrees when its 49 degrees outside, even when we have it to the lowest setting.”
- “The heating is always messed up. Sometimes it is way too hot and other days the AC is on when it is 35 degrees outside.”
- “The heat seems to turn off at night; gets very very cold.”
- “The wall heat dial is on a schedule independent of room holders for heat, AC, or any attempted change in temperature.”
- “Too warm (5th Floor)”
- “I would like it warmer”
- “Our room the heat won’t go off, and it has been 2 weeks, and res services still hasn’t fixed it, windows open, heat on, all day long...really green building.”
- “Often too warm”
- “I hate how opening the windows means the heat/AC shuts off. I know tis energy efficient, but this is a college dorm. If my roommates open their windows I don't

want to freeze or boil because of that. If that could be changed, that would be great.”

- “The heat comes on too soon”
- “Sometimes the heat is way too high.”

In isolating the longer term residents (longer than 10 months and spending over 50% of their time in East Hall) from the residents who have been residing at East Hall for less than 10 months the following was found:

25 students of the 60 students whom took the survey have resided in East Hall longer than 10 months. Of the 25 students 84% considered East Hall to be an energy efficient building. 88% of the residents were upperclassmen (juniors and seniors), 72% of the residents ran the AC in the summer months with 63% of those residents running it full day. 64% did not think that the AC was noisy when it was turned on, and 52% felt cool at 66 degrees.

68% felt their space is sufficiently heated, 40% felt warm at 72 degrees while 28% felt warm above 72 degrees and 32% felt warm under 72 degrees. 64% felt the heating systems are not noisy and 72% wish to have better control of the temperature controls in their space. 88% of the residents said the water heated up sufficiently to their desired temperature and 92% indicated the water heated up in less than 3 minutes.

84% felt there is sufficient interior lighting and 52% said they do not require additional lighting. 88% said there was sufficient lighting in the garage. 40% of the long-term residents said they plug in more than 4-6 appliances into the receptacles, while 48% said they plug too many to count. 56% plug in computer related appliances while 20% plugged in other types of appliances and 24% plugged in kitchen and miscellaneous electronics.

96% of the residents wash their hands 4 times or more per day, 84% ran the water less than 2 minutes. 92% don't shave every day, 64% of those residents who do shave run

the water less than 10 minutes. 60% of the residents shower every day and 56% of them shower for 15 minutes while 16% shower for 30 minutes. 84% use the watercloset 3 times or more a day, 56% use the full flush of the toilet once a day. 48% wash dishes every day and 76% of those who do dishes take less than 15 minutes.

44% of the 25 long term residents don't feel as though they consume less cause they live in an energy efficient building. 36% feel that they are sometimes reminded of their consumption behaviors due to the fact they live in an energy efficient building. Some students commented they felt frustrated with the energy saving features and went to great lengths to alter them. One particular comment that was indicative of the level of frustration was the following: "I often find the energy-saving measures extremely frustrating, and have taken steps to defeat or modify them where possible, such as replacing the or removing flow restrictors on sinks and the shower and bypassing the occupancy sensor on the light and HVAC system." 84% of the residents said that if they could view their consumption levels in real-time it may have an impact on their consumption behavior.

Since the 60 students spend 75% or more of their time in East Hall the consumption information received from the facilities department is within the higher range of possible building consumption. This indicates that even with the high consumption levels, the building still performed well in the area of mechanical and electrical consumption based on the results section of this research. In the area of water consumption the model used for the LEED credit submittal process was substantially lower. The students indicated rather high use of water features within the building and sensor altering activities which could have skewed water consumption levels. The behavioral consumption patterns of the 60 students were promising in that 72.9% of the residents indicated behavioral change or potential for change if they could view their consumption levels.

When the survey isolated the long term students (lived at East Hall longer than 10 months) the findings are just as promising in the area of behavioral change as 84%

indicated possibility of change if they could view their consumption. Some of the features in the building such as the sensors caused frustration amongst the students as they could not override the sensor settings, however the overall consensus of the green features incorporated in the building was positive. The air conditioning and heating systems were not deemed loud and performed relatively well based on their needs. The temperature controls for both the short term and long term residents was still a point of contention in that better control of the systems were desired. Better controls of HVAC systems should be further explored to ensure that energy is not wasted.

Living in a green building may or may not be everyone's cup of tea. Some of the residents welcomed the sustainability features whilst others did not. The survey indicated that overall whether they were making an active effort to live green or not the building still conserved energy. Fine tuning future designs of green buildings can be achieved through an integrated design process, with the input of all stakeholders addressed early on in the process. An integrated process where all project stakeholders provide input ensures that little details are addressed early on to minimize post construction changes and alterations (e.g. sensor time limits, zone isolation for cooling and heating, interior lighting requirements etc...).

5.0 RECOMMENDATIONS

5.1 LCCA and LEED

Currently there are piloted credits specifically requiring Life Cycle Cost Analysis be performed. Eventually these piloted credits will become part of the required LEED point system. The importance of this analysis yet again is heightened due to its ability to provide owners and stakeholders with a value engineering technique aiding in the selection of better and more efficient systems. Currently LEED pilot credit 1³⁷ requires the LCCA of Building Assemblies and Materials for testing for new construction. The intent of credit 1 is to encourage the use of environmentally preferable materials and assemblies.

LEED pilot credits 5 (pre-requisite to 6) and 6 also include LCCA in the Preliminary Integrative Project Planning and Design. The intent of credit 5 is to maximize the opportunities for an integrative cost-effective adoption of green design and construction. The intent of credit 6 is also to maximize opportunities for integrative, cost effective adoption of green design and construction strategies along with the utilization of innovative techniques and approaches for green design and construction³⁸. Using this research as a framework for performing LCC analysis, will aide WPI in its future LEED endeavors and sustainability commitments.

5.2 Green Factor Research and Applicability

The Green Factor used in this research requires further study to ensure its applicability to the maintenance costs. The Green Factor may decrease or completely diminish over time as these technologies become more popular and the learning curve reaches a plateau. Tracking of maintenance costs over a substantial time frame should enable the

³⁷ <http://www.usgbc.org/ShowFile.aspx?DocumentID=6350>

³⁸ <http://www.usgbc.org/ShowFile.aspx?DocumentID=6330>

stakeholders to have a better grasp on whether or not the Green Factor is applicable and if in fact it is what value it should truly be.

5.3 Building Information Modeling (BIM) and LCCA

Building Information Modeling (BIM) provides numerous avenues of integration with LCCA. A well-defined model with detailed systems information may greatly help the building owner and stakeholders in identifying potential problems in maintenance and operations and provide the facilities manager with all the information required in one location. The model has to be well defined, well managed and updated in order to ensure that the information being extracted from the model is correct. BIM can provide detailed information of building mechanical, electrical, plumbing or alternate systems schedule exports providing the analyst quick, easy, reliable access to information. This extracted information can then be inputted into the LCCA model and analyzed for alternatives analysis and also documentation of maintenance work required. BIM can decrease the time spent in problem definition and solving of operational problems; promote continuity of information reducing time needed to train new staff reducing turnover training costs.

BIM can also aide in the improvement of energy efficiency through the systematic measurement and verification of building systems. Energy and Atmosphere credit 5, Measurement & Verification, requires the development of a plan to evaluate building or energy system performance through simulation of engineering analysis. This requires the installation of necessary metering devices to measure energy use. Creating a BIM-based Baseline Building Model (B³M) (Woo et al. 2010), from an up-to-date BIM model will allow for regeneration of the buildings energy model reflecting updated operating conditions. B³M models can improve facilities management (FM) processes by providing real-time building performance data and more detailed analysis of building systems.

B³M models can act as depositories of various performance indicators such as consumption, occupancy, CO₂ emissions, and temperature through the installation of sensors within the building. Such models would not only provide a streamlined

approach to required data collection for performance verification, but they can also provide crucial decision-related information to other energy simulation programs. Such information can assist stakeholders in their various decision making processes. The integration of an up-to-date real-time BIM model along with performance data attained by means of sensors can potentially reduce operational and environmental risks (Woo et al. 2010).

5.4 O&M Database Creation (WBS) and Tracking

In the course of this research identifying maintenance costs was a particularly difficult task to undertake due to a lack of organized information. Detailed electronic records should be developed in a database with specific work breakdown structure (WBS) assignments. WBS coding will ease the tracking and trending process for future construction projects and current trending and budgeting processes. Economic feasibility studies will be more accurate and life cycle cost studies will reflect actual conditions directly related to WPI versus projected savings and operations and maintenance costs.

Additional recommendations to help in creating the above mentioned database are as follows: creation of an MEP Maintenance Program-Audit of Systems and creation of Equipment Data Sheets detailing work performed, condition of systems and repair/replacement/maintenance and operations. Maintaining and updating this information will ease and reduce trouble shooting problems and associated costs.

5.5 Building Energy Auditing

In order to understand the full scope of the monetary expenditures on WPI's facilities on energy, a facilities energy auditing program should be adopted. This will allow WPI to inventory all its facilities energy consumption and create trending information. Trending can be used as a tool to identify buildings requiring additional rehabilitation or repair of systems to ensure they are operating at optimal performance. Some key factors worthy of documentation are as follows:

- Detailed information of the facility in question: Building type/use and characteristics, building modifications or potential changes, sources of energy and providers, any existing conservation/energy saving measures
- Tracking of yearly consumption costs and usage (therms, kWh, CF)
- Inventory of the various MEP building systems (HVAC, Heating Plant details, Cooling Plants, lighting systems and controls, renewable energy source or potential)

Creating such an inventory will help WPI ensure its facilities are efficient and if they are not; it provides WPI with a roadmap of what needs to be addressed. Of course projects may be phased and scored on their level of importance. WPI's future goals may be used as a boundary by which to set the importance level of projects to undertake.

5.6 Analytical Hierarchy Process (AHP) use in Multi-Attribute Decision Analysis (MADA) of Investments (ASTM E1765-07)

AHP is a method in which qualitative and quantitative attributes in addition to the standard economic evaluation methods (Life Cycle Cost Analysis). Building decisions not only depend on monetary evaluations but also on non-monetary attributes. This evaluation tool may be used when there are components that cannot be represented in monetary terms. AHP facilitates ranking and choosing among alternatives using a weighted process of pairwise comparisons, and hierarchical description of attributes.

AHP can also be used when alternatives attributes are not all measured in the same unit. For example this may be applicable when looking at the public's perception of WPI; this attribute is not easily measured. However it may have an impact on the decision making process.

MADA analysis can be applied in a situation where there is no one dominant preferred alternative. Some attributes which could be selected in a MADA evaluation are: location preferences, architectural statement, WPI target goals, qualitative parameters

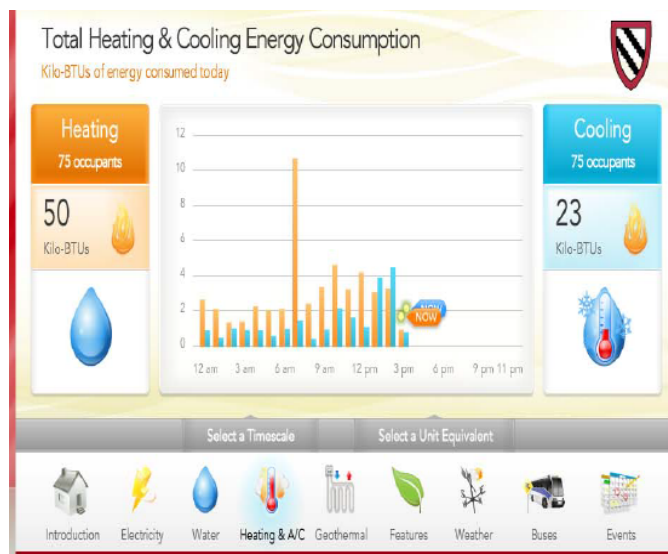
identified, building economic valuations (LCCA results), and all and any requirements the owner (WPI) would like to include.

Once the attributes are defined by WPI a decision matrix is developed with the performance of the alternative with respect to each of the identified parameters. Underlying trade-off relationships are identified and analyzed, and alternatives selected based on WPI's preferences. Pairwise comparison of each alternative's attributes against other alternative's attributes is performed asking the question "Alternative 1 is how much more desirable than Alternative 2, relative to the attribute of interest? This is an alternative method of analysis and evaluation of alternatives, in which life cycle costs analysis information may be used.

5.7 Consumption Tracking

One of the LEED points specifically targets tracking of consumption, with the intent to provide ongoing accountability of building energy consumption over time. Energy and Atmosphere credit 5, Measurement & Verification, requires the development of a plan to evaluate building or energy system performance through simulation of engineering analysis. This requires the

Figure 5-Byerly Hall Online Dashboard



installation of necessary metering devices to measure energy use. This application may also help in isolating water consumption of various systems not included in the LEED template, such as the water for the HVAC systems. This credit was not pursued by WPI East Hall project, however it may be pursued in the future. If such tracking is

undertaken, WPI can create an online dashboard such as the one created for Harvard for their recent dormitory Byerly Hall³⁹.

The dashboard provides real time consumption information of all building systems and sustainability components integrated in the building's design to optimize its performance. A sample of the website is provided in Figure 5-Byerly Hall Online Dashboard. When WPI East Hall residents were surveyed about whether they would minimize their consumption if it was tracked in real time, 35.6% answered yes. 37.3% of the residents said maybe! Well this means we can potentially change the consumption behavior of 72.9% of the residents. Sustainability is not only achieved through the design of green features in a building but in the attitudes of the students. WPI's yearly consumption costs lie in the consumption attitude of its dormitory residents. A shift in the mentality of consumers must take form before any of the measures are truly successful.

³⁹ Byerly Hall Real Time Dashboard: <http://buildingdashboard.com/clients/harvard/byerly/index.php?mod>

6.0 CONCLUSIONS

This thesis examined the creation of a framework for Life Cycle Cost Analysis at WPI using East Hall as a direct case study. In order to validate sustainable development investment decisions taken by WPI a series of inputs were tracked and analyzed to reflect their added percent cost or added percent savings. Even though there were limitations in the collection of operations and maintenance data, the results prove that building green makes financial sense.

The sensitivity analysis shows the worst case-Scenario 1 resulted in a 0.12% savings even though the assumptions were conservative. The total non-green cost was \$310.50/sf and green cost was \$310.13/sf over the life of the building resulting in a \$0.38/sf in savings. In this case the consumption savings per year alone contributed to overall savings. With more accurate operations and maintenance data these savings per year will increase substantially.

There are numerous claims made by leading researchers as well as the USGBC as to the savings generated in building green structures. This thesis provided the framework and data needed to evaluate these claims and compared how well WPI measured up to industry standards.

The green construction costs were 5.9% higher, a value that was 2.3 times higher than the 2.6% presented to the Board of Trustees. The 2.6% green premium included the deduction of the green roof gift donation which was not accounted for in this analysis. However the 5.9% green premium was still in the industry range (Kats, 2003) of 0.66%-6.5%.

In the arena of consumption costs there was an added cost of \$0.05/sf/yr in water consumption. The electrical and natural gas combined contributed to a \$0.82/sf/yr savings versus the \$1.03/sf/yr savings as indicated in Peyser's research (Peyser, 2008) a 20.39% differential. In comparing overall percent savings WPI realized a \$0.77/sf/yr savings in the area of water, electricity and natural gas consumption. This results in a

yearly savings of \$125,051.08, a substantial amount of money. Over a 25 year period at a 7% discount rate, the overall savings are in the range of \$1,457,300.

The operations and maintenance costs were 17.82% of the total costs for green construction, and 18.19% of total costs for the non-green construction portion. These are rather high percentages when compared to the 5% operations and maintenance costs of the cost distribution. If the operations and maintenance is reduced by 70% then the percent of total numbers are more in line with the cost distribution at 5.35% green costs and 5.46% non-green costs. Once WPI tracks its operations and maintenance costs, these values will reflect the actual cost case versus the assumed cases which is depicted in this research.

Based on this research building green makes sound financial sense, the tracking of actual costs in the area of operations and maintenance will not only fortify this stance but it will also provide WPI with a more accurate understanding of its building expenditures. The findings of this thesis were encouraging in that WPI is truly benefiting from building green.

7.0 FUTURE WORK

There are numerous avenues of potential future work in the area of costs and benefits of green buildings. Some areas of note which was beyond the scope of this research are as follows:

- Operations and Maintenance costs
- Employee productivity
- Student health and well-being
- Test score correlation to healthy environments
- Additional productivity and health costs and benefits
- Insurance benefits and costs of green buildings

The development of the above mentioned areas of future exploration will provide WPI with a more accurate Life Cycle Costing Analysis. It can also potentially identify new components that WPI will value in its decision making process not easily quantifiable. In cases where such inputs do exist the use of Analytical Hierarchy Process in Multi Attribute Decision Analysis of investments may be employed.

The survey taken by the WPI East Hall residents did not directly ask health related questions, however there were a couple of comments made by residents which indicated a direct correlation between the HVAC systems and their health. In a response from one of the residents the lack of control of the heating system due to sensor rules, caused the resident to get sick in the winter. This resident indicated that they anticipated getting sick this winter as well, which would have a direct impact on their studies. Such negative health impacts can be avoided through better control of HVAC systems.

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APPENDICES

**Baseline Design Case and Proposed Design Case Parameters (LEED
Template)**

Appendix A-ME2 Detail Baseline Design Case and Proposed Design Case assumptions

(Submitted LEED Template)

Detail Baseline Design Case and Proposed Design Case Information (LEED EA Credit 1)

Exterior Wall Construction

Proposed Design Input

The first floor walls are clad in architectural pre-cast concrete panels. The assembly is comprised of 5-inch thick pre-cast concrete panels backed with 3 inches of spray polyurethane foam insulation with $R=18.3$, air space, 6-inch steel studs, and 5/8" gypsum wall board.

Exterior walls on 2nd through 5th floors are brick veneer with steel stud back-up with a total thickness of 1"-2 1/8". They are comprised of a single wythe of face brick, air space, 3 inches of spray polyurethane foam insulation with $R=18.3$, air/vapor barrier, 1/4-inch glass fiber faced gypsum sheathing, 4-inch cold formed metal framing, and 5/8-inch gypsum wall board.

Baseline Design Input

Walls Above Grade Residential: Steel Framed: $U = 0.064$; $R = 13 + R = 7.5$ ci.

Roof Construction

Proposed Design Input

The roofscape is comprised of a vegetated green roof in the central bay flanked by two bays roofed with an Energy Star membrane roof with an SRI of 104 to comply with LEED heat island roof mitigation and other credit requirements. Roofing assembly consists of 5 thick concrete topped composite metal deck, vapor retarder, 4" inches polyisocyanurate insulation, 1/4-inch glass fiber faced underlayment board, and 0.048 inch thick adhered PVC sheet membrane. Thermal resistance for the roof insulation is $R=25.02$. Extensive Green Roofing System modular components are placed above the membrane roof assembly with a 1-inch clearance, and do not contribute to thermal resistance.

Baseline Design Input

Insulation Entirely above Deck Residential: $U = 0.063$; $R = 15$

Floor/Slab Construction

Proposed Design Input

The foundations consist of waterproofed cast-in-place concrete frost walls and a slab on grade with vapor retarder. They are insulated with 2-inch thick extruded polystyrene insulation with a thermal resistance of $R=10$.

Baseline Design Input

Floors Residential: $U = 0.074$; $R = 10.4$ ci

Window-to-gross wall ratio

Proposed Design Input & Baseline Design Input

27.23%

Fenestration type

Proposed Design Input

Glazing utilizes clear 1-inch insulating glass units with Low-E coating, an aluminum spacer and air filled cavity.

Baseline Design Input

Standard Glass meeting performance characteristics below.

Fenestration U-factor

Proposed Design Input

$U = 0.46$

Baseline Design Input

Operable Windows: $U = 0.67$. Fixed Windows: $U=0.57$

Fenestration SHGC - North

Proposed Design Input

SHGC = 0.38

Baseline Design Input

SHGC = 0.49

Fenestration SHGC - Non-North

Proposed Design Input

SHGC = 0.38

Baseline Design Input

SHGC = 0.39

Fenestration Visual Light Transmittance

Proposed Design Input

T(Vis) = 70%

Baseline Design Input

N/A

Shading Devices

Proposed Design Input

North Facade - None; East Facade - 6" External horizontal fins; South & West - 6" External vertical fins.

Baseline Design Input

None

Interior Lighting Power Density (W/sf)

Proposed Design Input

0.63 W/SF - Building Area Method: See attached - "Electrical - Lighting Power Densities Worksheet.pdf"

Baseline Design Input

Building Area Method: Dormitory, Office, Exercise Center all 1.0 W/SF.

Daylighting Controls

Proposed Design Input & Baseline Design Input

None

Other Lighting Control Credits

Proposed Design Input & Baseline Design Input

None

Exterior Lighting Power (kW)

Proposed Design Input

Exterior Lighting: 5.79 W/SF

Baseline Design Input

Exterior Lighting: Per ASHRAE 90.1 2004 Table 9.4.5: 30 W/SF for main entries.

Process Lighting (kW)

Proposed Design Input & Baseline Design Input

N/A

Receptacle Equipment Power Density (W/sf)

Proposed Design Input & Baseline Design Input

Receptacle equipment ranged from 1 W/sf to 12.5 W/sf depending on type of room and occupancy profile. For example, bathroom areas in suites were 3 W/sf on average when occupied

Parking Garage Lighting Power

Proposed Design Input

Garage Lighting: 0.1 W/SF - See attached - "Electrical - Lighting Power Densities Worksheet.pdf"

Baseline Design Input

Garage Lighting: 0.3 W/SF per Table 9.5.1

Primary HVAC System Type

Proposed Design Input

First Floor: Energy Recovery Units with Induction Units. 2-5 Floor: Energy Recovery Units with FCU serving apartments.

Baseline Design Input

First Floor: System #3 PSZ-AC - Packaged rooftop air conditioner, zoned as design. Unit EER = 9.5 per table 6.8.1A - Air conditioners, air cooled > or = to 135,000 BTUH and < 240,000 BTUH, "all other", single package.

2-5 Floors: System #1 PTAC - Packaged terminal air conditioner, per room. Units SEER = 10.6 (COP = 3.11) per table 6.8.1A - Through Wall < or = 30,000 BTU/h - single package

Other HVAC System Type

Proposed Design Input

Split Systems serving elevator machine rooms and TelCom Rooms; Cabinet Unit Heaters/Unit Heaters for stairs, mechanical/electrical spaces.

Baseline Design Input

PTAC or RTU as outlined in 90.1. Cabinet Unit Heaters/Unit Heaters for stairs, mechanical/electrical spaces.

Fan Supply Volume

Proposed Design Input

ERU-1 & 2: 7800 CFM supply air, 6500 CFM exhaust air, 15 HP & 7.5 HP fan motors respectively. ERU-3: 4600 CFM supply air, 4800 CFM exhaust air, 7.5 HP & 5 HP fan motor respectively. ERU-4: 6000 CFM supply air, 5000 CFM exhaust air, 10 HP & 7.5 HP fan motors respectively.

Baseline Design Input

PTAC's all supply 290 CFM. There are a total of 267 PTAC units; 77430 CFM

Single Zone RTU's vary. Total SA CFM for system is 33255 CFM.

Fan Power

Proposed Design Input

ERU-1 & 2: 15 HP & 7.5 HP supply and exhaust fan motors respectively. ERU-3: 7.5 HP & 5 HP supply and exhaust fan motors respectively. ERU-4: 10 HP & 7.5 HP supply and exhaust fan motors respectively.

Baseline Design Input

Total PTAC fan power calculated to be 51657 W. RTU fan power calculated to be 22911 W.

Economizer Control

Proposed Design Input

Enthalpy Control

Baseline Design Input

Dry Bulb

Demand Control Ventilation

Proposed Design Input & Baseline Design Input

None

Unitary Equipment Cooling Efficiency

Proposed Design Input & Baseline Design Input

See "Other HVAC Type"

Unitary Equipment Heating Efficiency

Proposed Design Input & Baseline Design Input

See "other HVAC Type"

Chiller Parameters

Proposed Design Input

2 - 90 nominal ton air cooled chillers with the following efficiency: 1.06 kW/ton, 0.75 kW/ton, 0.45 kW/Ton, 0.24 kw/ton at 100%, 75%, 50% and 25% cooling demand respectively.

Baseline Design Input

DX Cooling for PTAC units and rooftop units

Chilled Water Loop & Pump Parameters

Proposed Design Input

The chilled water distribution pumping system will be a primary, variable flow system with seven distribution pumps. One pump will serve the north wing fan coil units (3 HP motor), one pump will serve the south wing fan coil units (3 HP motor), one pump will serve the first floor induction units (0.75 HP) and one pump (4 total) will serve each of the 4 rooftop energy recovery units (0.5 HP each). Each pump will be sized for 100% of the design load to the piece or pieces of equipment it will be serving. All pumps will be controlled with variable frequency drives.

8.75 HP * 2.545 kBTUh = 22.3kBTU (IES accepts kBTU for the pump power input)

Baseline Design Input

N/A

Boiler Parameters

Proposed Design Input

3 - 1000 MBH input Aerco KC 1000 firetube condensing natural gas boilers with 15-1 turndown.

Baseline Design Input

System 1 - PTAC: Fossil fuel boilers - Two equally sized boilers per G3.1.3.2 - SF greater than 15,000 SF. 6.8.1F of ASHRAE 90.1 2004: 75% combustion efficiency for Gas-Fired > or = to 300,000 BTUH and < 2,500,000 BTUH. Each boiler (two total) sized for 1015 MBH.

Hot Water Loop & Pump Parameters

Proposed Design Input

2 - hot water heating pumps (one stand by). Each pump is sized for 180 GPM with a 3 HP motor. Each pump has a VFD associated with it.

$$3\text{HP} * 2.545 \text{ kBTUh} = 7.6 \text{ Kbtu}$$

Baseline Design Input

Baseline hot water pump power shall be 19W/GPM as called for in Section G3.1.2.5 and as outlined in ASHRAE 90.1 User Manual page G-30.

The pump power is 3420 W.

Cooling Tower Parameters

Proposed Design Input & Baseline Design Input

N/A

Condenser Water Loop & Pump Parameters

Proposed Design Input & Baseline Design Input

N/A

Domestic Water Heating System

Proposed Design Input

(3) 250 gallon natural gas hot water heaters. Each is figured to deliver 40% of the load (if one goes down they can still cover 80% of the worst case.) They are listed as having a 94% thermal efficiency. On top of the 250 gallons of storage, they can put out 640 gal/hour.

Baseline Design Input

(3) 250 gallon water heaters. Each is figured to deliver 40% of the load (if one goes down they can still cover 80% of the worst case.) They are listed as having a 94% thermal efficiency. On top of the 250 gallons of storage, they can put out 640 gal/hour.

UTILITY RATES AND ASSUMPTIONS ARE BASED ON THE FOLLOWING:

ELECTRICITY (Unit of Energy: kWh): \$0 .14

(http://tonto.eia.doe.gov/dnav/ng/ng_pri_sum_dcu_SMA_m.htm)

NATURAL GAS (Unit of Energy: therms): \$1.3

(http://tonto.eia.doe.gov/dnav/ng/ng_pri_sum_dcu_SMA_m.htm)

Energy and Atmosphere Credit 1-Submitted LEED Template

Appendix A-ME1 Energy and Atmosphere Credit 1 (Submitted LEED Template)



(Responsible Individual)

(Company Name)

I, **Fletcher Clarcq, PE**

, from

Cannon Design

verify that the information provided below is accurate, to the best of my knowledge.

CREDIT COMPLIANCE

(Please complete the color coded criteria(s) based on the option path selected)

Please select the appropriate compliance path option

Option 1 (Pg 2): Performance Rating Method, ASHRAE 90.1-2004 Appendix G or equivalent (up to 10 points possible)

Option 2 (Pg 14): ASHRAE Advanced Energy Design Guide for Small Office Buildings 2004 (4 points)

Option 3 (Pg 14): Advanced Buildings Benchmark™ Version 1.1, Basic Criteria & Prescriptive Measures (1 point)

OPTION 1: PERFORMANCE RATING METHOD

I confirm that the energy simulation software used for this project has all capabilities described in EITHER section 'G2 Simulation General Requirements' in Appendix G of ASHRAE 90.1-2004 OR the analogous section of the alternative qualifying energy code used.

I confirm that the baseline building and proposed building in this project's energy simulation runs use the assumptions and modeling methodology described in EITHER Appendix G of ASHRAE 90.1-2004 OR the analogous section of the alternative qualifying energy code used.

Complete the following sections to document compliance using Option 1:

- Section 1.1 - General Information
- Section 1.2 - Space Summary
- Section 1.3 - Advisory Messages
- Section 1.4 - Comparison of Proposed Design Versus Baseline Design Energy Model Inputs
- Section 1.5 - Energy Type Summary
- Section 1.6 - On-Site Renewable Energy *(if applicable)*
- Section 1.7 - Exceptional Calculation Measure Summary *(if applicable)*
- Section 1.8 - Performance Rating Method Compliance Report

Section 1.1 - General Information

Provide the following data for your project

Simulation Program:	<input type="text" value="IES Version 5.9.0.2"/>	Quantity of Stories:	<input type="text" value="5"/>
Principal Heating Source:	<input type="text" value="Fossil Fuel"/>	Weather File:	<input type="text" value="BostonTMY2.FWT"/>
Energy Code Used:	<input type="text" value="ASHRAE 90.1-2004 Appendix G"/>	Climate Zone:	<input type="text" value="5A"/>
New Construction Percent:	<input type="text" value="100 %"/>	Existing Renovation Percent:	<input type="text" value="0 %"/>

Enter the Target Finder score for your building from the Energy Star website (http://www.energystar.gov/index.cfm?fuseaction=target_finder.&CFID=154897). The score has no bearing on the number of EAc1 points earned. Use the following process to evaluate the Target Finder score:

1. Enter the facility information
2. Enter the facility characteristics. Select each primary and secondary space type that applies to the project. Then complete the required information for each space type.
4. Enter the total energy use per energy source for your project based on the totals reflected in the Proposed Design energy simulation output report.

Target Finder Score:



Section 1.2 - Space Summary

Provide the space summary for your project
(click "CLEAR" to clear the contents of any row All numeric entries must be entered as whole numbers without commas):

Table 1.2 - Space Summary				
Building Use (Occupancy Type)	Conditioned Area (sf)	Unconditioned Area (sf)	Total Area (sf)	
Exercise Rooms/Gaming Room/Stretching/Music R	2,616		2,616	CLEAR
1st Floor: Admin/RA work/Offices/Meeting Rooms/	4,510		4,510	CLEAR
Residential Living Spaces (Bedrooms/Living Rooms	58,270		58,270	CLEAR
2-5 Floors: Project Rooms	908		908	CLEAR
				CLEAR
Mechanical/Electrical/TelCom - Conditioned	4,126		4,126	CLEAR
Mechanical/Electrical - Unconditioned		3,072	3,072	CLEAR
Back of House Spaces: Laundry/Linens/Trash/Recyc	3,458		3,458	CLEAR
Stairs	3,120		3,120	CLEAR
Corridors	12,376		12,376	CLEAR
Garage		69,948	69,948	CLEAR
Total:	89,384	73,020	162,404	

Section 1.3 - Advisory Messages

Complete the following information from the simulation output files (all entries should be entered as whole numbers, without commas)

TABLE 1.3 - Advisory Messages	Proposed Building	Baseline Building (0 deg. rotation)	Difference
Number of hours heating loads not met:	0	0	0
Number of hours cooling loads not met:	0	0	0
Number of warning messages:	0	0	0
Number of error messages:	0	0	0
Number of defaults overridden:	0	0	0



Section 1.4 - Comparison of Proposed Design Versus Baseline Design Energy Model Inputs

Use **Table 1.4** to document the Baseline and Proposed design energy model inputs for your project. Include descriptions for:

1. Exterior wall, underground wall, roof, floor, and slab assemblies including framing type, assembly R-values, assembly U-factors, and roof reflectivity when modeling cool roofs. (Refer to ASHRAE 90.1 Appendix A)
2. Fenestration types, assembly U-factors (including the impact of the frame on the assembly), SHGCs, and visual light transmittances, overall window-to-gross wall ratio, fixed shading devices, and automated movable shading devices.
3. Interior lighting power densities, exterior lighting power, process lighting power, and lighting controls modeled for credit.
4. Receptacle equipment, elevators or escalators, refrigeration equipment, and other process loads.
5. HVAC system information including types and efficiencies, fan control, fan supply air volume, fan power, economizer control, demand control ventilation, exhaust heat recovery, pump power and controls, and any other pertinent system information. (Include the ASHRAE 90.1-2004 Table G.3.1.1B Baseline System Number).
6. Domestic hot water system type, efficiency and storage tank volume.
7. General schedule information

Documentation should be sufficient to justify the energy and cost savings numbers reported in the Performance Rating Table.

(Click "CLEAR" to clear the contents of any row.)

TABLE 1.4 - Comparison of Proposed Design Versus Baseline Design			
Model Input Parameter	Proposed Design Input	Baseline Design Input	
Exterior Wall Construction	The first floor walls are clad in architectural pre-cast concrete panels. The assembly is comprised of 5-inch thick pre-cast concrete panels backed	Walls Above Grade Residential: Steel Framed: U = 0.064; R = 13 + R = 7.5 ci.	CLEAR
Roof Construction	The roofscape is comprised of a vegetated green roof in the central bay flanked by two bays roofed with an Energy Star membrane roof with an SRI	Insulation Entirely above Deck Residential: U = 0.063; R = 15	CLEAR
Floor/Slab Construction	The foundations consist of waterproofed cast-in-place concrete frost walls and a slab on grade with vapor retarder. They are insulated with 2-	Floors Residential: U = 0.074; R = 10.4 ci	CLEAR
Window-to-gross wall ratio	27.23%	27.23%	CLEAR
Fenestration type	Glazing utilizes clear 1-inch insulating glass units with Low-E coating, an aluminum spacer and air-filled cavity	Standard Glass meeting performance characteristics below.	CLEAR
Fenestration U-factor	U = 0.46	Operable Windows: U = 0.67. Fixed Windows: U=0.57	CLEAR
Fenestration SHGC - North	SHGC = 0.38	SHGC = 0.49	CLEAR
Fenestration SHGC - Non-North	SHGC = 0.38	SHGC = 0.39	CLEAR
Fenestration Visual Light Transmittance	T(Vis) = 70%	N/A	CLEAR
Shading Devices	North Facade - None; East Facade - 6" External horizontal fins; South & West - 6" External vertical fins	None	CLEAR
			CLEAR
Interior Lighting Power Density (W/sf)	0.63 W/SF - Building Area Method: See attached - "Electrical - Lighting Power Densities Worksheet.pdf"	Building Area Method: Dormitory, Office, Exercise Center all 1.0 W/SF.	CLEAR



TABLE 1.4 - Comparison of Proposed Design Versus Baseline Design

Model Input Parameter	Proposed Design Input	Baseline Design Input	
Daylighting Controls	None	None	CLEAR
Other Lighting Control Credits	None	None	CLEAR
Exterior Lighting Power (kW)	Exterior Lighting: 5.79 W/SF	Exterior Lighting: Per ASHRAE 90.1 2004 Table 9.4.5: 30 W/SF for main entries.	CLEAR
Process Lighting (kW)	N/A	N/A	CLEAR
Receptacle Equipment Power Density (W/sf)	Receptacle equipment ranged from 1 W/sf to 12.5 W/sf depending on type of room and occupancy profile. For example, bathroom area	Same as proposed design building.	CLEAR
Parking Garage Lighting Power	Garage Lighting: 0.1 W/SF - See attached - "Electrical - Lighting Power Densities Worksheet.pdf"	Garage Lighting: 0.3 W/SF per Table 9.5.1	CLEAR
Primary HVAC System Type	First Floor: Energy Recovery Units with Induction Units. 2-5 Floor: Energy Recovery Units with FCU serving apartments	First Floor: System #3 PSZ-AC - Packaged rooftop air conditioner, zoned as design. Unit EER = 9.5 per table 6.8.1A - Air conditioners, air cooled	CLEAR
Other HVAC System Type	Split Systems serving elevator machine rooms and TelCom Rooms; Cabinet Unit Heaters/Unit Heaters for stairs, mechanical/electrical spaces	PTAC or RTU as outlined in 90.1. Cabinet Unit Heaters/Unit Heaters for stairs, mechanical/electrical spaces	CLEAR
Fan Supply Volume	ERU-1 & 2: 7800 CFM supply air, 6500 CFM exhaust air, 15 HP & 7.5 HP fan motors respectively. ERU-3: 4600 CFM supply air, 4800	PTAC's all supply 290 CFM. There are a total of 267 PTAC units; 77430 CFM Single Zone RTU's vary. Total SA CFM for system	CLEAR
Fan Power	ERU-1 & 2: 15 HP & 7.5 HP supply and exhaust fan motors respectively. ERU-3: 7.5 HP & 5 HP supply and exhaust fan motors respectively. ERU-4: 10	Total PTAC fan power calculated to be 51657 W. RTU fan power calculated to be 22911 W.	CLEAR
Economizer Control	Enthalpy Control	Dry Bulb	CLEAR
Demand Control Ventilation	None	None	CLEAR
Unitary Equipment Cooling Efficiency	See "Other HVAC System Type"	See "Other HVAC System Type"	CLEAR
Unitary Equipment Heating Efficiency	See "Other HVAC System Type"	See "Other HVAC System Type"	CLEAR
Chiller parameters	2 - 90 nominal ton air cooled chillers with the following efficiency: 1.06 kW/ton, 0.75 kW/ton, 0.45 kW/ton, 0.24 kW/ton at 100%, 75%, 50% ar	DX Cooling for PTAC units and rooftop units	CLEAR
Chilled water loop & pump parameters	The chilled water distribution pumping system will be a primary, variable flow system with seven distribution pumps. One pump will serve the	N/A	CLEAR
Boiler parameters	3 - 1000 MBH input Aerco KC 1000 firetube condensing natural gas boilers with 15-1 turndown	System 1 - PTAC: Fossil fuel boilers - Two equally sized boilers per G3.1.3.2 - SF greater than 15,000 SF - 6.8.1E of ASHRAE 90.1 2004: 75% combustion	CLEAR
Hot water loop & pump parameters	2 - hot water heating pumps (one stand by). Each pump is sized for 180 GPM with a 3 HP motor. Each pump has a VED associated with it	Baseline hot water pump power shall be 19W/GPM as called for in Section G3.1.2.5 and as outlined in ASHRAE 90.1 User Manual page G-3	CLEAR
Cooling tower parameters	N/A	N/A	CLEAR
Condenser water loop & pump parameters	N/A	N/A	CLEAR
Domestic Water Heating System	(3) 250 gallon natural gas hot water heaters. Each are figured to deliver 40% of the load (if one goes down they can still cover 80% of the worst case)	(3) 250 gallon water heaters. Each are figured to deliver 40% of the load (if one goes down they can still cover 80% of the worst case). They are	CLEAR



Section 1.5 - Energy Type Summary

List the energy types used by your project (i.e. electricity, natural gas, purchased chilled water or steam, etc.) for either the Baseline or Proposed design. Also describe the utility rate used for each energy type (i.e. Feswick County Electric LG-S), as well as the units of energy used, and the units of demand used. (Click "CLEAR" to clear the contents of any row):

TABLE 1.5 - Energy Type Summary

Energy Type	Utility Rate Description	Units of Energy	Units of demand	
Electricity	.14 (http://tonto.eia.doe.gov/dna)	kWh	kW	<input type="button" value="CLEAR"/>
Natural Gas	1.3 (http://tonto.eia.doe.gov/dna)	therms	MBH	<input type="button" value="CLEAR"/>
				<input type="button" value="CLEAR"/>
				<input type="button" value="CLEAR"/>

Energy Units:

1 kBtu = 1,000 Btu 1 MBtu = 1,000 kBtu
 1 kWh = 3,412 kBtu 1 MWh = 3,412 kBtu
 1 therm = 100 kBtu 1 ton hr = 12 kBtu

Demand Units

1 MBH = 1,000 Btu/h 1 MMBtuh = 1,000 MBH
 1 kW = 3.412 MBH 1 ton = 12 MBH



Section 1.6 - On-Site Renewable Energy

If the project does not include on-site renewable energy, skip to Section 1.7

The project includes On-Site Renewable Energy

How is the on-site renewable energy cost calculated?

This form will automatically calculate the *Renewable Energy Cost* based on the "virtual" energy rate from the proposed design energy model results. This form will subtract the *Renewable Energy Cost* from the proposed design energy model results to calculate the *Proposed Building Performance Rating*. (You do NOT need to fill out the "Renewable Energy Cost" field in Table 1.6 below)

Renewable Energy Cost for each on-site renewable source is analyzed separately from the energy model based on local utility rate structures. The Renewable Energy Cost for each renewable source is reported in Table 1.6 below, This form will subtract the reported Renewable Energy Cost from the proposed design energy model results to calculate the Proposed Building Performance Rating.

On-site renewable energy is modeled directly in the energy model. *Renewable Energy Cost* is already credited in the proposed design energy model results (i.e. the energy model already reflects zero cost for on-site renewable energy, and this form will NOT subtract the *Renewable Energy Cost* a second time).

Indicate the on-site renewable energy source(s) used, the backup energy type for each source (i.e. the fuel that is used when the renewable energy source is unavailable - ASHRAE 90.1-2004, Section G2.4), the rated capacity for the source, and the annual energy generated from each source.

TABLE 1.6 - Renewable Energy Source Summary

Renewable Source	Backup Energy Type	Annual Energy Generated	Rated Capacity	Renewable Energy Cost	
					CLEAR
					CLEAR



Section 1.7 - Exceptional Calculation Measure Summary

(If the energy analysis does not include exceptional calculation methods, skip to Section 1.8)

The energy analysis includes exceptional calculation method(s) (ASHRAE 90.1-2004, G2.5)

How is the exceptional calculation measure cost savings determined?

This form will automatically calculate the exceptional calculation measure cost savings based on the "virtual" energy rate from the proposed design energy model results. This form will subtract this cost savings from the proposed design energy model results to calculate the *Proposed Building Performance Rating*.

Exceptional calculation measure cost for each exceptional calculation measure is analyzed based on local utility rate structures. The *cost savings* for each exceptional calculation is reported below, This form will subtract the reported exceptional calculation cost savings from the proposed design energy model results to calculate the *Proposed Building Performance Rating*.

For each exceptional calculation method employed, document the predicted energy savings by energy type , the energy cost savings (if option 2 above is selected), and a narrative explaining the exceptional calculation method performed, and theoretical or empirical information supporting the accuracy of the method. Reference any applicable Credit Interpretation Rulings. [Note: if an end-use has an energy loss rather than an energy savings, enter it as a negative number]

Exceptional Calculation Measure Short Description:

Energy Type(s)	Annual Energy Savings by Energy Type	Annual Cost Savings	Exceptional Calculation Measure Narrative:
<input type="text"/>	<input type="text"/>	<input type="text"/>	
<input type="text"/>	<input type="text"/>	<input type="text"/>	
<input type="text"/>	<input type="text"/>	<input type="text"/>	
<input type="text"/>	<input type="text"/>	<input type="text"/>	

Exceptional Calculation Measure Short Description:

Energy Type(s)	Annual Energy Savings by Energy Type	Annual Cost Savings	Exceptional Calculation Measure Narrative:
<input type="text"/>	<input type="text"/>	<input type="text"/>	
<input type="text"/>	<input type="text"/>	<input type="text"/>	
<input type="text"/>	<input type="text"/>	<input type="text"/>	
<input type="text"/>	<input type="text"/>	<input type="text"/>	



Section 1.8 - Performance Rating Method Compliance Report (Option 1 Compliance Only)

In **Table 1.8.1**, list each energy end use for your project (including all end uses reflected in the baseline and proposed designs). Then check whether the end-use is a process load, select the energy type, and list the energy consumption and peak demand for each end-use for all four Baseline Design orientations. In **Table 1.8.1(b)** indicate the total baseline energy cost for each energy type for all four Baseline Design orientations. If either the baseline or proposed design uses more than one energy type for a single end use (i.e. electric resistance reheat, and central natural gas heating), enter each energy type as a separate end use (i.e. *Heating - Electric*, and *Heating, NG*).

Fill out the Proposed Design energy consumption and peak demand for each end use in **Table 1.8.2**. In **Table 1.8.2 (b)** indicate the total proposed energy cost for each energy type. [Note: Process loads for the proposed design must equal those listed in the Baseline design. Any process load energy savings for the project must be reported in Section 1.7.]

(Click "CLEAR" to clear the contents of any end use)

End Use	Process?	Baseline Design Energy Type	Units of Annual Energy & Peak Demand	Baseline (0° rotation)	Baseline (90° rotation)	Baseline (180° rotation)	Baseline (270° rotation)	Baseline Design	
Interior Lighting	<input type="checkbox"/>	Electricity	Energy Use (kWh)	494,272.4	494,272.4	494,272.4	494,272.4	494,272.4	CLEAR
			Demand (kW)	84.6	84.6	84.6	84.6	84.6	
Parking Garage Lighting	<input type="checkbox"/>	Electricity	Energy Use (kWh)	130,020.3	130,020.3	130,020.3	130,020.3	130,020.3	CLEAR
			Demand (kW)	21.5	21.5	21.5	21.5	21.5	
Space Heating	<input type="checkbox"/>	Natural Gas	Energy Use (therms)	49,317.2	49,006.6	49,236.7	49,552.7	49,278.3	CLEAR
			Demand (MBH)	2,453.9	2,453.8	2,504.5	2,465.5	2,469.4	
Space Cooling	<input type="checkbox"/>	Electricity	Energy Use (kWh)	447,630.8	447,217.5	447,953.8	448,493.7	447,824	CLEAR
			Demand (kW)	279	278.6	280.5	279.8	279.5	
Pumps	<input type="checkbox"/>	Electricity	Energy Use (kWh)	29,278.9	29,272.2	29,307.7	29,268.7	29,281.9	CLEAR
			Demand (kW)	3.4	3.4	3.4	3.4	3.4	
	<input type="checkbox"/>	Electricity	Energy Use (kWh)						CLEAR
			Demand (kW)						
Fans - Interior	<input type="checkbox"/>	Electricity	Energy Use (kWh)	443,621.5	443,621.5	443,621.5	443,621.5	443,621.5	CLEAR
			Demand (kW)	50.6	50.6	50.6	50.6	50.6	
	<input type="checkbox"/>	Electricity	Energy Use (kWh)						CLEAR
			Demand (kW)						
Domestic Water Heating	<input checked="" type="checkbox"/>	Natural Gas	Energy Use (therms)	27,362.9	27,362.9	27,362.9	27,362.9	27,362.9	CLEAR
			Demand (MBH)	461.5	461.5	461.5	461.5	461.5	
Receptacle Equipment	<input checked="" type="checkbox"/>	Electricity	Energy Use (kWh)	972,388	972,388	972,388	972,388	972,388	CLEAR
			Demand (kW)	192.9	192.9	192.9	192.9	192.9	



Table 1.8.1 - Baseline Performance - Performance Rating Method Compliance

End Use	Process?	Baseline Design Energy Type	Units of Annual Energy & Peak Demand	Baseline (0° rotation)	Baseline (90° rotation)	Baseline (180° rotation)	Baseline (270° rotation)	Baseline Design	
Interior Lighting (Process)	<input checked="" type="checkbox"/>	Electricity	Energy Use (kWh)						CLEAR
			Demand (kW)						
Refrigeration	<input checked="" type="checkbox"/>	Electricity	Energy Use (kWh)						CLEAR
			Demand (kW)						
Data Center Equipment	<input checked="" type="checkbox"/>	Electricity	Energy Use (kWh)						CLEAR
			Demand (kW)						
	<input checked="" type="checkbox"/>		Energy Use						CLEAR
			Demand						
Elevators & Escalators	<input checked="" type="checkbox"/>	Electricity	Energy Use (kWh)	81,713.6	81,713.6	81,713.6	81,713.6	81,713.6	CLEAR
			Demand (kW)	74.6	74.6	74.6	74.6	74.6	
Exterior Lighting - Building Facade ⁺	<input type="checkbox"/>	Electricity	Energy Use (kWh)	6,986.1	6,986.1	6,986.1	6,986.1	6,986.1	CLEAR
			Demand (kW)	1.7	1.7	1.7	1.7	1.7	
Baseline Energy Totals:			Total Annual Energy Use (MBtu/year)	16,559	16,527	16,553	16,586	16,556	
			Annual Process Energy (MBtu/year)					6,333	

Note: Process Cost equals at least 25% of Baseline Performance, as required for showing credit compliance.

Table 1.8.1(b) - Baseline Energy Costs

Energy Type	Baseline Cost (0° rotation)	Baseline Cost (90° rotation)	Baseline Cost (180° rotation)	Baseline Cost (270° rotation)	Baseline Building Performance
Electricity	\$363,897	\$363,860	\$362,968	\$363,038	\$363,440
Natural Gas	\$99,684	\$99,280	\$99,580	\$99,991	\$99,633
Total Baseline Costs:	\$463,581	\$463,140	\$462,548	\$463,029	\$463,073

Table 1.8.2 - Performance Rating Table - Performance Rating Method Compliance

End Use	Process?	Proposed Design Energy Type	Proposed Design Units	Proposed Building Results	Baseline Building Units	Baseline Building Results	Percent Savings
Interior Lighting		Electricity	Energy Use (kWh)	305,173.1	Energy Use (kWh)	494,272.4	38.3 %
			Demand (kW)	52.3	Demand (kW)	84.6	38.2 %



Table 1.8.2 - Performance Rating Table - Performance Rating Method Compliance

End Use	Process?	Proposed Design Energy Type	Proposed Design Units	Proposed Building Results	Baseline Building Units	Baseline Building Results	Percent Savings
Parking Garage Lighting		Electricity	Energy Use (kWh)	47,674.2	Energy Use (kWh)	130,020.3	63.3 %
			Demand (kW)	7.9	Demand (kW)	21.5	63 %
Space Heating		Natural Gas	Energy Use (therms)	15,441	Energy Use (therms)	49,278.3	68.7 %
			Demand (MBH)	1,004.1	Demand (MBH)	2,469.4	59.3 %
Space Cooling		Electricity	Energy Use (kWh)	313,005.6	Energy Use (kWh)	447,824	30.1 %
			Demand (kW)	148.8	Demand (kW)	279.5	46.8 %
Pumps		Electricity	Energy Use (kWh)	65,281.3	Energy Use (kWh)	29,281.9	-122.9 %
			Demand (kW)	8.7	Demand (kW)	3.4	-163.6 %
		Electricity	Energy Use (kWh)		Energy Use (kWh)		0 %
			Demand (kW)		Demand (kW)		0 %
Fans - Interior		Electricity	Energy Use (kWh)	290,196.8	Energy Use (kWh)	443,621.5	34.6 %
			Demand (kW)	41	Demand (kW)	50.6	19.2 %
		Electricity	Energy Use (kWh)		Energy Use (kWh)		0 %
			Demand (kW)		Demand (kW)		0 %
Domestic Water Heating	X	Natural Gas	Energy Use (therms)	27,362.9	Energy Use (therms)	27,362.9	0 %
			Demand (MBH)	461.7	Demand (MBH)	461.5	0 %
Receptacle Equipment	X	Electricity	Energy Use (kWh)	972,388	Energy Use (kWh)	972,388	0 %
			Demand (kW)	192.9	Demand (kW)	192.9	0 %
Interior Lighting (Process)	X	Electricity	Energy Use (kWh)		Energy Use (kWh)		0 %
			Demand (kW)		Demand (kW)		0 %
Refrigeration	X	Electricity	Energy Use (kWh)		Energy Use (kWh)		0 %
			Demand (kW)		Demand (kW)		0 %
Data Center Equipment	X	Electricity	Energy Use (kWh)		Energy Use (kWh)		0 %
			Demand (kW)		Demand (kW)		0 %
	X		Energy Use		Energy Use		0 %
			Demand		Demand		0 %
Elevators & Escalators	X	Electricity	Energy Use (kWh)	81,713.6	Energy Use (kWh)	81,713.6	0 %
			Demand (kW)	74.6	Demand (kW)	74.6	0 %
Exterior Lighting - Building Facade	+	Electricity	Energy Use (kWh)	1,349	Energy Use (kWh)	6,986.1	80.7 %
			Demand (kW)	.3	Demand (kW)	1.7	80 %
Energy Totals:		Total Annual Energy Use (MBtu/year)		11,366		16,556	31.3 %
		Annual Process Energy (MBtu/year)		6333		6,333	0 %



Table 1.8.2(b) - Energy Cost and Consumption by Energy Type - Performance Rating Method Compliance

Energy Type	Proposed Design		Baseline Design		Percent Savings	
	Energy Use	Cost	Energy Use	Cost	Energy Use	Cost
Electricity	2,076,779 kWh	\$290,749	2,606,103 kWh	\$363,440	20.3 %	20 %
Natural Gas	42,803 therms	\$55,644	76,640 therms	\$99,633	44.2 %	44.2 %
	0		0		0 %	0 %
	0		0		0 %	0 %
Subtotal (Model Outputs):	11,366 (MBtu/year)	\$346,393	16,556 (MBtu/year)	\$463,073	31.3 %	25.2 %
On-Site Renewable Energy	Energy Generated	Renewable Energy Cost				
Exceptional Calculations	Energy Savings	Cost Savings				
Total:	Proposed Design		Baseline Design		Percent Savings	
	Energy Use	Cost	Energy Use	Cost	Energy	Cost
	11,366 (MBtu/year)	\$346,393	16,556 (MBtu/year)	\$463,073	31.3 %	25.2 %

DOCUMENTATION DESCRIPTION LOG

Please upload the compliance summaries for ASHRAE 90.1-2004 (or qualifying local energy code) and/or LEED if available from the energy simulation software used. Please also upload the energy rate tariff from the project's energy providers if the project is not using the default rates in the LEED-NC v2.2 Reference Guide.

If the software is incapable of producing the energy code or LEED compliance summaries please provide output summaries and example input summaries for both the baseline and proposed buildings that support the data entered in the template tables above.

- * Output summaries must include simulated energy consumption by end use as well as total building energy consumption and cost by energy type used in the building.
- * Example input summaries must be a sampling of model input assumptions, focusing on the most common systems present in the building. The example input summaries should be taken from the simulation software's standard input reports if available; if the software will not produce input summary reports then screen captures of representative inputs are acceptable. The example input summaries must include samples of the following input information:

1. Occupancy and usage patterns
2. Assumed envelope component sizes and traits (area, R-value, U-value, etc.)
3. Assumed mechanical equipment types and traits (capacity, efficiency, etc.)

Please note that uploaded documents should be SUMMARIES, and not large quantities of detailed data

Documentation Description Log

In the text box below, please reference the file name of each uploaded file (e.g. simulationsummary.pdf)

Proposed Design Energy Simulation Summary.pdf
 WPI - Baseline Model 0 degree - Energy Results.pdf
 WPI - Baseline Model 90 degree - Energy Results.pdf
 WPI - Baseline Model 180 degree - Energy Results.pdf
 WPI - Baseline Model 270 degree - Energy Results.pdf
 WPI Energy Model Profiles.pdf (Complete list - not necessarily all profiles used)
 WPI Thermal Templates.pdf
 EAc1 Response - WPI - LEED Responses - Construction Application Review.pdf
 EAc1 Response - WPI - HVAC Energy Conservation Measures.pdf
 EAc1 Response - WPI - Baseline Model - Energy Results 2009.05.06.pdf
 EAc1 Response - WPI - Baseline Thermal Templates Information file 2009.05.06.pdf
 I have provided the appropriate supporting documentation in the document upload section of LEED Online. Please refer to the above sheets.
 EAc1 Response - WPI - Proposed Model - Energy Results 2009.05.05.pdf
 EAc1 Response - WPI - Proposed Thermal Templates Information file 2009.05.06.pdf
 EAc1 Response - WPI - Proposed Model - Schedules.pdf
 EAc1 Response - WPI - Electrical - Lighting Power Densities Worksheet.pdf



OPTION 2: ASHRAE ADVANCED ENERGY DESIGN GUIDE FOR SMALL OFFICE BUILDINGS, 2004

The building complies with all the prescriptive measures of the ASHRAE Advanced Energy Design Guide for Small Office Buildings 2004. The following restrictions are applicable:

The project is less than 20,000 square feet.

The project is office occupancy.

The project has fully complied with all applicable criteria as established in the Advanced Energy Design Guide for the climate zone in which the building is located

Climate zone

OPTION 3: ADVANCED BUILDINGS BENCHMARK™ VERSION 1.1

The project fully complies with the Basic Criteria and Prescriptive Measures of the Advanced Buildings Benchmark™ Version 1.1 with the exception of the following sections: 1.7 Monitoring and Trend-logging, 1.11 Indoor Air Quality, and 1.14 Networked Computer Monitor Control.

Climate zone



NARRATIVE (Optional)

Please provide any additional comments or notes regarding special circumstances or considerations regarding the project's credit approach.

The project is seeking point(s) for this credit using an alternate compliance approach. The compliance approach, including references to any applicable Credit Interpretation Rulings is fully documented in the narrative above. *(Indicate the number of points documented in the "Alternative Compliance Points Documented" field below).*

Alternative Compliance Points Documented

Project Name: New Residence Hall, WPI

Credit: EA Credit 1: Optimize Energy Performance

Points Documented:

READY TO SAVE THIS TEMPLATE TO LEED-ONLINE? Please enter your first name, last name and today's date below, followed by your LEED-Online Username and Password associated with the Project listed above to confirm submission of this template.

<input type="text" value="Fletcher"/>	<input type="text" value="Clarcq"/>	<input type="text" value="2008-02-13"/>	<input type="text" value="fclarcq@cannondesign.com"/>	<input type="text" value=""/>
First Name	Last Name	Date	Username (Email Address)	Password

SAVE TEMPLATE TO LEED-ONLINE

PRINT TEMPLATE

10000451
Letter Template Version A1 .

Mechanical Consumption Costs

Appendix A-M1 Baseline Design Case and Proposed Design Case

Mechanical Comparison								
Baseline Design Case and Proposed Design Case								
Based on LEED-NC 2.2 Submittal Template								
EA Credit 1: Optimize Energy Performance								
END USE-NATURAL GAS	Baseline Design Case (0°, 90°, 180°, 270°)		Proposed Design Case Design		Percent Savings		ENERGY	
	ENERGY USE	Demand	ENERGY USE	Demand			COSTS ¹	COSTS ²
	THERMS	(MBH)	THERMS	(MBH)	Energy use	Demand	2006	2008-2009
SPACE HEATING	49,278.30	2,469.40	15,441.00	1,004.10	68.67%	59.34%	1.3000	0.2308
DOMESTIC WATER HEATING	27,362.90	461.50	27,362.90	461.70	0.00%	-0.04%	1.3000	0.2308
	76,641.20	2,930.90	42,803.90	1,465.80	34.33%	29.65%		TOTALS
Unit Price: cost \$/therm ³	\$ 1.30		\$ 1.30					
NOTES:								
Only End-Uses utilizing Natural Gas Energy have been included in this portion of analysis								
End uses are the intended component for which the energy is expended.								
Example 1: End-Use: Interior Lighting, Energy Use: Electrical.								
Example 2: End-Use: Space Heating, Energy Use: Natural Gas.								
FOOTNOTES:								
1								
Pricing indicated in the LEED NC 2.2 SUBMITTAL EA Credit 1 Template								
2								
Pricing data provided by WPI (Billing Information)								
3								
\$/Therm were arrived at by using information in the LEED NC 2.2 EA Credit 1 Template								
	Proposed Design Case Cost	\$ 55,644.00						
	Proposed Design Case Therm Consumption	42,803.90						
	Unit Price	\$ 1.30	per therm					
	Baseline Design Case	\$ 99,633.00						
	Baseline Design Case Therm Consumption	76,641.20						
		\$ 1.30	per therm					

ENERGY UNITS:								
1 kBtu=1000 Btu								
1 Mbtu=1000 kBtu								
1 kWh=3.412 kBtu								
1 MWh=3412kBtu								
1 therm= 100 kBtu								
DEMAND UNITS:								
1 MBH=1000 Btu/h								
1MMBtuh=1000 MBH								
1 Kw=3.412 MBH								
1 ton=12 MBH								

Appendix A-M2 Actual Case versus Baseline Design Case and Proposed Design Case

Mechanical Comparison					
Actual Case versus Baseline Design Case and Proposed Design Case					
Based on LEED-NC 2.2 Submittal Template					
EA Credit 1: Optimize Energy Performance					
Comparison of Therms					
END USE-NATURAL GAS	ENERGY USE-THERMS	U/P COSTS ¹	U/P COSTS ²	TOTAL COSTS ¹	TOTAL COSTS ²
BASELINE DESIGN CASE	76,641.20	\$ 1.3000	\$ 0.2308	\$ 99,631.64	\$ 17,687.28
PROPOSED DESIGN CASE	42,803.90	\$ 1.3000	\$ 0.2308	\$ 55,644.00	\$ 9,878.30
ACTUAL CASE	33,665.00	\$ 1.3000	\$ 0.2308	\$ 43,763.66	\$ 7,769.22
SUMMARY OF FINDINGS WITH NEUTRALIZED COSTS (\$0.2308-Per Billing Information)					
	Total Costs ²	Consumption			
Baseline Design Case	\$ 17,687.28	76,641.20			
Proposed Design Case	\$ 9,878.30	42,803.90			
Actual Case	\$ 7,769.22	33,665.00			
	Energy Use	Comments	Costs ² Comparison	Comments	
	% Difference		%		
Actual Case v. Baseline Design Case	56.07%	Baseline was 56.07% higher	56.07%	Baseline was 56.07% higher	
Actual Case v. Proposed Design Case	21.35%	Proposed Design was 21.35% higher	21.35%	Proposed Design was 21.35% higher	
USING COSTS¹ \$1.30-LEED TEMPLATE PRICING					
	Total Costs ¹	Consumption			
Baseline Design Case	\$ 99,631.64	76,641.20			
Proposed Design Case	\$ 55,644.00	42,803.90			
Actual Case	\$ 43,763.66	33,665.00			
	Energy Use	Comments	Costs ¹ Comparison	Comments	
	% Difference		%		
Actual Case v. Baseline Design Case	56.07%	Baseline was 56.07% higher	56.07%	Baseline was 56.07% higher	
Actual Case v. Proposed Design Case	21.35%	Proposed Design was 21.35% higher	21.35%	Proposed Design was 21.35% higher	
FOOTNOTES:					
1	Pricing indicated in the LEED NC 2.2 SUBMITTAL EA Credit 1 Template				
2	Pricing data provided by WPI (Billing Information)				

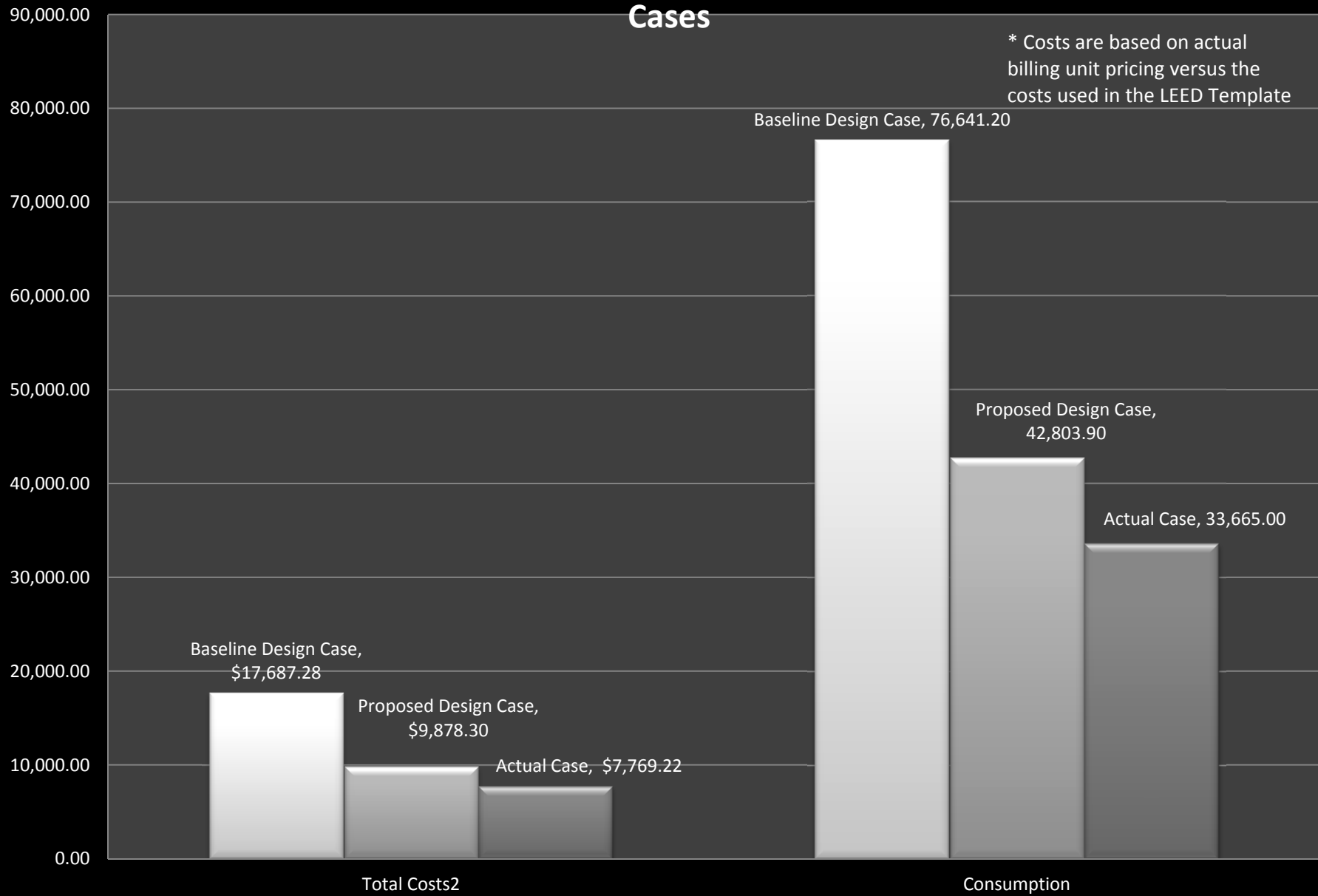
Appendix A-M3 Natural Gas Consumption and Cost Data (WPI-East Hall)

Mechanical-Natural Gas Data (WPI EAST HALL)					
Provided by Alfred DiMauro					
Consumption and Costs-2008 to 2009					
Billing Period	Total Cost	Therms		NSTAR GAS	July 08-June 09
				Total \$	Total Therms
8/19/2008	\$ 52.26	153			
9/18/2008	\$ 110.78	557		\$7,769.22	33,665
10/20/2008	\$ 185.11	1,070			
11/19/2008	\$ 560.47	2,847			\$ 0.23 /therm
12/19/2008	\$ 1,455.25	6,024			162,404.00 Total Building SF
1/19/2009	\$ 1,491.21	6,269			
2/19/2009	\$ 1,820.97	7,786		Actual Case	0.207291692 therms/SF
3/19/2009	\$ 1,095.09	4,630			
4/17/2009	\$ 750.55	3,132		Design Case	0.263564321 therms/SF
5/21/2009	\$ 197.15	1,017			
6/19/2009	\$ 50.38	180			
7/20/2009	\$ 53.86	211			
TOTAL	\$ 7,769.22	33,665			

Appendix A-M4 Graph: Natural Gas Consumption and Cost Comparison of Various
Design Cases

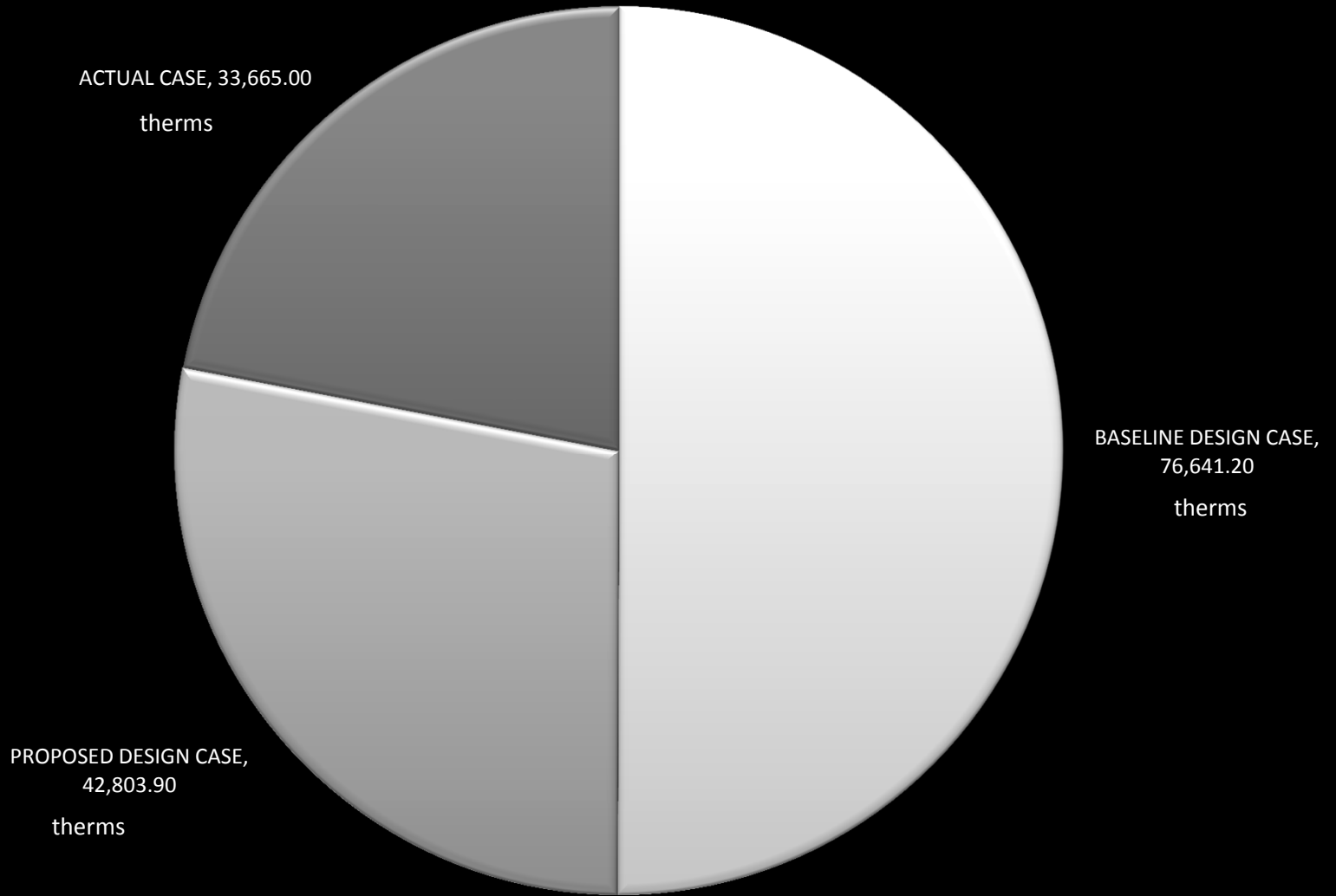
Natural Gas Consumption and Cost* Comparison of Various Design Cases

* Costs are based on actual billing unit pricing versus the costs used in the LEED Template



Appendix A-M5 Pie Chart: Natural Gas Consumption of Various Design Cases

Natural Gas Consumption of Various Design Cases



Electrical Consumption Costs

Appendix A-E1 Baseline Design Case and Proposed Design Case

Electrical Comparison								
Baseline Design Case and Proposed Design Case								
Based on LEED-NC 2.2 Submittal Template								
EA Credit 1: Optimize Energy Performance								
END USE-ELECTRICAL ENERGY	Baseline Design (0°, 90°, 180°, 270°)		Proposed Design Case Design		Percent Savings		ENERGY	ENERGY
	ENERGY USE	Demand	ENERGY USE	Demand	kWh	kW	U/P Cost ¹	U/P Cost ²
	kWh	kW	kWh	kW	ENERGY USE	DEMAND	2007	2006
INTERIOR LIGHTING	494,272.40	84.60	305,173.10	52.30	38.26%	38.18%	\$ 0.16	\$ 0.14
EXTERIOR LIGHTING-GARAGE	130,020.30	21.50	47,674.20	7.90	63.33%	63.26%	\$ 0.16	\$ 0.14
SPACE COOLING	447,824.00	279.50	313,005.60	148.80	30.11%	46.76%	\$ 0.16	\$ 0.14
PUMPS	29,281.90	3.40	65,281.30	8.70	-122.94%	-155.88%	\$ 0.16	\$ 0.14
HEAT REJECTION	0.00	0.00	0.00	0.00	N/A	N/A	\$ 0.16	\$ 0.14
FANS-INTERIOR	443,621.50	50.60	290,196.80	41.00	34.58%	18.97%	\$ 0.16	\$ 0.14
FANS-PARKING GARAGE	0.00	0.00	0.00	0.00	N/A	N/A	\$ 0.16	\$ 0.14
EXTERIOR LIGHTING-BUILDING FAÇADE	6,986.10	1.70	1,349.00	0.30	80.69%	82.35%	\$ 0.16	\$ 0.14
ELEVATORS AND ESCALATORS-PROCESS ENERGY ⁴	81,713.60	74.60	81,713.60	74.60	0.00%	0.00%	\$ 0.16	\$ 0.14
RECEPTACLE EQUIPMENT-PROCESS ENERGY ⁴	972,388.00	192.90	972,388.00	192.90	0.00%	0.00%	\$ 0.16	\$ 0.14
TOTALS	2,606,107.80	708.80	2,076,781.60	526.50	15.50%	11.71%		
	Total Consumption	Total Demand Baseline Design	Total Consumption	Total Demand Proposed Design	Average savings of Energy Usage	Average Savings in Demand		TOTALS
	Baseline Design		Proposed Design Case (LEED Template)		per End-Use	per End-Use		
	(LEED Template)							
NOTES:								
The electrical energy use includes process energy ⁴				20.31%	savings between Proposed Design case and Baseline Design Case			
Only End-Uses ³ utilizing Electrical Energy have been included in this portion of analysis								
ADDITIONAL NOTES ON CALCULATIONS:								
Calculations in this spreadsheet yield different totals than those indicated in the LEED Template								
Based on the LEED Template the following is true:								
Electricity Baseline Design Case Usage	2,606,103.00							
Electricity Proposed Design Case Usage	2,076,779.00							
% Difference between Analysis Calculations and LEED Template-Baseline	0.0002%							
% Difference between Analysis Calculations and LEED Template-Design	0.0001%							
This % differential is assumed to be NEGLIGIBLE for the purposes of this analysis								

Electrical Comparison
Baseline Design Case and Proposed Design Case

Based on LEED-NC 2.2 Submittal Template
 EA Credit 1: Optimize Energy Performance

END USE-ELECTRICAL ENERGY	Percent		Percent	
	Savings (Using Average State Prices) [Costs ¹]		Savings (Using Average State Prices) [COSTS ²]	
	Energy Use Cost-Baseline	Energy Use Cost-Design	Energy Use Cost-Baseline	Energy Use Cost-Design
INTERIOR LIGHTING	\$ 79,083.58	\$ 48,827.70	\$ 69,198.14	\$ 42,724.23
EXTERIOR LIGHTING-GARAGE	\$ 20,803.25	\$ 7,627.87	\$ 18,202.84	\$ 6,674.39
SPACE COOLING	\$ 71,651.84	\$ 50,080.90	\$ 62,695.36	\$ 43,820.78
PUMPS	\$ 4,685.10	\$ 10,445.01	\$ 4,099.47	\$ 9,139.38
HEAT REJECTION	\$ -	\$ -	\$ -	\$ -
FANS-INTERIOR	\$ 70,979.44	\$ 46,431.49	\$ 62,107.01	\$ 40,627.55
FANS-PARKING GARAGE	\$ -	\$ -	\$ -	\$ -
EXTERIOR LIGHTING-BUILDING FAÇADE	\$ 1,117.78	\$ 215.84	\$ 978.05	\$ 188.86
ELEVATORS AND ESCALATORS-PROCESS ENERGY ⁴	\$ 13,074.18	\$ 13,074.18	\$ 11,439.90	\$ 11,439.90
RECEPTACLE EQUIPMENT-PROCESS ENERGY ⁴	\$ 155,582.08	\$ 155,582.08	\$ 136,134.32	\$ 136,134.32
TOTALS				
	\$ 416,977.25	\$ 332,285.06	\$ 364,855.09	\$ 290,749.42
	Percent Savings		Percent Savings	
	20.31%		20.31%	

FOOTNOTES:								
1								
Costs based on the EIA-DOE Spreadsheet for Average Price Per State 2009, in this case the cost for residential Full Service Providers has been used.								
2								
Costs are based on the LEED-NC 2.2 Submittal Template Document provided by Canon Design.								
3								
End uses are the intended component for which the energy is expended. Example 1: End-Use: Interior Lighting, Energy Use: Electrical. Example 2: End-Use: Space Heating, Energy Use: Natural Gas.								
4								
Process Energy is considered to include but is not limited to: office and general miscellaneous equipment, computers, elevators, escalators, kitchen cooking and refrigeration, laundry washing and drying, lighting exempt from the lighting power allowance (e.g. lighting integral to medical equipment) and other (e.g. waterfall pumps)								

Appendix A-E2 Actual Case versus Baseline Design Case and Proposed Design Case

Electrical Comparison Actual Case versus Baseline Design Case and Proposed Design Case Based on LEED-NC 2.2 Submittal Template						
EA Credit 1: Optimize Energy Performance						
END USE-ELECTRICAL ENERGY	Baseline Design (0°, 90°, 180°, 270°)		Proposed Design Case Design		Percent	
	ENERGY USE	Demand	ENERGY USE	Demand	Savings	
	kWh	kW	kWh	kW	Energy use	Demand
INTERIOR LIGHTING	494,272.40	84.60	305,173.10	52.30	38.26%	38.18%
EXTERIOR LIGHTING-GARAGE	130,020.30	21.50	47,674.20	7.90	63.33%	63.26%
SPACE COOLING	447,824.00	279.50	313,005.60	148.80	30.11%	46.76%
PUMPS	29,281.90	3.40	65,281.30	8.70	-122.94%	-155.88%
HEAT REJECTION	0.00	0.00	0.00	0.00	N/A	N/A
FANS-INTERIOR	443,621.50	50.60	290,196.80	41.00	34.58%	18.97%
FANS-PARKING GARAGE	0.00	0.00	0.00	0.00	N/A	N/A
EXTERIOR LIGHTING-BUILDING FAÇADE	6,986.10	1.70	1,349.00	0.30	80.69%	82.35%
ELEVATORS AND ESCALATORS-PROCESS ENERGY ⁴	81,713.60	74.60	81,713.60	74.60	0.00%	0.00%
RECEPTACLE EQUIPMENT-PROCESS ENERGY ⁴	972,388.00	192.90	972,388.00	192.90	0.00%	0.00%
TOTALS	2,606,107.80	708.80	2,076,781.60	526.50	15.50%	11.71%
	Total Consumption	Total Demand Baseline Design	Total Consumption	Total Demand Proposed Design	Average savings of Energy Usage	Average Savings in Demand
	Baseline Design (LEED Template)		Proposed Design Case (LEED Template)		per End-Use	per End-Use
	ENERGY USE	TOTAL				ACTUAL VERSUS PROPOSED DESIGN
	kWh	COSTS²		Comments	Cost Per kWh	Unit Cost Comparison
Actual Consumption (East Hall Data provided by Alfred DiMauro)	1,102,800.00	\$ 148,872.91	\$ 148,872.91	This total cost is based on the WPI billing information.	\$ 0.13	7.69%
Baseline Design Case (LEED Template)	2,606,107.80	\$ 364,855.09	\$ 364,855.09		\$ 0.14	The actual U/P cost was 7.69% less than that which was assumed in the proposed design case.
Proposed Design Case (LEED Template)	2,076,781.60	\$ 290,749.42	\$ 290,749.42		\$ 0.14	

ENERGY					
COSTS ¹		Percent		Percent	
COSTS ²		Savings (Using Average State Prices) [COSTS ¹]		Savings (Using Average State Prices) [COSTS ²]	
2007	2006	Energy Use Costs-Baseline	Energy Use Costs-Design	Energy Use Costs-Baseline	Energy Use Costs-Design
\$ 0.16	\$ 0.14	\$ 79,083.58	\$ 48,827.70	\$ 69,198.14	\$ 42,724.23
\$ 0.16	\$ 0.14	\$ 20,803.25	\$ 7,627.87	\$ 18,202.84	\$ 6,674.39
\$ 0.16	\$ 0.14	\$ 71,651.84	\$ 50,080.90	\$ 62,695.36	\$ 43,820.78
\$ 0.16	\$ 0.14	\$ 4,685.10	\$ 10,445.01	\$ 4,099.47	\$ 9,139.38
\$ 0.16	\$ 0.14	\$ -	\$ -	\$ -	\$ -
\$ 0.16	\$ 0.14	\$ 70,979.44	\$ 46,431.49	\$ 62,107.01	\$ 40,627.55
\$ 0.16	\$ 0.14	\$ -	\$ -	\$ -	\$ -
\$ 0.16	\$ 0.14	\$ 1,117.78	\$ 215.84	\$ 978.05	\$ 188.86
\$ 0.16	\$ 0.14	\$ 13,074.18	\$ 13,074.18	\$ 11,439.90	\$ 11,439.90
\$ 0.16	\$ 0.14	\$ 155,582.08	\$ 155,582.08	\$ 136,134.32	\$ 136,134.32
Total:		\$ 416,977.25	\$ 332,285.06	\$ 364,855.09	\$ 290,749.42
		Percent Savings 20.31%		Percent Savings 20.31%	

SUMMARY OF FINDINGS Based on Costs ²			
	Energy Usage	Cost Comparison	
	% Savings	% Savings	
Actual v. Proposed Design	46.90%	48.80%	Proposed was 46.90% higher in energy use and 48.80% higher in cost
Actual v. Baseline Design	57.68%	59.20%	Baseline was 57.68% higher in energy use and 59.20% higher in cost.
Neutralizing all Unit Costs to \$0.13 (National Grid Pricing)			
	Total Cost	Consumption	
Baseline Design Case	\$ 351,812.52	2,606,107.80	
Proposed Design Case	\$ 280,355.93	2,076,781.60	
Actual Case	\$ 148,872.91	1,102,800.00	
	% Difference		
Actual v. Proposed Design	46.90%		
Actual v. Baseline Design	57.68%		
NOTES:			
The electrical energy use includes process energy ⁴			
Only End-Uses ³ utilizing Electrical Energy have been included in this portion of analysis			
FOOTNOTES:			
1			
Costs based on the EIA-DOE Spreadsheet for Average Price Per State 2009, in this case the cost for residential Full Service Providers has been used.			
2			
Costs are based on the LEED-NC 2.2 Submittal Template Document provided by Canon Design.			
3			
End uses are the intended component for which the energy is expended. Example 1: End-Use: Interior Lighting, Energy Use: Electrical. Example 2: End-Use: Space Heating, Energy Use: Natural Gas.			
4			
Process Energy is considered to include but is not limited to: office and general miscellaneous equipment, computers, elevators, escalators, kitchen cooking and refrigeration, laundry washing and drying, lighting exempt from the lighting power allowance (e.g. lighting integral to medical equipment) and other (e.g. waterfall pumps)			

Appendix A-E3 Electrical Consumption and Cost Data (WPI-East Hall)

Electrical Data (WPI EAST HALL)				
Provided by Alfred DiMauro				
Consumption and Costs-2008 to 2009				
DATE	COST/PERIOD	kWh	National Grid	July 08-June 09
7/16-8/21/08	\$ 17,565.49	101,600	Total \$	Total KWH
8/21-9/17/09	\$ 15,601.23	98,400	\$148,872.91	1,102,800
9/17-10/16/08	\$ 17,644.12	98,800		
10/16-11/17/08	\$ 15,816.66	99,000	\$0.13 Cost/kWh	
11/17-12/15/08	\$ 12,226.23	86,800		
12/15/08 -01/20/09	\$ 13,780.97	96,000		
1/20/09- 2/18/09	\$ 9,438.83	95,400		
2/18/2009- 3/19/09	\$ 10,615.13	88,800		
3/19/09 - 4/20/09	\$ 11,213.23	95,600		
4/20/09 - 5/18/09	\$ 9,279.10	84,600		
5/18/09 - 6/17/09	\$ 7,351.43	73,400		
6/17/09 - 7/21/09	\$ 8,340.49	84,400		
TOTAL	\$ 148,872.91	1,102,800		

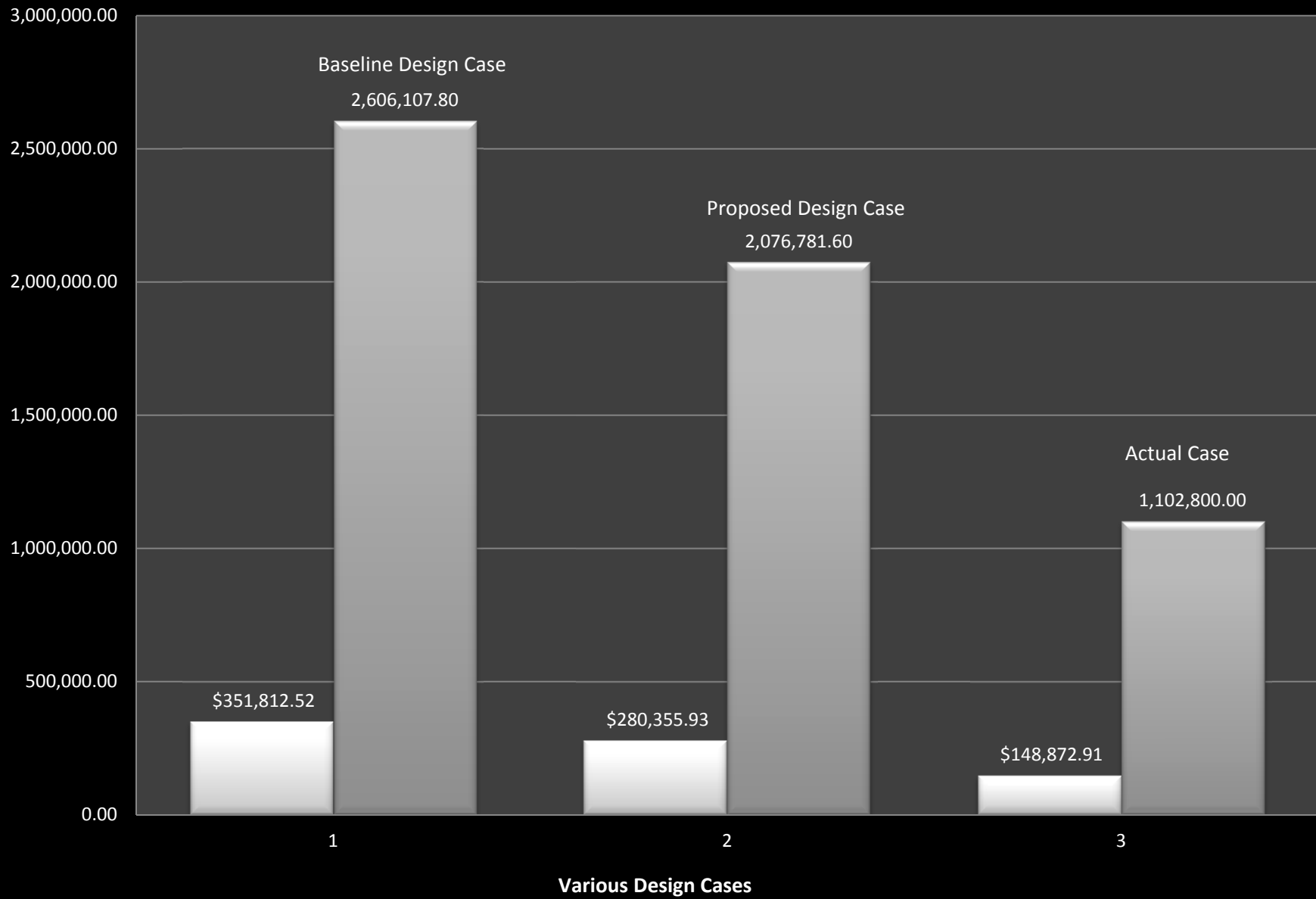
Appendix A-E4 Electrical Average Price Data (By State)

State Historical Tables for 2007
Released: January 29, 2009
Next Update: October 2009

Average Price by State by Provider, 1990-2007									
Year	State	Industry Sector Category	Residential Price (Cents per kilowatthour)	Commercial Price (Cents per kilowatthour)	Industrial Price (Cents per kilowatthour)	Other Price (Cents per kilowatthour)	Transportation Price (Cents per kilowatthour)	Total Price (Cents per kilowatthour)	Comments
2007	MA	Total Electric Industry	16.23	15.2	13.03	NA	9.24	15.16	
2007	MA	Full-Service Providers	16.11	15.71	11.61	NA	9.9	15.43	This Unit Cost has been used for the purposes of this analysis.
2007	US-TOTAL	Full-Service Providers	10.59	9.29	6.17	NA	8.82	8.98	
2007	MA	Unregulated Service Providers	17.44	14.86	14.07	NA	9.14	14.79	
2007	US-TOTAL	Unregulated Service Providers	15.8	12.35	8.37	NA	10.11	11.03	
2007	MA	Energy-Only Providers	10.67	10.32	10.65	NA	8.48	10.4	
2007	US-TOTAL	Energy-Only Providers	9.8	8.71	6.87	NA	8.28	8.09	
2007	MA	Delivery-Only Service	6.77	4.54	3.43	NA	0.66	4.4	
2007	US-TOTAL	Delivery-Only Service	6	3.63	1.5	NA	1.84	2.95	

Appendix A-E5 Graph: Neutralized Cost Comparison of Various Design Cases

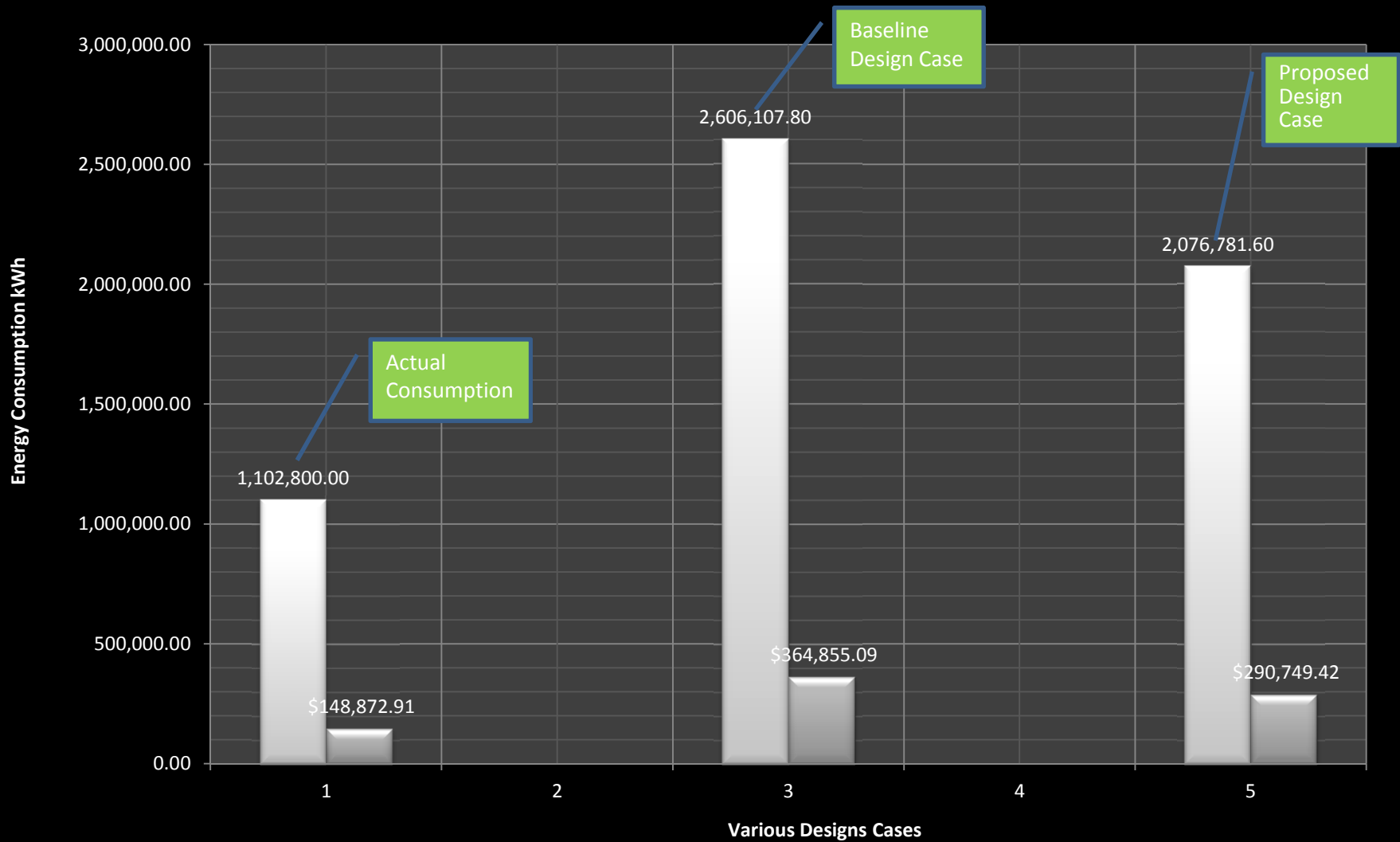
Neutralized Cost Comparison of Various Design Cases



Appendix A-E6 Graph: Energy Consumption and Costs

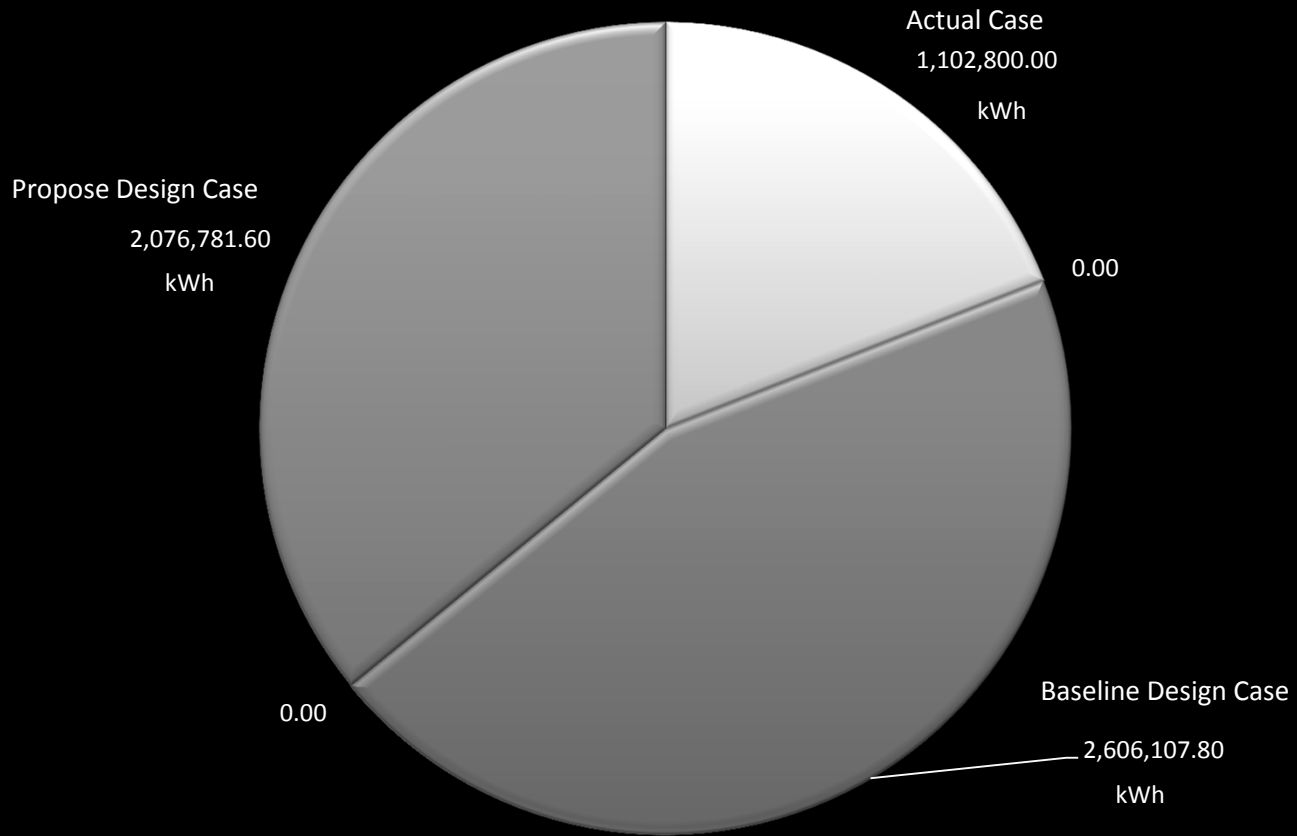
* Baseline and Proposed Design Case= \$ 0.14 /kWh
Actual Case (National Grid)= \$0.13/kWh

Energy Consumption and Costs*



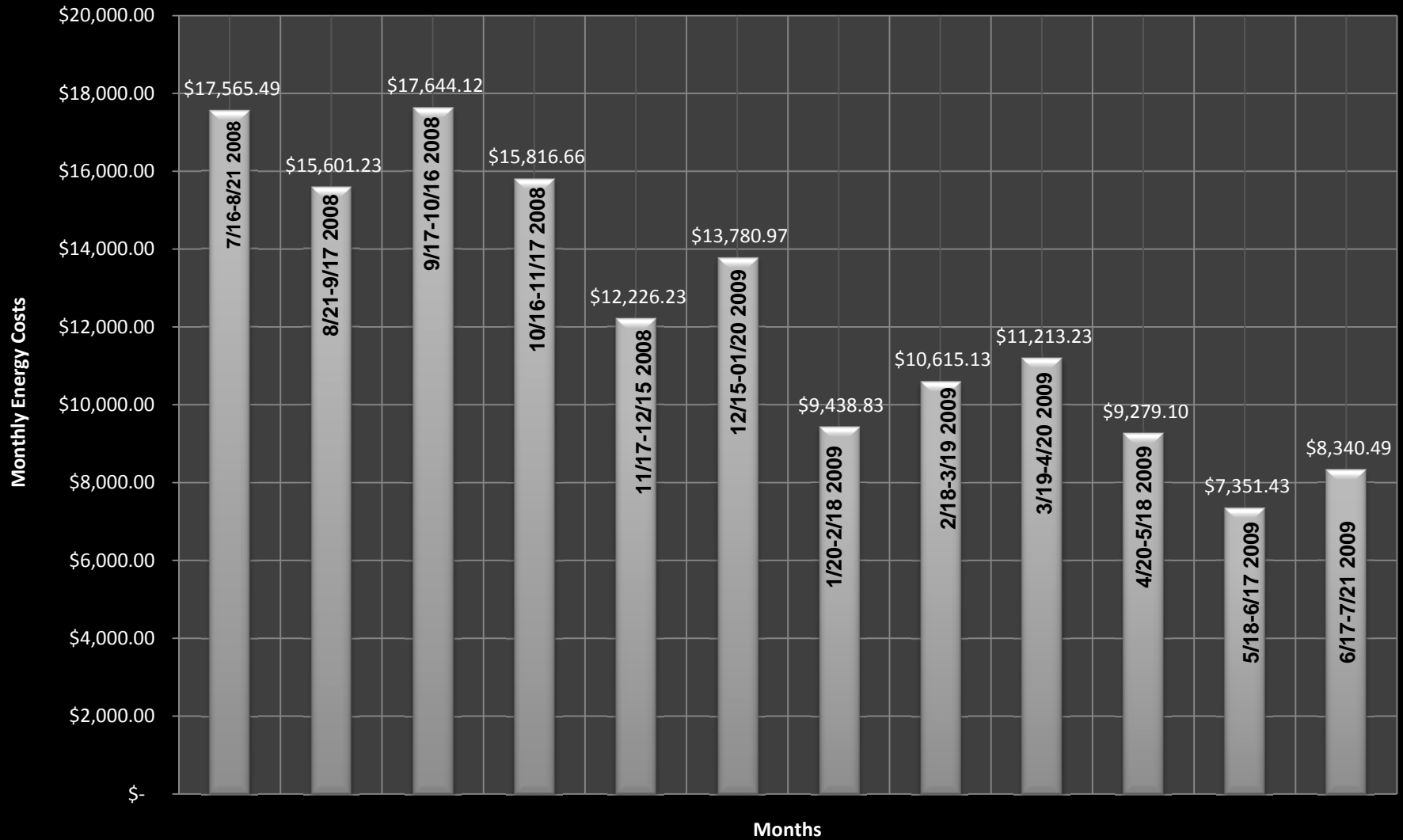
Appendix A-E7 Pie Chart: Energy Use of Various Design Cases

Energy Use of Various Design Cases



Appendix A-E8 Graph: WPI East Hall-Energy Costs per Month

WPI East Hall-Energy Costs per Month



Water Consumption Costs

Appendix A-W1 Baseline Design Case and Proposed Design Case

Water Comparison		
East Hall Water Use-Baseline Design Case (From LEED Template)		
TOTAL # OF RESIDENTS:	232	See Note 4
ASSUMED FEMALE	116	See Note 3
ASSUMED MALE	116	See Note 3
Flush Fixture	Total gallons/yr	
Annual Baseline Flush Fixture Water Usage	576,328.00	
Annual Baseline Flow fixture water usage	1,822,222.00	
	2,398,550.00	
	Total Usage	
	gallons/yr	
East Hall Water Use-Proposed Design Case (From LEED Template)		
TOTAL # OF RESIDENTS:	232	See Note 4
ASSUMED FEMALE	116	See Note 3
ASSUMED MALE	116	See Note 3
Flush Fixture	Total gallons/yr	
Annual Design Flush Fixture Water Usage	456,170.00	
Annual Design Case Flow Fixture Water Usage	1,201,584.00	
	1,657,754.00	
	Total Usage	
	gallons/yr	

NOTES:		
1. No water reclamation or Grey water was used, based on LEED-NC 2.2 Submittal Template for WE credit 3: water use reduction.		
2. Based on the LEED project checklist WE credit 3.1 and 3.2 were applied for therefore a 30% reduction is assumed in these calculations.		
3. The actual female/male split is 65/165 based on correspondence with Naomi Carton (Director of Residential Services); however the Default Female/Male Occupancy Breakdown was used per the LEED documentation.		
4. East Hall Occupant Information was retrieved from the Residential Services Department at WPI.		
5. Flowrate information retrieved from LEED-NC Water Efficiency section from: " <u>LEED-NC Version 2.2 Reference Guide</u> " and " <u>The Energy Policy Act (EPA) of 1992</u> ".		

Water Use Comparison: Baseline Case Versus Design Case

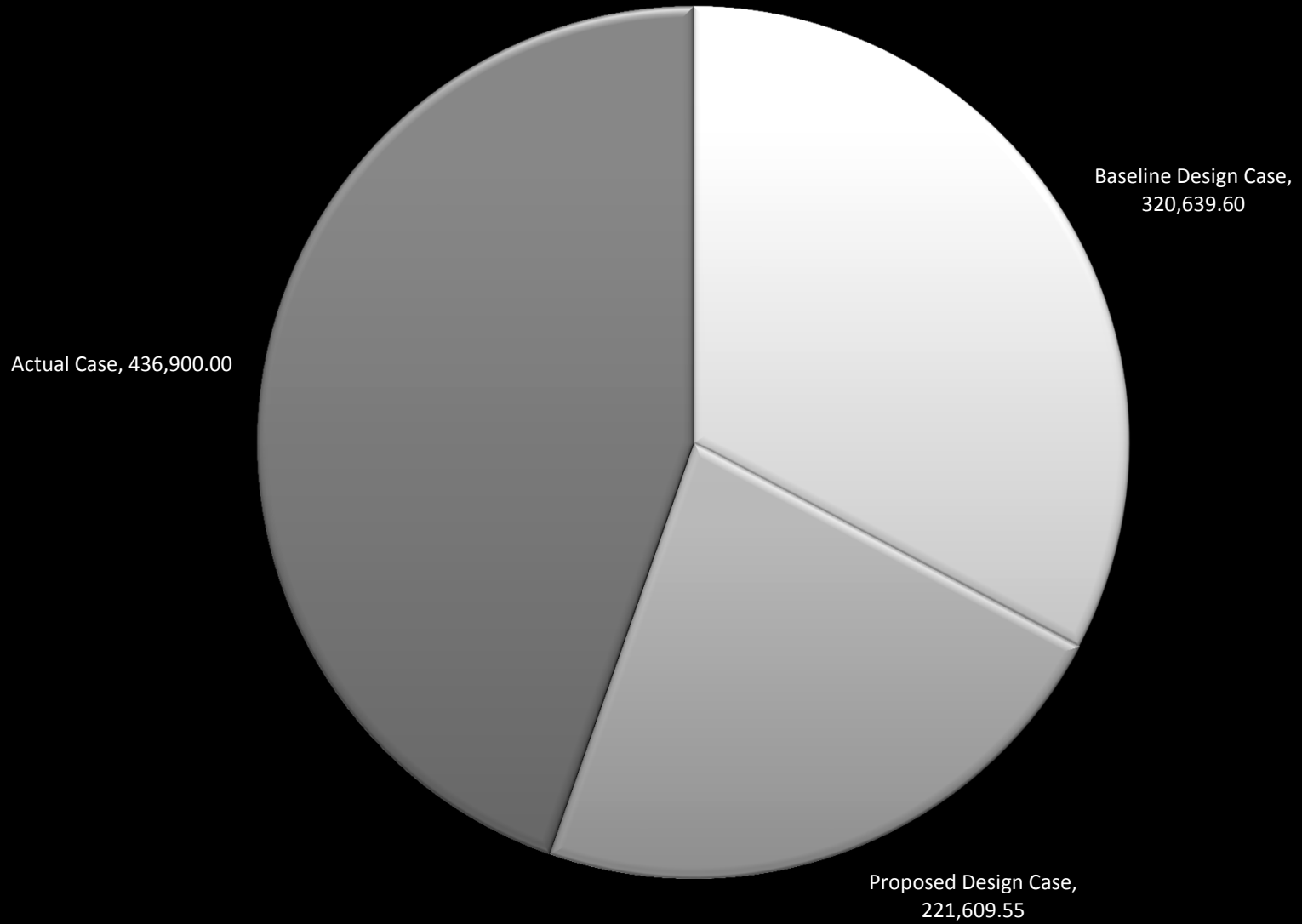
			Gallons	Cubic Feet	Cost ¹ of Water Purchase	Cost ¹ of Water Discharge to City System	Total Cost/Year
Baseline Case-Annual Water Consumption (gal)			2,398,550	320,640	\$ 9,587.12	\$ 13,691.31	\$ 23,278.44
Design Case- Annual Water Consumption (gal)			1,657,754	221,610	\$ 6,626.13	\$ 9,462.73	\$ 16,088.85
Total Greywater/ Water Reclamation (gal)			0				
Total Water Savings			30.89%				
			Based on the LEED-NC 2.2 Submittal Template WE credit 3: Water Use reduction				
FOOTNOTES:							
1							
Based on information from City of Worcester Department of Public works cost of water is \$0.0299/CF And Discharge is \$0.0427/CF.							
Worcester water billing office 1-508-799-1440							

Appendix A-W2 Actual Case versus Baseline Design Case and Proposed Design Case

Water Comparison				
Actual Case versus Baseline Design Case and Proposed Design Case				
Design	Consumption	U/P Cost¹	U/P Cost²	Total Cost^{1&2}
	CF	per CF	per CF	
Baseline Design Case	320,639.60	\$0.07	\$0.07	\$ 22,676.02
Proposed Design Case	221,609.55	\$0.07	\$0.07	\$ 15,672.49
Actual Case	436,900.00	\$0.07	\$0.07	\$ 30,898.09
SUMMARY OF FINDINGS				
	Water Usage	Comments	Cost Comparison	Comments
	% Difference		% Difference	
Actual v. Proposed Design Case	-97.15%	Design case was 97.15% lower than Actual case	-97.15%	Design case was 97.15% lower than Actual case
Actual v. Baseline Design Case	-36.26%	Baseline Case was 36.26% lower than the Actual case	-36.26%	Baseline Case was 36.26% lower than the Actual case
FOOTNOTES:				
1				
This unit price cost is based on WPI billing information				
2				
This unit price cost is based on information from City of Worcester Department of Public works cost of water is \$0.0299/CF And Discharge is \$0.0427/CF.				

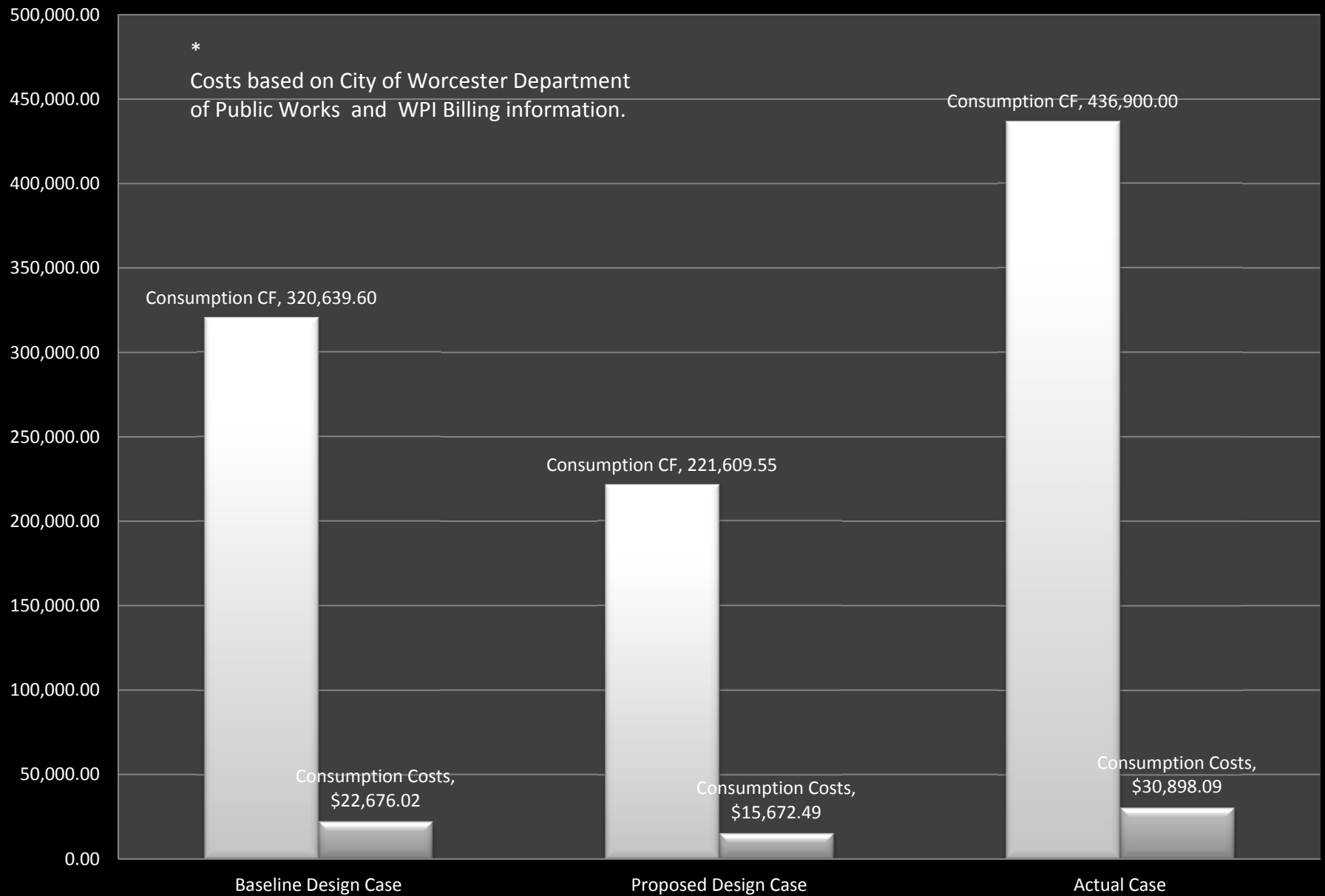
Appendix A-W3 Pie Chart: Consumption Comparison of Various Design Cases

Water Consumption (CF) Comparison of Various Design Cases



Appendix A-W4 Graph: Consumption and Costs of Various Design Cases

Consumption and Costs* of Various Design Cases



Appendix A-W5 Water Consumption and Cost Data (WPI-East Hall)

Water Data (WPI EAST HALL)				
Provided by Alfred DiMauro				
Consumption and Costs-2008 to 2009				
City of Worcester - Water & Sewer (24 Boynton Street)			City of Worcester Water & Sewer	July 08-June 09
DATE	\$	Usage/100 Cubic Feet	Total \$	Total Usage-CF
7/10/2008-8/-8/8/2008	\$ 241.74	34	\$30,898.09	436,900
8/08/2008-9/11/2008	\$ 2,858.22	402		
9/11/20090-10/10/2008	\$ 4,095.36	576		
10/10/2008-11/20/2008	\$ 4,877.46	686		\$0.07 /CF
11/20/2008-12/31/2009	\$ 3,732.75	525		
12/31/2009-1/27/2009	\$ 1,891.26	266		
1/27/2009-2/20/2009	\$ 3,242.16	456		
2/20/2009-3/19/2009	\$ 2,765.79	389		
3/19/2009-4/16/2009	\$ 3,796.74	534		
4/16/2009-5/14/2009	\$ 2,886.66	406		
5/14/2009-6/22/2009	\$ 319.95	45		
6/22/2009-7/14/2009	\$ 190.00	50		
TOTAL	\$ 30,898.09	4,369	PER 100 CF	

Appendix A-W6 Water Efficiency Credit 3: Water Use Reduction

**LEED-NC 2.2 Submittal Template
WE Credit 3: Water Use Reduction**



LEED-NC 2.2 Submittal Template
WE Credit 3: Water Use Reduction



(Responsible Individual)

(Company Name)

I, John O'Neill, from Cannon Design

verify that the information provided below is accurate, to the best of my knowledge.

GENERAL INFORMATION

Please enter the following general project information:

Use Default Male / Female Occupancy Breakdown (50% / 50%).
ENTER THE TOTAL OCCUPANCY FOR EACH OCCUPANCY TYPE IN TABLE 1.01 BELOW

Special Male/Female Occupancy Breakdown
ENTER THE MALE AND FEMALE OCCUPANCY FOR EACH OCCUPANCY TYPE IN TABLE 1.02 BELOW. PROVIDE A NARRATIVE DESCRIPTION AT THE END OF THIS FORM TO EXPLAIN THE UNIQUE MALE/FEMALE OCCUPANCY BREAKDOWN.

Table 1.01 - Occupancy Breakdown (Default Male / Female Occupancy)
Enter the values as whole numbers without any commas

	Full Time Equivalent (FTE):	Student/Visitor:	Retail Customer:	Residential:	Other:
Total	8			232	
Male	4			116	
Female	4			116	

Table 1.02 - Occupancy Breakdown (Special Male / Female Occupancy Breakdown)
Enter the values as whole numbers without any commas

	Full Time Equivalent (FTE):	Student/Visitor:	Retail Customer:	Residential:	Other:
Total					
Male					
Female					

Percent of male restrooms with urinals: 100 %

Annual Days of Operation (1-365): 305

**LEED-NC 2.2 Submittal Template
WE Credit 3: Water Use Reduction**



LEED-NC 2.2 Submittal Template
WE Credit 3: Water Use Reduction



WATER SAVINGS CALCULATION

1 - Baseline Case

Tables 1.1 and 1.2 reflect the default baseline flush and flow fixtures for the project.

To edit the baseline, deselect the "Included in Project?" checkbox for any baseline fixtures that don't apply to your project. The default flush and flow rates, and daily uses per person match those in the reference guide, and should not be altered unless justification for these changes is provided in the narrative at the end of this form. Provide daily use per person input for "other" occupants (if applicable), and justify these values in the required narrative

Table 1.1 - Flush Fixture Data - Baseline Case

Fixture Reference	Baseline Fixture Type	Gender	Flush Rate (GPF)	Daily Uses Per Person				Included in Project?
				FTE	Student / Visitor	Retail Customer	Residential	
1	Conventional Water Closet	Female	1.6	3.0			5.0	<input checked="" type="checkbox"/>
2	Conventional Water Closet	Male	1.6	1.0			5.0	<input checked="" type="checkbox"/>
3	Conventional Urinal	Male	1.0	2.0				<input checked="" type="checkbox"/>

Annual Baseline Flush Fixture Water Usage: 576,328 gallons/year

LEED-NC 2.2 Submittal Template
WE Credit 3: Water Use Reduction



LEED-NC 2.2 Submittal Template
WE Credit 3: Water Use Reduction



Fixture Reference	Baseline Fixture Type	Flow Rate (GPM)	Duration (seconds)	Daily Uses Per Person				Included in Project?
				FTE	Student / Visitor	Retail Customer	Residential	
A	Conventional Lavatory	2.5	15	3.0			5.0	<input checked="" type="checkbox"/>
B	Conventional Shower	2.5	300	0.1			1.0	<input checked="" type="checkbox"/>
C	Kitchen Sink	2.5	60	0.2			4.0	<input checked="" type="checkbox"/>
D	Janitor Sink	2.5	15	0.1				<input checked="" type="checkbox"/>
E								<input type="checkbox"/>

TOTAL ANNUAL BASELINE WATER USAGE:	2,398,550	gallons/year
Annual Baseline Flow Fixture Water Usage:	1,822,222	gallons/year

LEED-NC 2.2 Submittal Template
WE Credit 3: Water Use Reduction



LEED-NC 2.2 Submittal Template
WE Credit 3: Water Use Reduction



2 - Design Case

Document the Design Case flush and flow fixtures in Tables 2.1 and 2.2 respectively. The daily uses per person, and duration of use for each fixture type should equal those listed for the comparable fixture type in the Baseline case. If the design case fixture type is not listed in the dropdownlist, simply type in the appropriate fixture type.

Provide the fixture manufacturer and model number, and the flush or flow rate for each fixture type.

Multiple corresponding fixture types: If the project has multiple design case fixtures that correspond to a single Baseline comparison system fixture type, enter the "Percent of Occupants" field to reflect the percentage of each fixture (e.g. for a project with 25% non-water urinals and 75% low-flow urinals corresponding to Fixture Reference # 3 - "Conventional Urinals" in the Baseline design, enter the "Percent of Occupants" as 25% for non-water urinals. Then, in a blank line, select Fixture Reference #3, and enter the "Percent of Occupants" as 75% for low-flow urinals).

Dual-Flush Water Closets: If the project has dual-flush water closets, utilize the "Percent of Occupants" field to enter 33% for "Dual-Flush Water Closets, Full-Flush" (for solid waste use). Then, in a blank line, select Fixture Reference #1, and enter the "Percent of Occupants" as 67% for "Dual-Flush Water Closets, Low-Flush" (for liquid waste). Note: This clarification is not applicable for males when urinals are used.

Automatic Controls: If the flow fixtures include automatic faucet controls, you may adjust the Duration in Table 2.2 to reflect the impact of the automated controls. Justification for these input values, along with the identification of the faucet control manufacturer and model number must be provided in the required narrative.

Table 2.1 - Flush Fixture Data - Design Case

Fixture Reference	Design Case Fixture Type	Gender	Fixture Manufacturer	Fixture Model	Flush Rate (GPF)	Percent of Occupants	Daily Uses Per Person			
							FTE	Student / Visitor	Retail Customer	Residential
1	Dual-Flush Water Closet, Full-Flus	Female	Sloan	WES-115	1.6	33 %	3.0			5.0
1	Dual-Flush Water Closet, Low-Flu	Female	Sloan	WES-115	1.1	67 %	3.0			5.0
2	Dual-Flush Water Closet, Full-Flus	Male	Sloan	WES-115	1.6	33 %	1.0			5.0
2	Dual-Flush Water Closet, Low-Flu	Male	Sloan	WES-115	1.1	67 %	1.0			5.0
3	Conventional Urinal	Male	Sloan	Optima 186-1.0 ES	1.0	100 %	2.0			
						%				

Annual Design Case Flush Fixture Water Usage: 456,170 gallons/year

**LEED-NC 2.2 Submittal Template
WE Credit 3: Water Use Reduction**



LEED-NC 2.2 Submittal Template
WE Credit 3: Water Use Reduction



Table 2.2 - Flow Fixture Data - Design Case

Fixture Reference	Design Case Fixture Type	Fixture Manufacturer	Fixture Model	Flow Rate (GPF)	Percent of Occupants	Duration (seconds)	Daily Uses Per Person			
							FTE	Student / Visitor	Retail Customer	Residential
A	Ultra Low-Flow Lavatory	Sloan	Optima EAF-275-ISM	0.5	100 %	15	3.0			5.0
B	Low-Flow Shower	Symmons	4-141-1.5	1.5	100 %	300	0.1			1.0
C	Low-Flow Kitchen Sink	Symmons	Symmetrix S-23-2	2.2	100 %	60	0.2			4.0
D	Janitor Sink	Chicago	911-IS	2.5	100 %	15	0.1			
					%					
					%					
					%					
					%					

Annual Design Case Flow Fixture Water Usage: 1,201,584 gallons/year

Annual Design Case Flush and Flow Fixture Water Usage: 1,657,754 gallons/year

Non-Potable Source Water

Enter the annual amount of on-site collected / treated water used for flush or flow fixtures. (Click "CLEAR" to clear a row of data. Enter the Annual Quantity as a whole number without commas.)

Water Source	Annual Quantity (gal)	
Grey Water Re-Use	0	<input type="button" value="CLEAR"/>
Rainwater Re-Use	0	<input type="button" value="CLEAR"/>
		<input type="button" value="CLEAR"/>
		<input type="button" value="CLEAR"/>
Total on-site nonpotable water:	0	

LEED-NC 2.2 Submittal Template
WE Credit 3: Water Use Reduction



LEED-NC 2.2 Submittal Template
WE Credit 3: Water Use Reduction



WATER USE SUMMARY

Baseline Case - Annual Water Consumption (gal):	2,398,550	gallons/year
Design Case - Annual Water Consumption (gal):	1,657,754	gallons/year
Total Annual Non-Potable Water Consumption (gal):	0	gallons/year
Total Water Savings:	30.9	%

For credit compliance, a water savings of at least 20% earns 1 LEED point, and a water savings of at least 30% earns 2 LEED points.

NARRATIVE (Required)

Please provide any additional comments or notes regarding special circumstances or considerations regarding the project's credit approach. Describe the water savings features of this project, and include specific data regarding any water saving fixtures and/or reclaimed water usage (greywater re-use / rainwater reuse).

We used a 12 second duration, as opposed to a 15 second duration, for the lavatories since they are sensor faucets. The Sensor faucet is Sloan Optima EAF-275-ISM, and the 12 second estimate was taken from the MCAA (Mechanical Contractors Association of America) - 12 seconds is the number for sensor faucets that they use in their guideline for this calculation.

NARRATIVE (Optional)

Please provide any additional comments or notes regarding special circumstances or considerations regarding the project's credit approach.

None

The project is seeking point(s) for this credit using an alternate compliance approach. The compliance approach, including references to any applicable Credit Interpretation Rulings is fully documented in the narrative above. (Indicate the number of points documented in the Alternate Compliance Points Documented field below).

Alternative Compliance Points Documented

LEED-NC 2.2 Submittal Template
WE Credit 3: Water Use Reduction



LEED-NC 2.2 Submittal Template
WE Credit 3: Water Use Reduction



Project Name: New Residence Hall, WPI

Credit: WE Credit 3: Water Use Reduction

Points Documented: 2

READY TO SAVE THIS TEMPLATE TO LEED-ONLINE?

Please enter your first name, last name and today's date below, followed by your LEED-Online Username and Password associated with the Project listed above to confirm submission of this template.

John	O'Neill	2008-06-10	joneill@cannondesign.com	
First Name	Last Name	Date	Username (Email Address)	Password

SAVE TEMPLATE TO LEED-ONLINE

PRINT TEMPLATE

Letter Template Version A1



LEED-NC 2.2 Submittal Template | Last Modified: April, 2006

Contact: O'Neill, John [joneill@CANNONDESIGN.COM]

Appendix A-W7 Water Costs over a 5 Year Period

WORCESTER WATER COSTS OVER 5 YEAR PERIOD				
Department:	City of Worcester Water Billing Department			
Contact:	Mrs. Fanya Pliszka			
Telephone Number:	1-508-799-1440			
YEAR	WATER	% CHANGE	SEWER	% CHANGE
	PER 100 CF	From Previous Year	PER 100 CF	From Previous Year
2004	\$ 2.38		\$ 2.61	
2005	\$ 2.38	0.00%	\$ 3.11	19.16%
2006	\$ 2.61	9.66%	\$ 3.52	13.18%
2007	\$ 2.74	4.98%	\$ 3.97	12.78%
2008	\$ 2.84	3.65%	\$ 4.27	7.56%
2009	\$ 2.99	5.28%	\$ 4.61	7.96%
	\$ 2.66	4.72%	\$ 3.68	12.13%
	Average cost over a 5 year period	Average % change over a 5 yr Period	Average cost over a 5 year period	Average % change over a 5 yr Period
NOTES:				
COST OF WATER IS DICTATED BY THE WATER FILTRATION PLANTS AND THE DISCHARGE RATE IS BY THE WASTEWATER TREATMENT PLANTS				

Appendix A-W8 Articles from WDPW on Water Cost Increases

CITY OF WORCESTER, MASSACHUSETTS



ROBERT L. MOYLAN, JR. P.E.
Commissioner

Telephone
(508) 799-1437
EMERGENCY (508) 799-1488

DEPARTMENT OF PUBLIC WORKS
Water Operations
18 East Worcester Street
Worcester, MA 01604-3699

FACSIMILE TRANSMISSION COVER SHEET

FAX (508) 799-1522

PLEASE DELIVER THE FOLLOWING PAGES TO:

NAME: Niki Alborz

LOCATION: _____

FAX #: 617 482-8487

FROM: _____

LOCATION: _____

TOTAL NUMBER OF PAGES _____ INCLUDING COVER LETTER

DATE: 8-10-09

TIME: 2:45 pm

IF YOU DO NOT RECEIVE ALL THE PAGES, PLEASE CALL BACK AS SOON AS POSSIBLE.

PLEASE PHONE: (508) 799-1440

TELECOPIER OPERATOR: _____

COMMENTS: _____

Superintendent says schools face 'terrible budget'

FITCHBURG — School Superintendent André R. Ravenelle said the \$46 million spending plan he presented for a vote last night was "a terrible budget" that nonetheless maintained a comprehensive program for city students.

The School Committee was expected to approve the budget last night, and gave credit to administrators for working within tight financial constraints.

"With that terrible budget we're still offering sports to our students," Mr. Ravenelle said, adding that art and music were also intact.

"We've really kept our eye on that ball of a comprehensive program," the superintendent said.

The budget, which Mr. Ravenelle said does not rely on projected revenues such as school choice tuitions or federal stimulus money, calls for the elimination of about 20 full-time positions. The cuts were less than forecast two months ago.

The committee also took time last night to salute students from the Fitchburg Arts Academy whose work was recognized in the Boston Globe Scholastic Art Competition this year. All 10 student entries won prizes or honorable mentions.

Also recognized last night were students from the alternative education program, who have been doing building and grounds work at the other public schools as part of a community service project. School officials saluted their work ethic and quality.

— Matthew Bruun

Lancaster

some additional Clark said.

"We will increase and revenue stream some of those said. The part that's left, or between the school and the school at a reflective of within the budget about the bud

Superintendent 'curriculum'

LEICESTER Schools Paul School Com curriculum road map ton through

The road m viding Leice based instruc of increasing

"At the end expect our s learning need tion without acquire the employed."

Mr. Soojia areas: curric language ar ence, physio technology, the progres

Water, sewer rate hike to cost about \$32/year

Homeowners on average pay \$800 annually

By Nick Kotsopoulos
TELEGRAM & GAZETTE STAFF

WORCESTER

WORCESTER — The City Council Public Works Committee last night endorsed the city administration's recommendation to increase the city's water and sewer rates by 49 cents, which will add \$32.49 to the average annual combined water and sewer bill for homeowners.

The water rate will increase 15 cents, to \$2.99 per 750 gallons of water used. The sewer fee, meanwhile, will go up 34 cents, to \$4.61.

Robert L. Moylan, commissioner of public works and parks, said the rate increase will bring the average annual combined water and sewer bills for homeowners to about \$800. Despite the increase, he said, the city's water and sewer costs are below the national average and far below the rates of the Massachusetts Water Re

sources Authority.

He said the rate hikes were necessitated by a significant decrease in water usage and the cost of unfunded regulatory mandates imposed upon the city's water and sewer utilities. Since the 1980s, the city's water usage has dropped by about 20 percent, from a high of 28 million gallons of water per day to 23 million gallons.

District 3 Councilor Paul P. Clancy Jr., committee chairman, and Councilor-at-Large Michael J. Germain voted in favor of the rate increases, saying they are needed to maintain the high quality of the systems. District 2 Councilor Philip P. Palmieri, meanwhile, voted in opposition, arguing that the state and federal governments have not done enough to assist the city on mandated water quality projects.

April 28, 2009
New increased w/s rates approved

APRIL 15,

2009

Water, sewer rate hikes to cost average \$50 more per year

By Aaron Nicodemus
TELEGRAM & GAZETTE STAFF

WORCESTER - Water and sewer rates in the city are set to go up July 1, costing the average single-family homeowner an extra \$50 per year.

Robert L. Moylan Jr., commissioner of public works and parks, recommended that the water rate increase by 5.3 percent, and the sewer rate increase by 8 percent for the next fiscal year. In a letter to the City Council, Mr. Moylan

wrote that two major factors led to the proposed increase: a decrease in water usage by users and "unfunded regulatory mandates imposed upon water and sewer utilities."

The new water rate would be \$2.99 per hundred cubic feet, up 15 cents, which is 5.3 percent. The new sewer rate would be \$4.61 per hundred cubic feet, up 34 cents, or 8 percent.

The water rate for users outside the city will remain the same next year at \$3.40 per hundred cubic feet, Mr. Moylan

Jan wrote.

The city's water and sewer rates have increased by nearly 50 percent in the last five years, increases largely fueled by unfunded mandates levied against the city by state and federal environmental regulators, he wrote.

The largest unfunded mandate is the \$180 million upgrade to the Upper Blackstone Water Pollution District,

which is 90 percent funded by city funds and with no state or federal assistance. "The pressure on water and sewer utilities to meet the increasingly stringent requirements imposed by regulators without funding assistance cannot be overstated," he wrote.

As rates have gone up, usage has gone down, despite a growing population and more water customers outside the city, he wrote.

Turn to Page 10/Rate Hikes/Page B2

1 1 1

Rate hikes

on Page B1

Last night, the City Council deferred the request for a rate increase to the council's committee on public works.

In his report explaining the rate increases, Mr. Moylan said the Water and Sewer Department cut five employees, which will "defer needed maintenance to vital elements of the water system yet again."

Appendix A-RW1 Actual Case (20% Reduction) v. BDC & PDC

**Water Comparison-Actual Case 20% Reduction
Actual Case versus Baseline Design Case and Proposed Design Case**

Design	Consumption	U/P Cost¹	U/P Cost²	Total Cost^{1&2}
	CF	per CF	per CF	
Baseline Design Case	320,639.60	\$0.07	\$0.07	\$ 22,676.02
Proposed Design Case	221,609.55	\$0.07	\$0.07	\$ 15,672.49
Actual Case-20% Reduction Applied ³	349,520.00	\$0.07	\$0.07	\$ 24,718.47

SUMMARY OF FINDINGS

	Water Usage	Comments	Cost Comparison	Comments
	% Difference		% Difference	
Actual v. Proposed Design Case	-57.72%	Design case was lower than Actual case	-57.72%	Design case was lower than Actual case
Actual v. Baseline Design Case	-9.01%	Baseline Case was lower than the Actual case	-9.01%	Baseline Case was lower than the Actual case

FOOTNOTES:

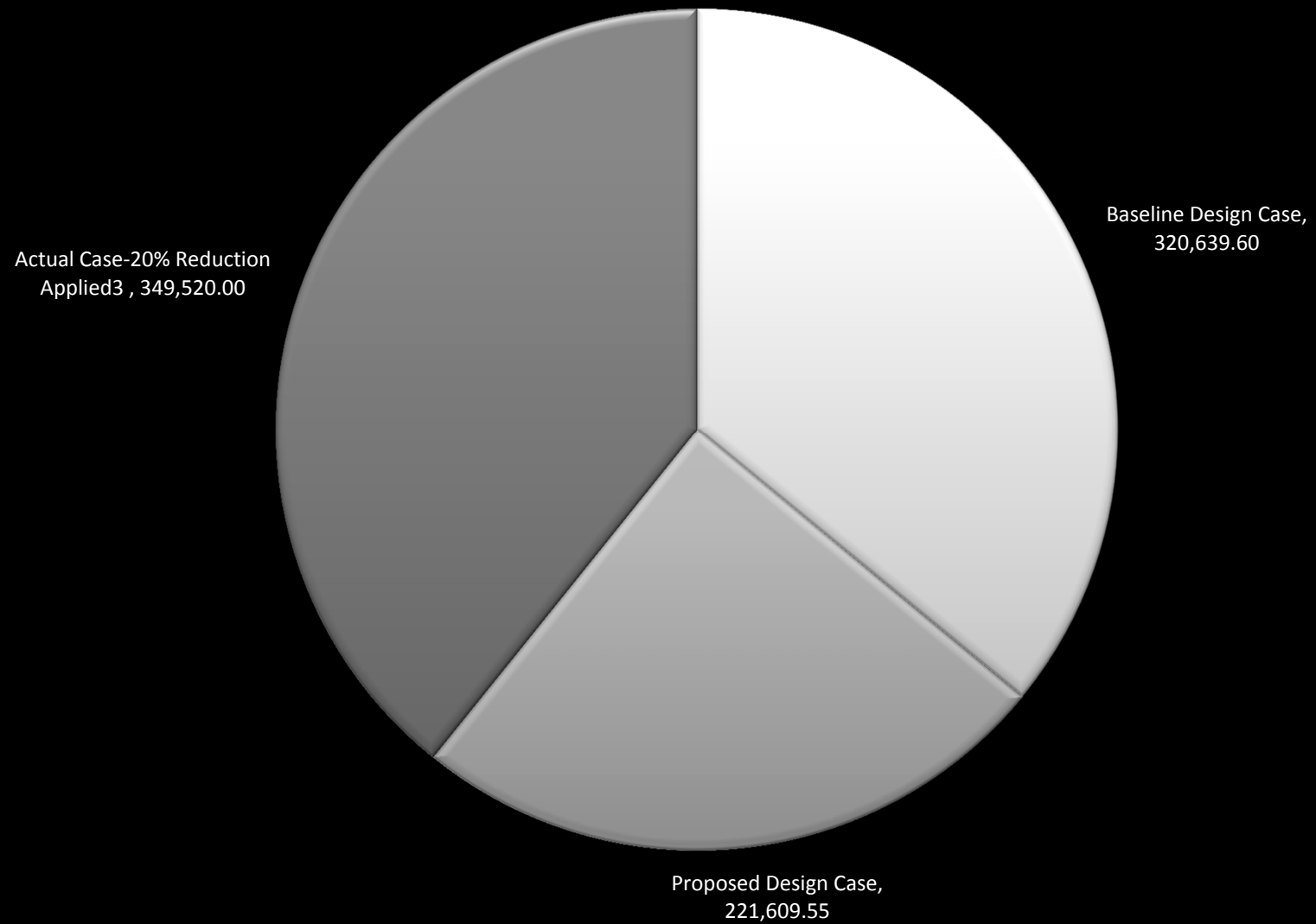
1
This unit price cost is based on WPI billing information

2
This unit price cost is based on information from City of Worcester Department of Public works cost of water is \$0.0299/CF And Discharge is \$0.0427/CF.

3
The Actual Case was reduced to account for water consumption not factored into the LEED Template numbers.

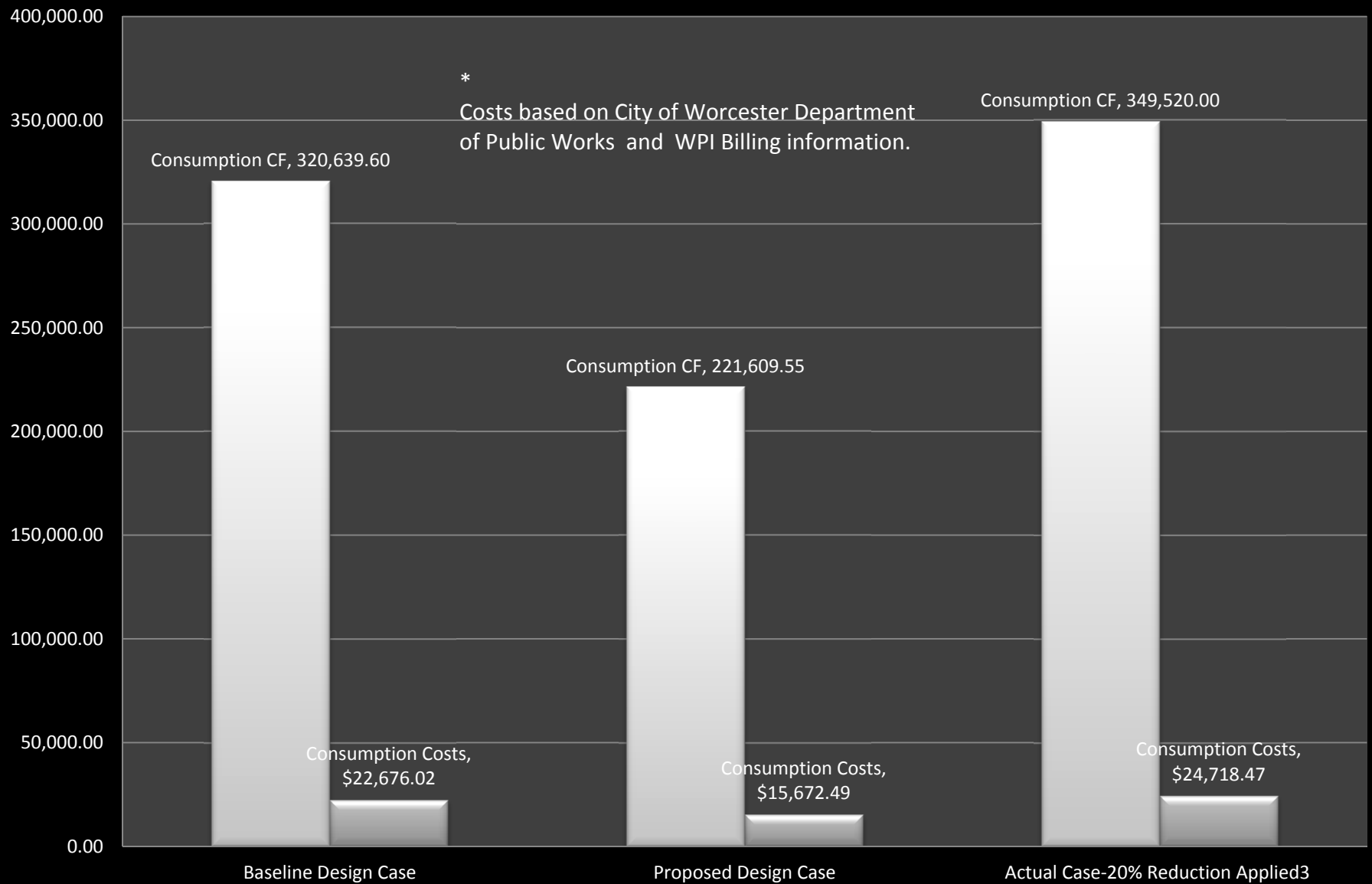
Appendix A-RW2 Pie Chart: Water Consumption 20% Reduction Comparison of Various
Design Cases

Water Consumption 20% Reduction (CF) Comparison of Various Design Cases



Appendix A-RW3 Graph: Water Consumption 20% Reduction and Costs of Various
Design Cases

Consumption (Actual Case 20% Reduction) and Costs* of Various Design Cases



Appendix A-RW4 Actual Case (25% Reduction) v. BDC & PDC

**Water Comparison-Actual Case 25% Reduction
Actual Case versus Baseline Design Case and Proposed Design Case**

Design	Consumption	U/P Cost¹	U/P Cost²	Total Cost^{1&2}
	CF	per CF	per CF	
Baseline Design Case	320,639.60	\$0.07	\$0.07	\$ 22,676.02
Proposed Design Case	221,609.55	\$0.07	\$0.07	\$ 15,672.49
Actual Case-25% Reduction Applied ³	327,675.00	\$0.07	\$0.07	\$ 23,173.57

SUMMARY OF FINDINGS

	Water Usage	Comments	Cost Comparison	Comments
	% Difference		% Difference	
Actual v. Proposed Design Case	-47.86%	Design case was lower than Actual case	-47.86%	Design case was lower than Actual case
Actual v. Baseline Design Case	-2.19%	Baseline Case was lower than the Actual case	-2.19%	Baseline Case was lower than the Actual case

FOOTNOTES:

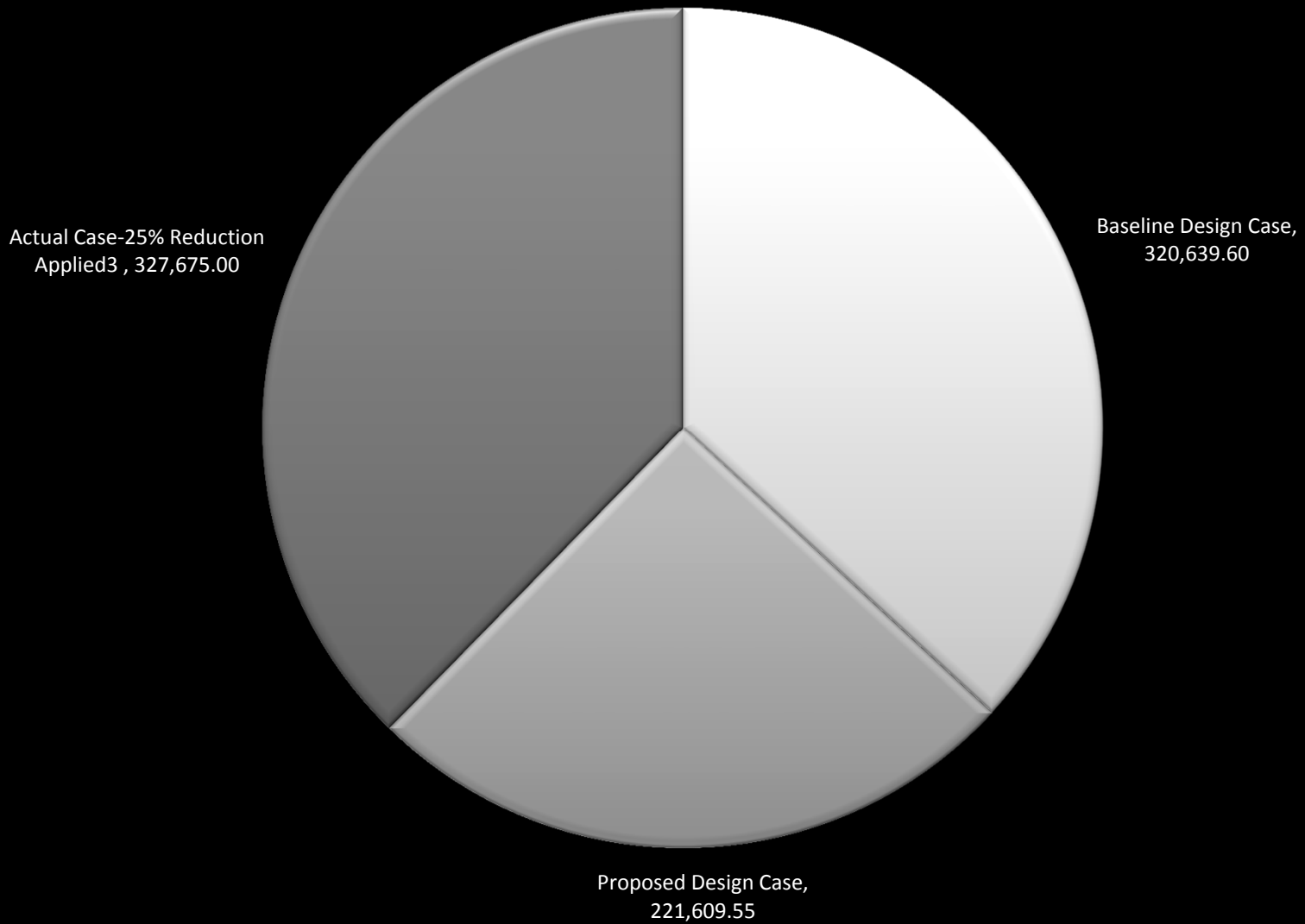
1
This unit price cost is based on WPI billing information

2
This unit price cost is based on information from City of Worcester Department of Public works cost of water is \$0.0299/CF And Discharge is \$0.0427/CF.

3
The Actual Case was reduced to account for water consumption not factored into the LEED Template numbers.

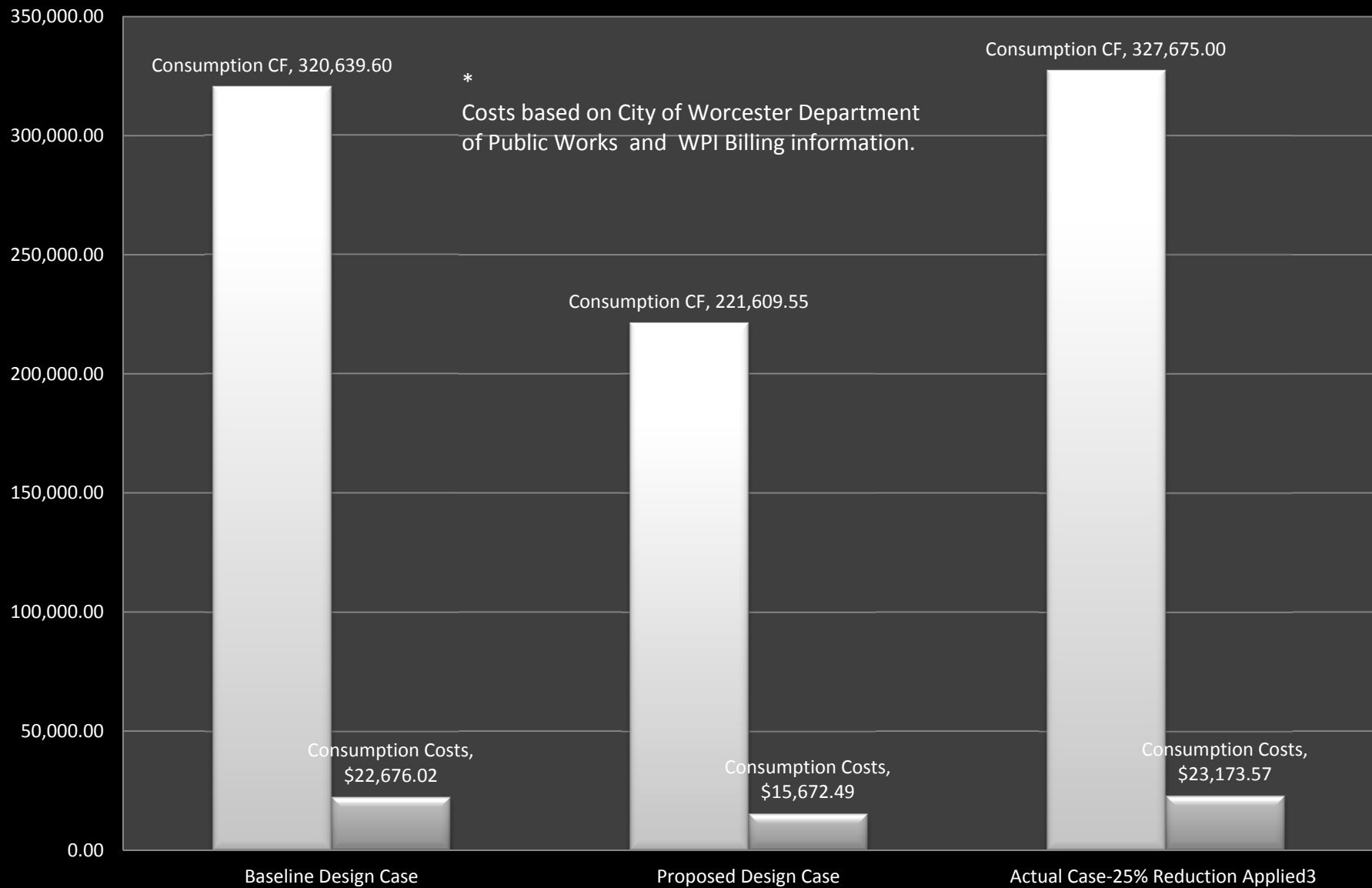
Appendix A-RW5 Pie Chart: Water Consumption 25% Reduction Comparison of Various
Design Cases

Water Consumption 25% Reduction (CF) Comparison of Various Design Cases



Appendix A-RW6 Graph: Water Consumption 25% Reduction and Costs of Various
Design Cases

Consumption (Actual Case 25% Reduction) and Costs* of Various Design Cases



Appendix A-RW7 Actual Case (30% Reduction) v. BDC & PDC

**Water Comparison-Actual Case 30% Reduction
Actual Case versus Baseline Design Case and Proposed Design Case**

Design	Consumption	U/P Cost¹	U/P Cost²	Total Cost^{1&2}
	CF	per CF	per CF	
Baseline Design Case	320,639.60	\$0.07	\$0.07	\$ 22,676.02
Proposed Design Case	221,609.55	\$0.07	\$0.07	\$ 15,672.49
Actual Case-30% Reduction Applied ³	305,830.00	\$0.07	\$0.07	\$ 21,628.66

SUMMARY OF FINDINGS

	Water Usage	Comments	Cost Comparison	Comments
	% Difference		% Difference	
Actual v. Proposed Design Case	-38.00%	Design case was lower than Actual case	-38.00%	Design case was lower than Actual case
Actual v. Baseline Design Case	4.62%	Baseline Case was lower than the Actual case	4.62%	Baseline Case was lower than the Actual case

FOOTNOTES:

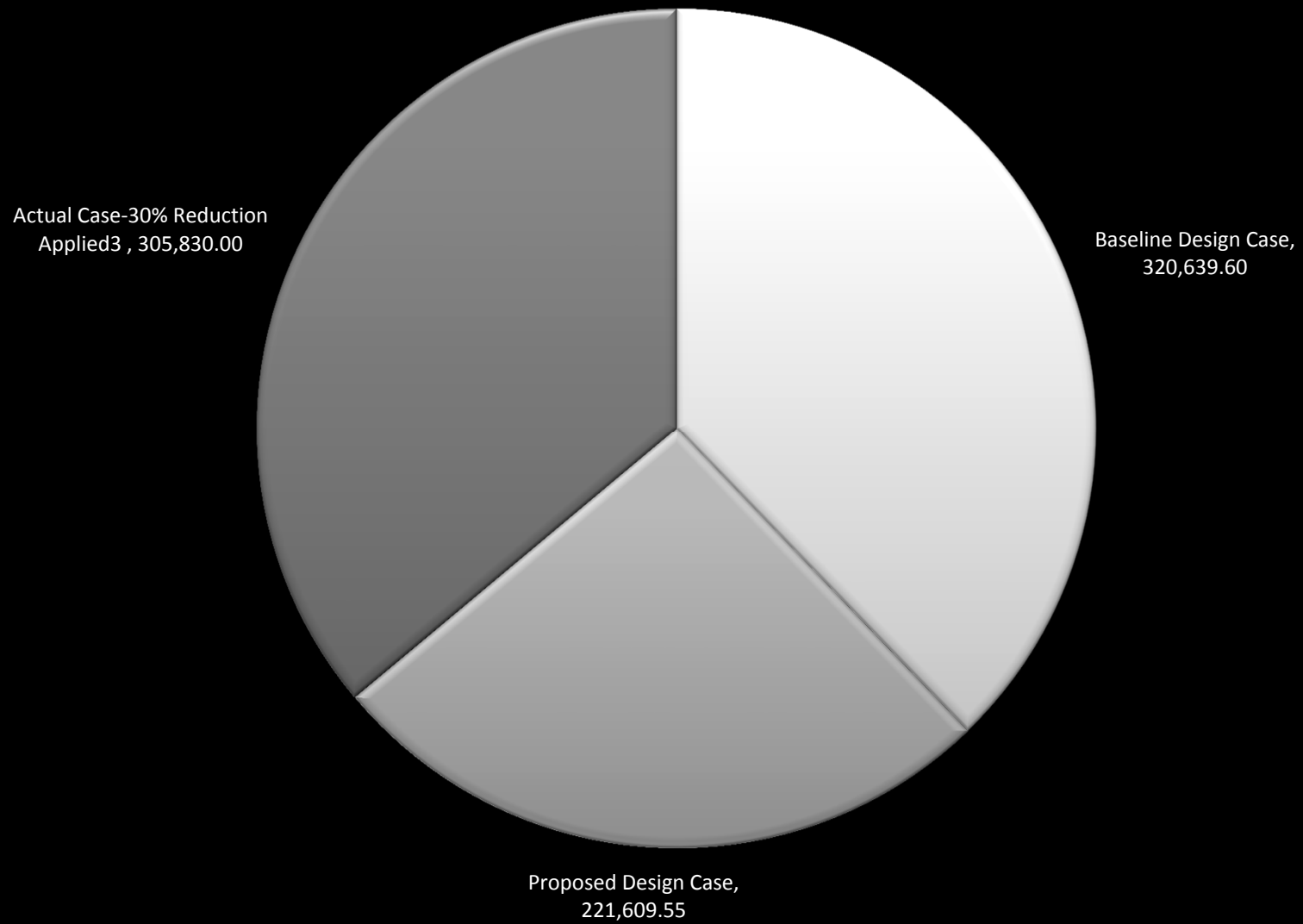
1
This unit price cost is based on WPI billing information

2
This unit price cost is based on information from City of Worcester Department of Public works cost of water is \$0.0299/CF And Discharge is \$0.0427/CF.

3
The Actual Case was reduced to account for water consumption not factored into the LEED Template numbers.

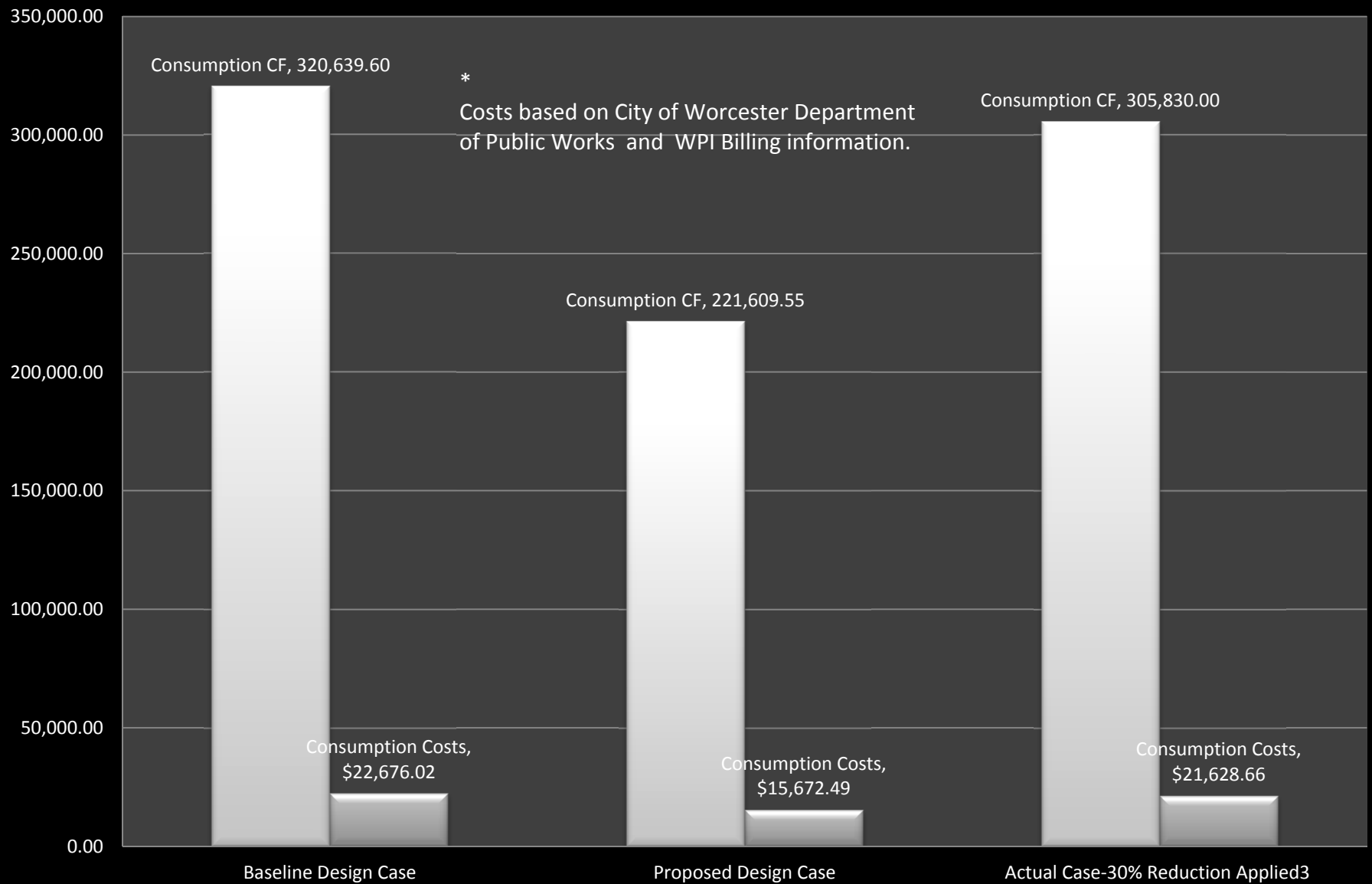
Appendix A-RW8 Pie Chart: Water Consumption 30% Reduction Comparison of Various
Design Cases

Water Consumption 30% Reduction (CF) Comparison of Various Design Cases



Appendix A-RW9 Graph: Water Consumption 30% Reduction and Costs of Various
Design Cases

Consumption (Actual Case 30% Reduction) and Costs* of Various Design Cases



Green and Non-Green Construction Costs

Appendix B-1 Construction Cost Comparison of East Hall to High-end Dormitory Facilities

Traditional Base Construction Cost versus Green Base Construction Cost

SF COSTS RS MEANS DORMITORIES MID RISE (4-8 STORY) - NATIONAL AVERAGE July 2009 Dollars

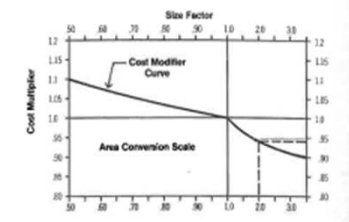
De-Escalation Adjustment of RS Means to East Hall Timeline of July 2009		0.97044						
DESCRIPTION	UNIT	UNIT COSTS			% OF TOTAL			
		1/4	MEDIAN	3/4	1/4	MEDIAN	3/4	
DORMITORIES MID RISE (4-8 STORY)	SF	\$ 129.07	\$ 168.86	\$ 208.64				
TOTAL PROJECT COSTS	CF	\$ 14.27	\$ 15.67	\$ 18.73				
ELECTRICAL	SF	\$ 13.73	\$ 15.62	\$ 20.86	8.20%	10.20%	11.95%	
TOTAL : MECHANICAL AND ELECTRICAL	SF	\$ 38.33	\$ 39.79	\$ 78.12	25.50%	34.50%	37.50%	
PER BED, TOTAL COST	BED	\$ 18,438.30	\$ 42,019.92	\$ 106,262.85				

WPI EAST HALL DORMITORY (5 STORY) 2010 WORCESTER MA			
DESCRIPTION	UNIT	COST/SF	NOTES
DORMITORY SF COST	SF	\$ 230.72	
ELECTRICAL	SF	\$ 19.20	
TOTAL : MECHANICAL AND ELECTRICAL	SF	\$ 65.29	ADDITION OF TEMP VENTILATION, MECH, ELEC AND FIRE PROTECTION
PER BED, TOTAL COST	BED	\$ 161,507.38	

COMPARISON OF WPI EAST HALL TO RS MEANS MID RISE DORMITORY (4-8 STORY) HIGH END							
DESCRIPTION	UNIT	WPI COST/SF	RS MEANS SF COST		RS MEANS LOCATION ADJUSTED	VARIANCE	% OF TOTAL
			HIGH END 3/4				
			WORCESTER, MA	NATIONAL AVG			
DORMITORY SF COST ³	SF	\$ 230.72	\$ 208.64	\$ 198.21	\$ 217.04	-6.30%	
ELECTRICAL ³	SF	\$ 19.20	\$ 20.86	\$ 19.82	\$ 21.70	11.52%	8.23%
TOTAL : MECHANICAL AND ELECTRICAL ³	SF	\$ 65.29	\$ 78.12	\$ 74.21	\$ 81.26	19.66%	27.97%
PER BED, TOTAL COST ³	BED	\$ 161,507.38	\$ 106,262.85	\$ 100,949.71	\$ 110,539.93	-46.11%	

RS MEANS SF COSTS ADJUSTED TO REFLECT WORCESTER MA AND PROJECT SIZE

COST PER SF ADJUSTED BASED ON BUILDING AREA	U/M	AREA	
PROPOSED BUILDING AREA	SF	162,404.00	
TYPICAL SIZE FROM RS MEANS TABLE ¹	SF	85,000.00	
		AREA CONVERSION SCALE FACTOR	1.910635294
		BASED ON BELOW GRAPH COST MULTIPLIER - size adjustment	0.95
			ONLY 95% OF THE VALUES ARE APPLICABLE FOR WORCESTER THEREFORE THE RS MEANS SF COSTS SHOULD BE LOWERED BY 5%
LOCATION FACTOR ADJUSTMENT	FACTOR		
LOCATION FACTOR WEIGHTED AVERAGE TOTAL ²	1.095		THE COSTS SHOULD BE INCREASED BY 9.5% TO REFLECT THE LOCATION ADJUSTMENT REQUIREMENTS



FOOTNOTES:

1
RS MEANS BUILDING CONSTRUCTION COST DATA 2010 PAGE 816

2
CITY COST INDICES RS MEANS BUILDING CONSTRUCTION COST DATA PAGE 710

3
CURRENT AMOUNT INCLUDING ESCALATION AND ADD-ONS (GILBANE BUILDING COMPANY)

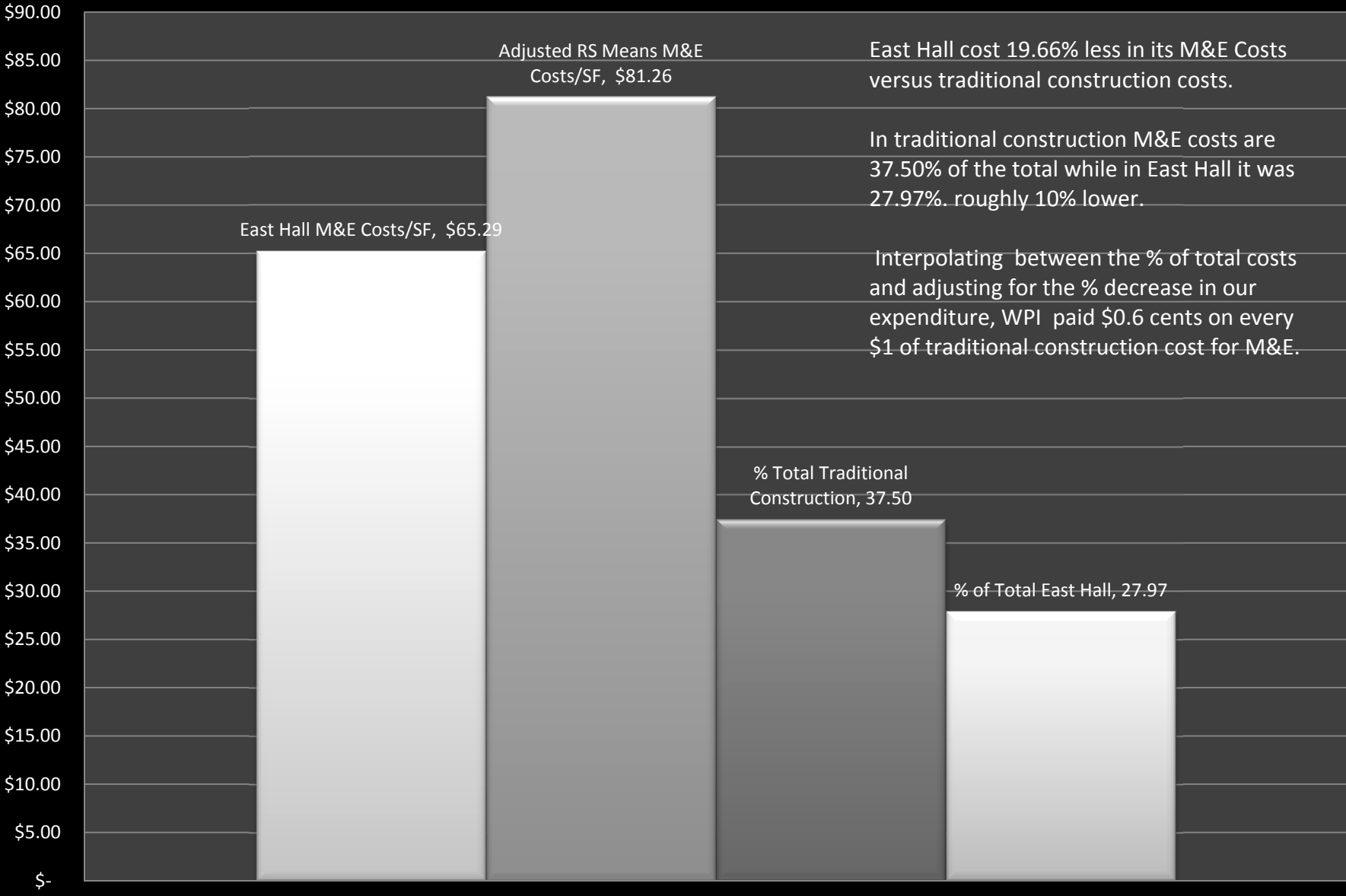
Appendix B-2 Adjusted East Hall Cost Estimate (GBC)

Green Base Construction Cost										
Project: East Hall 232 Residents										
Gilbane Building Company Information										
Project Cost Update-For Comparison Purposes										
1/9/2008										
Escalation Factor per year to 2010										
	6.00%	6.00%								
EAST HALL CONSTRUCTION COST ESTIMATE										
BID PACKAGE DESCRIPTIONS	Escalated GMP Amount (July 2009)	Escalated GMP Amount (July 2009) W/ADD ONS	Escalated Current Amount	Escalated Current Amount (July 2009) W/ADD ONS	Variance between GMP Amount and Current Amount	% of Total GMP Construction Amount	% Total of Current Construction Amount	% Total of GMP W/OH&P	% Total of Current W/OH&P	
DEMOLITION	\$ 255,263.68	\$ 293,532.56	\$ 255,263.68	\$ 296,428.58	(2,896.02)	0.78%	0.79%	0.78%	0.79%	
SITE PREP	\$ 1,282,320.73	\$ 1,474,565.03	\$ 1,282,320.73	\$ 1,489,113.22	(14,548.18)	3.93%	3.97%	3.93%	3.97%	
SITE IMPROVEMENTS/LANDSCAPING	\$ 378,146.02	\$ 434,837.31	\$ 392,717.55	\$ 456,048.84	(21,211.54)	1.16%	1.22%	1.16%	1.22%	
CONCRETE	\$ 2,035,013.54	\$ 2,340,100.83	\$ 2,035,013.54	\$ 2,363,188.45	(23,087.63)	6.23%	6.31%	6.23%	6.31%	
STRUCTURAL PRECAST	\$ 2,539,104.19	\$ 2,919,764.26	\$ 2,539,104.19	\$ 2,948,570.90	(28,806.64)	7.78%	7.87%	7.78%	7.87%	
ARCHITECTURAL PRECAST	\$ 310,485.32	\$ 357,032.98	\$ 310,485.32	\$ 360,555.50	(3,522.52)	0.95%	0.96%	0.95%	0.96%	
MASONRY	\$ 1,638,561.44	\$ 1,884,213.01	\$ 1,638,561.44	\$ 1,902,802.81	(18,589.80)	5.02%	5.08%	5.02%	5.08%	
HARDWARE ALLOWANCE	\$ 7,639.36	\$ 8,784.64	\$ 7,639.36	\$ 8,871.31	(86.67)	0.02%	0.02%	0.02%	0.02%	
STRUCTURAL STEEL	\$ 2,421,676.35	\$ 2,784,731.76	\$ 2,421,676.35	\$ 2,812,206.15	(27,474.39)	7.42%	7.51%	7.42%	7.51%	
MISC METALS	\$ 476,870.53	\$ 548,362.50	\$ 476,870.53	\$ 553,772.69	(5,410.19)	1.46%	1.48%	1.46%	1.48%	
PRECAST SUPPORT ALLOWANCE	\$ 64,956.37	\$ 74,694.56	\$ 64,956.37	\$ 75,431.51	(736.94)	0.20%	0.20%	0.20%	0.20%	
COMPACTOR ALLOWANCE	\$ 16,370.05	\$ 18,824.23	\$ 16,370.05	\$ 19,009.96	(185.72)	0.05%	0.05%	0.05%	0.05%	
MILLWORK ALLOWANCE	\$ 1,091,336.79	\$ 1,254,948.97	\$ 971,289.75	\$ 1,127,924.05	127,024.91	3.34%	3.01%	3.34%	3.01%	
RE. MILLWORK ALLOW			\$ 120,047.05	\$ 139,406.34	(139,406.34)	0.00%	0.37%	0.00%	0.37%	
ROOF/WATERPROOF	\$ 555,490.43	\$ 638,769.02	\$ 555,490.43	\$ 645,071.17	(6,302.15)	1.70%	1.72%	1.70%	1.72%	
SPRAY WATERPROOF	\$ 122,993.66	\$ 141,432.75	\$ 122,993.66	\$ 142,828.14	(1,395.39)	0.38%	0.38%	0.38%	0.38%	
CURTAIN WALL	\$ 3,847,507.87	\$ 4,424,322.58	\$ 3,847,507.87	\$ 4,467,973.31	(43,650.73)	11.78%	11.92%	11.78%	11.92%	
GENERAL TRADES	\$ 300,128.53	\$ 345,123.52	\$ 129,541.68	\$ 150,432.12	194,691.40	0.92%	0.40%	0.92%	0.40%	
WINDOW BLINDS	\$ 54,785.11	\$ 62,998.44	\$ 54,785.11	\$ 63,619.99	(621.55)	0.17%	0.17%	0.17%	0.17%	
DRYWALL	\$ 3,105,944.52	\$ 3,571,584.76	\$ 3,105,944.52	\$ 3,606,822.31	(35,237.55)	9.51%	9.63%	9.51%	9.63%	
DOORS AND HARDWARE	\$ 526,624.57	\$ 605,575.62	\$ 526,624.57	\$ 611,550.28	(5,974.66)	1.61%	1.63%	1.61%	1.63%	
FLOORING	\$ 962,411.72	\$ 1,106,695.57	\$ 962,411.72	\$ 1,117,614.32	(10,918.75)	2.95%	2.98%	2.95%	2.98%	
PAINTING	\$ 517,788.02	\$ 595,414.30	\$ 365,270.43	\$ 424,175.48	171,238.82	1.59%	1.13%	1.59%	1.13%	
APPLIANCES	\$ 146,566.53	\$ 168,539.65	\$ 146,566.53	\$ 170,202.47	(1,662.83)	0.45%	0.45%	0.45%	0.45%	
SIGNAGE ALLOWANCE	\$ 60,023.52	\$ 69,022.19	\$ 60,023.52	\$ 69,703.17	(680.98)	0.18%	0.19%	0.18%	0.19%	
ELEVATOR	\$ 321,234.99	\$ 369,394.23	\$ 321,234.99	\$ 373,038.70	(3,644.47)	0.98%	1.00%	0.98%	1.00%	
FIRE PROTECTION	\$ 523,186.86	\$ 601,622.53	\$ 523,186.86	\$ 607,558.19	(5,935.66)	1.60%	1.62%	1.60%	1.62%	
MECHANICAL	\$ 5,799,401.93	\$ 6,668,842.73	\$ 5,799,401.93	\$ 6,734,638.08	(65,795.35)	17.76%	17.97%	17.76%	17.97%	
ELECTRICAL	\$ 2,685,779.85	\$ 3,088,429.40	\$ 2,685,779.85	\$ 3,118,900.10	(30,470.70)	8.23%	8.32%	8.23%	8.32%	
UNDERGROUND ELECTRICAL	\$ 63,779.90	\$ 73,341.73	\$ 63,779.90	\$ 74,065.32	(723.60)	0.20%	0.20%	0.20%	0.20%	
CONTAMINATED SOILS ALLOWANCE	\$ 141,873.78	\$ 163,143.37	\$ 141,873.78	\$ 164,752.95	(1,609.59)	0.43%	0.44%	0.43%	0.44%	
TEMP VENTILATION FILTER CHANGE ALLOWANCE	\$ 122,229.72	\$ 140,554.28	\$ 122,229.72	\$ 141,941.00	(1,386.72)	0.37%	0.38%	0.37%	0.38%	
CHANGE REQUIREMENT LOG	\$ 274,586.89	\$ 315,752.69	\$ 199,347.94	\$ 231,495.64	84,257.05	0.84%	0.62%	0.84%	0.62%	
TOTAL CONSTRUCTION COSTS	\$ 32,650,082.75	\$ 37,544,952.00	\$ 32,266,310.89	\$ 37,469,713.06		100.00%	100.00%	100.00%	100.00%	
TOTAL CONSTRUCTION COSTS INCLUDING ALL ADD-ONS¹ (2010) 14.99% (GMP Amount)	\$ 37,544,952.00									
TOTAL CONSTRUCTION COSTS INCLUDING ALL ADD-ONS² (2010) 16.13% (GMP Amount)			\$ 37,469,713.06							

COST PER SF OF BUILDING-2010	162,404.00	Total SF of bldg.		\$ 230.72	July 2009 Pricing	Current Amount				
				\$ 231.18	July 2009 Pricing	GMP Amount				
ESCALATION FACTOR-From Jan 2008 to July 2009-1.5 yrs @ 6%	1.0913									
FOOTNOTES:										
1										
The Add-ons are based on the below the line items as indicated in the GMP Amount construction cost estimate column provided by Gilbane Building Company as follows:										
	Below the line items	\$ 4,485,205.00								
	Add-on based on provided information	14.99%								
2										
The Add-ons are based on the below the line items as indicated in the Current Amount construction cost estimate column provided by Gilbane Building Company as follows:										
	Below the line items	\$ 4,767,916.00								
	Add-on based on provided information	16.13%								

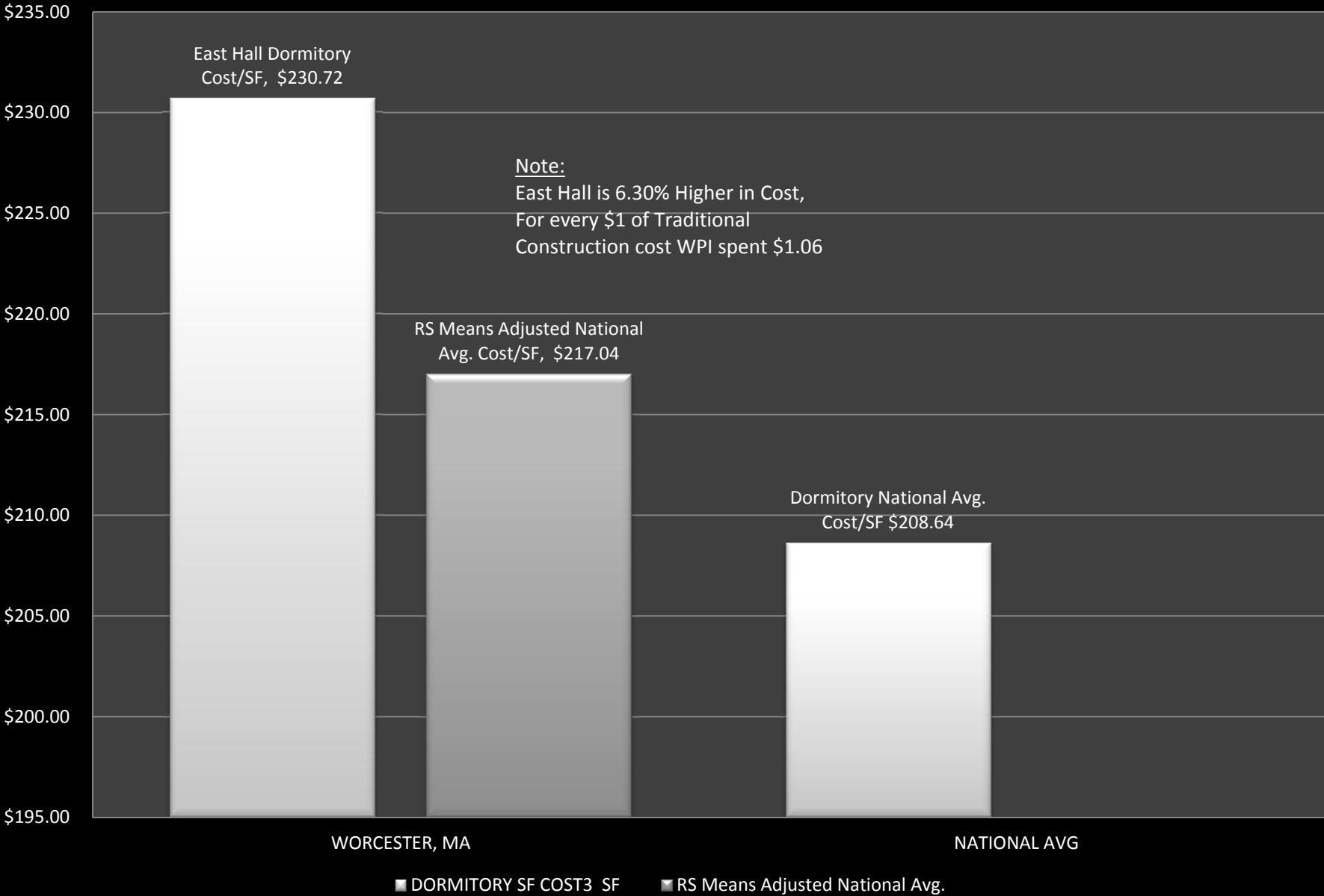
Appendix B-3 Graph: Non-Green versus Green Base Mechanical and Electrical Costs

Non-Green versus Green Base M&E Costs



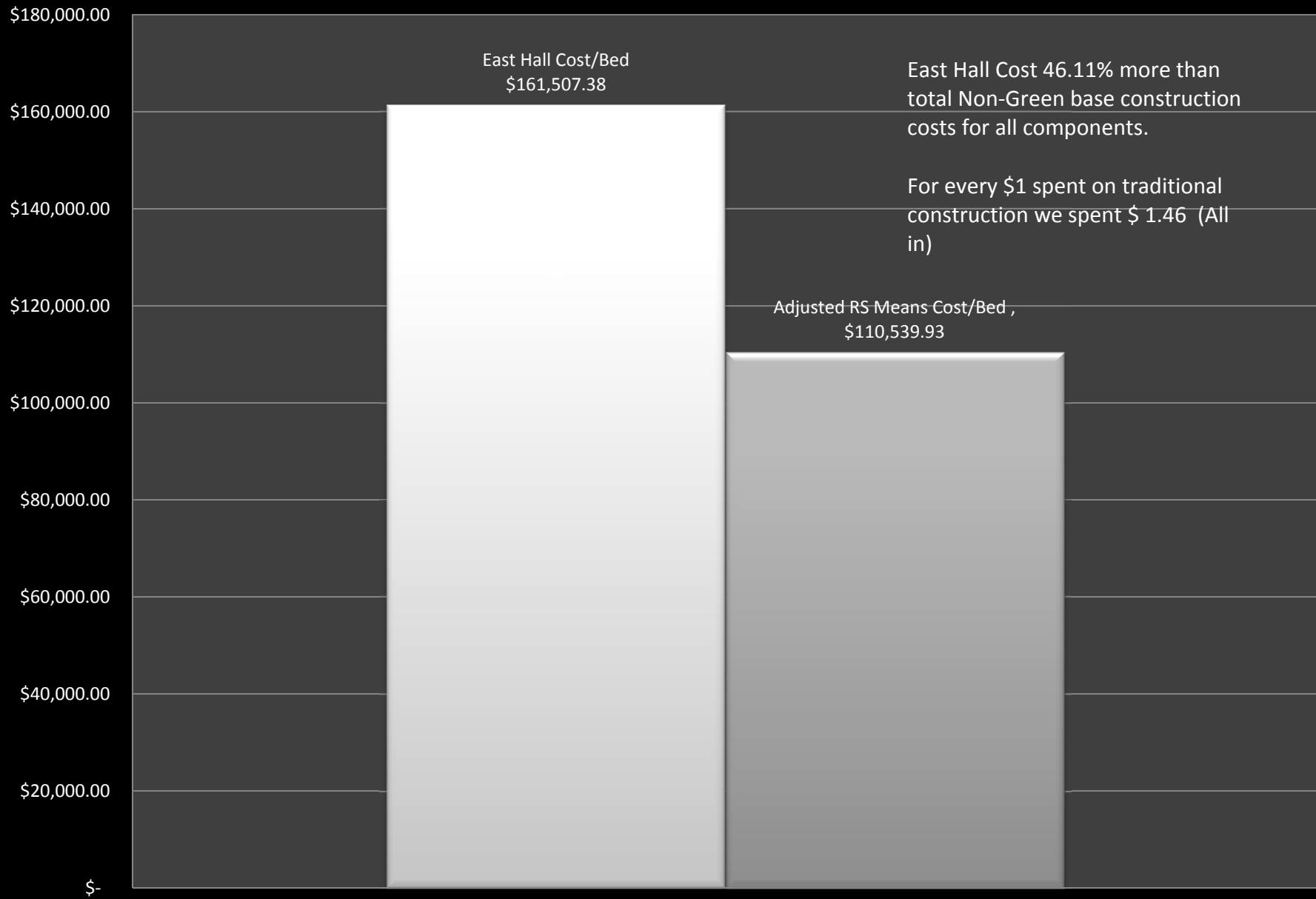
Appendix B-4 Graph: Dormitory Square Foot Cost Comparison

Dormitory Square Foot Costs



Appendix B-5 Graph: Total Cost per Bed Comparison for All Components (MEP, Arch.,
Struc. etc...)

Comparison of Total Cost/Bed for All Components (MEP,Arch,Struc. etc...)



Appendix B-6 RS Means Construction Cost Data

Square Foot Project Size Modifier

One factor that affects the S.F. cost of a particular building is the size. In general, for buildings built to the same specifications in the same locality, the larger building will have the lower S.F. cost. This is due mainly to the decreasing contribution of the exterior walls plus the economy of scale usually achievable in larger buildings. The Area Conversion Scale shown below will give a factor to convert costs for the typical size building to an adjusted cost for the particular project.

The Square Foot Base Size lists the median costs, most typical project size in our accumulated data, and the range in size of the projects.

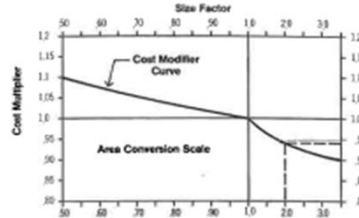
The Size Factor for your project is determined by dividing your project area in S.F. by the typical project size for the particular Building Type. With this factor, enter the Area Conversion Scale at the appropriate Size Factor and determine the appropriate cost multiplier for your building size.

Example: Determine the cost per S.F. for a 100,000 S.F. Mid-rise apartment building.

$$\frac{\text{Proposed building area} = 100,000 \text{ S.F.}}{\text{Typical size from below} = 50,000 \text{ S.F.}} = 2.00$$

Enter Area Conversion scale at 2.0, intersect curve, read horizontally the appropriate cost multiplier of .94. Size adjusted cost becomes $.94 \times \$106.00 = \100.00 based on national average costs.

Note: For Size Factors less than .50, the Cost Multiplier is 1.1
For Size Factors greater than 3.5, the Cost Multiplier is .90



Square Foot Base Size						
Building Type	Median Cost per S.F.	Typical Size Gross S.F.	Typical Range Gross S.F.	Building Type	Median Cost per S.F.	Typical Size Gross S.F.
Apartments, Low Rise	\$ 83.50	21,000	9,700 - 37,200	Jails	\$ 254.00	40,000
Apartments, Mid Rise	106.00	50,000	32,000 - 100,000	Libraries	159.00	12,000
Apartments, High Rise	115.00	145,000	95,000 - 600,000	Living, Assisted	135.00	32,300
Auditoriums	140.00	25,000	7,600 - 39,000	Medical Clinics	144.00	7,200
Auto Sales	104.00	20,000	10,800 - 28,600	Medical Offices	136.00	6,000
Banks	187.00	4,200	2,500 - 7,500	Hotels	100.00	40,000
Churches	128.00	17,000	2,000 - 42,000	Nursing Homes	140.00	23,000
Clubs, Country	131.00	6,500	4,500 - 15,000	Offices, Low Rise	119.00	20,000
Clubs, Social	124.00	10,000	6,000 - 13,500	Offices, Mid Rise	117.00	120,000
Clubs, YMCA	141.00	28,300	12,800 - 39,400	Offices, High Rise	150.00	260,000
Colleges (Class)	150.00	50,000	15,000 - 150,000	Police Stations	188.00	10,500
Colleges (Science Lab)	238.00	45,600	16,600 - 80,000	Post Offices	139.00	12,400
College (Student Union)	176.00	33,400	16,000 - 85,000	Power Plants	1000.00	7,500
Community Center	132.00	9,400	5,300 - 16,700	Religious Education	119.00	9,000
Court Houses	178.00	32,400	17,800 - 105,000	Research	195.00	19,000
Dept. Stores	77.50	90,000	44,000 - 122,000	Restaurants	170.00	4,400
Dormitories, Low Rise	141.00	25,000	10,000 - 95,000	Retail Stores	82.50	7,200
Dormitories, Mid Rise	174.00	85,000	20,000 - 200,000	Schools, Elementary	123.00	41,000
Factories	75.00	26,400	12,900 - 50,000	Schools, Jr. High	127.00	92,000
Fire Stations	138.00	5,800	4,000 - 8,700	Schools, Sr. High	132.00	101,000
Fraternity Houses	129.00	12,500	8,200 - 14,800	Schools, Vocational	127.00	37,000
Funeral Homes	144.00	10,000	4,000 - 20,000	Sports Arenas	102.00	15,000
Garages, Commercial	92.50	9,300	5,000 - 13,600	Supermarkets	81.50	44,000
Garages, Municipal	117.00	8,300	4,500 - 12,600	Swimming Pools	191.00	20,000
Garages, Parking	50.00	163,000	76,400 - 225,300	Telephone Exchange	222.00	4,500
Gymnasiums	127.00	19,200	11,600 - 41,000	Theaters	118.00	10,500
Hospitals	225.00	55,000	27,200 - 125,000	Town Halls	135.00	10,800
House (Elderly)	114.00	37,000	21,000 - 66,000	Warehouses	59.00	25,000
Housing (Public)	105.00	36,000	14,400 - 74,400	Warehouse & Office	65.00	25,000
Ice Rinks	151.00	29,000	27,200 - 33,600			

50 17 | Square Foot Costs

50 17 00 S.F. Costs		UNIT	UNIT COSTS			% OF TOTAL		
			1/4	MEDIAN	3/4	1/4	MEDIAN	3/4
30	2900 Electrical	S.F.	6.55	9	10.65	9.05%	12.15%	14.95%
	3100 Total Mechanical & Electrical	↓	11.55	14.80	26	13.20%	21.50%	50%
31	0010 DORMITORIES Low Rise (1 to 3 story)	S.F.	109	141	188			
	0020 Total project costs	C.F.	6.15	9.90	14.85			
	2720 Plumbing	S.F.	6.55	8.75	11.05	8.05%	9%	9.65%
	2770 Heating, ventilating, air conditioning	↓	6.90	8.25	11	4.61%	8.05%	10%
	2900 Electrical	↓	7.20	10.35	14.95	6.40%	8.65%	9.50%
	3100 Total Mechanical & Electrical	↓	37.50	40	62.50	22%	25%	27%
	9000 Per bed, total cost	Bed	46,000	51,000	105,500			
32	0010 DORMITORIES Mid Rise (4 to 8 story)	S.F.	133	174	215			
	0020 Total project costs	C.F.	14.70	16.15	19.30			
	2900 Electrical	S.F.	14.15	16.10	21.50	8.20%	10.20%	11.90%
	3100 Total Mechanical & Electrical	*	39.50	41	80.50	25.50%	34.50%	37.50%
	9000 Per bed, total cost	Bed	19,000	43,300	109,500			
34	0010 FACTORIES	S.F.	50.50	75	116			
	0020 Total project costs	C.F.	3.24	4.83	8			
	0100 Site work	S.F.	5.75	10.50	16.60	6.95%	11.48%	17.95%
	2720 Plumbing	↓	2.72	5.05	8.95	3.73%	6.05%	8.10%
	2770 Heating, ventilating, air conditioning	↓	5.30	7.60	10.25	5.25%	8.43%	11.35%
	2900 Electrical	↓	6.25	9.90	15.15	8.10%	10.50%	14.20%
	3100 Total Mechanical & Electrical	↓	17.90	24	36.50	21%	28.50%	36.50%
36	0010 FIRE STATIONS	S.F.	100	138	185			
	0020 Total project costs	C.F.	5.85	8.05	10.70			
	0500 Masonry	S.F.	14.80	25	34	8.35%	11.55%	16.15%
	1140 Roofing	↓	3.26	8.85	10.05	1.90%	4.94%	5.65%
	1580 Painting	↓	2.53	3.78	3.87	1.37%	1.57%	2.07%
	1800 Equipment	↓	1.24	2.38	4.41	.62%	1.86%	3.54%
	2720 Plumbing	↓	5.60	9.05	13.05	5.85%	7.35%	9.45%
	2770 Heating, ventilating, air conditioning	↓	5.55	9	13.90	5.15%	7.40%	9.40%
	2900 Electrical	↓	7.15	12.55	17	6.80%	8.60%	10.70%
	3100 Total Mechanical & Electrical	↓	36.50	47	53	18.40%	23%	26%
37	0010 FRATERNITY HOUSES & Sorority Houses	S.F.	100	129	176			
	0020 Total project costs	C.F.	9.95	10.40	12.50			
	2720 Plumbing	S.F.	7.55	8.65	15.85	6.80%	8%	10.65%
	2900 Electrical	↓	6.60	14.25	17.90	6.60%	9.90%	10.65%
	3100 Total Mechanical & Electrical	↓	7.80	25	30		15.10%	15.30%
38	0010 FUNERAL HOMES	S.F.	106	144	261			
	0020 Total project costs	C.F.	10.75	12	23			
	2900 Electrical	S.F.	4.66	8.55	9.35	3.58%	4.44%	5.95%
	3100 Total Mechanical & Electrical	↓	16.50	24	33.50	12.90%	12.90%	12.90%
39	0010 GARAGES, COMMERCIAL (Service)	S.F.	60	92.50	128			
	0020 Total project costs	C.F.	3.93	5.80	8.45			
	1800 Equipment	S.F.	3.37	7.60	11.80	2.21%	4.62%	6.87%
	2720 Plumbing	↓	4.14	6.40	11.05	5.45%	7.85%	10.65%
	2730 Heating & ventilating	↓	5.45	7.20	9.75	5.25%	6.85%	8.50%
	2900 Electrical	↓	5.70	8.65	12.50	7.15%	9.25%	10.85%
	3100 Total Mechanical & Electrical	↓	12.55	24	38.50	12.35%	17.40%	26%
40	0010 GARAGES, MUNICIPAL (Repair)	S.F.	88	117	165			
	0020 Total project costs	C.F.	5.90	6.95	11.95			
	0500 Masonry	S.F.	8.25	16.10	25	5.60%	9.15%	12.50%
	2720 Plumbing	↓	3.94	7.55	14.25	3.59%	6.70%	13.50%
	2730 Heating & ventilating	↓	6.75	9.75	18.85	6.15%	7.45%	11.50%
	2900 Electrical	↓	6.50	10.20	14.70	6.60%	8.15%	11.35%
	3100 Total Mechanical & Electrical	↓	30	41.50	60.50	21.50%	25.50%	28.50%

Estimating Tips

- The cost figures in this Square Foot Cost section were derived from approximately 11,200 projects contained in the RSMMeans database of completed construction projects. They include the contractor's overhead and profit, but do not generally include architectural fees or land costs. The figures have been adjusted to January of the current year. New projects are added to our files each year, and outdated projects are discarded. For this reason, certain costs may not show a uniform annual progression. In no case are all subdivisions of a project listed.
- These projects were located throughout the U.S. and reflect a tremendous variation in square foot (S.F.) and cubic foot (C.F.) costs. This is due to differences, not only in labor and material costs, but also in individual owners' requirements. For instance, a bank in a large city would have different features than one in a rural area. This is true of all the different types of buildings analyzed. Therefore, caution should be exercised when using these Square Foot costs. For example, for court houses, costs in the database are local court house costs and will not apply to the larger, more elaborate federal court houses. As a general rule, the projects in the 1/4 column do not include any site work or equipment, while the projects in the 3/4 column may include both equipment and site work. The median figures do not generally include site work.
- None of the figures "go with" any others. All individual cost items were computed and tabulated separately. Thus, the sum of the median figures for Plumbing, HVAC and Electrical will not normally total up to the total Mechanical and Electrical costs arrived at by separate analysis and tabulation of the projects.
- Each building was analyzed as to total and component costs and percentages. The figures were arranged in ascending order with the results tabulated as shown. The 1/4 column shows that 25% of the projects had lower costs and 75% had higher. The 3/4 column shows that 75% of the projects had lower costs and 25% had higher. The median column shows that 50% of the projects had lower costs and 50% had higher.
- There are two times when square foot costs are useful. The first is in the conceptual stage when no details are available. Then square foot costs make a useful starting point. The second is after the bids are in and the costs can be worked back into their appropriate units for information purposes. As soon as details become available in the project design, the square foot approach should be discontinued and the project priced as to its particular components. When more precision is required, or for estimating the replacement cost of specific buildings, the current edition of *RSMMeans Square Foot Costs* should be used.
- In using the figures in this section, it is recommended that the median column be used for preliminary figures if no additional information is available. The median figures, when multiplied by the total city construction cost index figures (see City Cost Indexes) and then multiplied by the project size modifier at the end of this section, should present a fairly accurate base figure, which would then have to be adjusted in view of the estimator's experience, local economic conditions, code requirements, and the owner's particular requirements. There is no need to factor the percentage figures, as these should remain constant from city to city. All tabulations mentioning air conditioning had at least partial air conditioning.
- The editors of this book would greatly appreciate receiving cost figures on one or more of your recent projects, which would then be included in the averages for next year. All cost figures received will be kept confidential, except that they will be averaged with other similar projects to arrive at Square Foot cost figures for next year's book. See the last page of the book for details and the discount available for submitting one or more of your projects.

DIVISION		MASSACHUSETTS			
		WORCESTER			
		015 - 016			
		MT.	INCL.	TOTAL	NET
015433	CONTRACTOR EQUIPMENT		100.6	100.6	
0200, 25 - 5A	WEL. & INFRASTRUCTURE DEMOLITION	82.7	109.2	90.3	73.3
0310	Concrete Forming & Accessories	98.2	122.6	119.1	97.2
0320	Concrete Reinforcing	110.6	147.0	129.4	116.3
0330	Cast-In-Place Concrete	95.2	146.0	111.9	90.9
03	CONCRETE	103.6	134.5	117.1	95.8
04	MASONRY	97.3	149.5	128.2	92.1
05	METALS	99.6	123.0	107.5	91.1
06	WOOD, PLASTICS & COMPOSITES	100.1	120.3	111.5	98.1
07	THERMAL & MOISTURE PROTECTION	96.0	138.5	112.1	100.1
08	OPENINGS	104.3	129.6	116.6	94.1
0920	Plaster & Gypsum Board	100.4	120.2	114.1	97.1
0950, 0980	Ceilings & Acoustic Treatment	98.7	120.2	112.4	96.1
0960	Flooring	97.6	168.9	117.3	90.1
0970, 0990	Wall Finishes & Painting/Coating	94.6	143.5	126.0	93.1
09	FINISHES	95.3	133.4	117.8	90.1
COVERS	DIVS. 10 - 14, 25, 28, 41, 43, 44	100.0	100.1	102.2	100.1
21, 22, 23	FIRE SUPPRESSION, PLUMBING & HVAC	100.1	111.8	104.9	100.1
26, 27, 3370	ELECTRICAL, COMMUNICATIONS & UTIL.	98.0	102.9	100.5	94.1
WF2004	WEIGHTED AVERAGE	99.6	122.1	109.5	94.1

Appendix B-7 Construction Cost Estimate from GBC

CONSTRUCTION COST ESTIMATE FROM GILBANE BUILDING COMPANY

WPI RESIDENCE HALL					
GILBANE BUILDING COMPANY					
Project Cost Update					
1/9/2008					
BID PACKAGES		GMP Amount	Current Amount	Difference (Cont.)	Difference (Allow.)
DEMOLITION		\$233,900	\$233,900	--	--
SITE PREPARATION		\$1,175,000	\$1,175,000	--	--
SITE IMPV/LNDSCP'NG		\$346,498	\$359,850	\$13,352	--
CONCRETE		\$1,864,698	\$1,864,698	--	--
STRUCTURAL PRECAST		\$2,326,600	\$2,326,600	--	--
ARCHITECTURAL PRECAST		\$284,500	\$284,500	--	--
MASONRY		\$1,501,426	\$1,501,426	--	--
	Hardware Allow	\$7,000	\$7,000	--	--
STRUCTURAL STEEL		\$2,219,000	\$2,219,000	--	--
MISC METALS		\$436,960	\$436,960	--	--
	Precast Support Allow	\$59,520	\$59,520	--	--
	Compactor Allow	\$15,000	\$15,000	--	--
MILLWORK-- Allow		\$1,000,000	\$890,000	--	-\$110,000
	Rem. Millwork Allow	--	\$110,000	--	--
ROOF/WATERPROOF		\$509,000	\$509,000	--	--
SPRAY FIREPROOF		\$112,700	\$112,700	--	--
CURTAINWALL		\$3,525,500	\$3,525,500	--	--
GENERAL TRADES		\$275,010	\$118,700	-\$156,310	--
	Window Blinds	\$50,200	\$50,200	--	--
DRYWALL		\$2,846,000	\$2,846,000	--	--
DOORS AND HARDWARE		\$482,550	\$482,550	--	--
FLOORING		\$881,865	\$881,865	--	--
PAINTING		\$474,453	\$334,700	-\$139,753	--
APPLIANCES		\$134,300	\$134,300	--	--
SIGNAGE-- Allow		\$55,000	\$55,000	--	--
ELEVATOR		\$294,350	\$294,350	--	--
FIRE PROTECTION		\$479,400	\$479,400	--	--
MECHANICAL		\$5,314,035	\$5,314,035	--	--
ELECTRICAL		\$2,461,000	\$2,461,000	--	--
UG ELECTRICAL		\$58,442	\$58,442	--	--
Contaminated Soils-- Allow		\$130,000	\$130,000	--	--
Temp Ventilation Filter Change-- Allowa		\$112,000	\$112,000	--	--
Change Req. Log		\$251,606	\$182,664	--	-\$68,942
SUBTOTAL PACKAGE WORK		\$29,917,513	\$29,565,860	-\$282,711	-\$178,942

GENERAL CONDITIONS			
Original CM Contingency Amount	\$575,000.00		N/A
Original CM Contingency spent to date	N/A		\$82,681.00
CM Contingency Projected to be Spent	N/A		\$492,319.00
CM Contingency Added from Buyout	N/A		\$282,711.00
Revised CM Contingency Amount	N/A		\$857,711.00
General Requirements	\$991,900.00		\$991,900.00
CM Preconstruction Services	\$125,000.00		\$125,000.00
CM General Conditions	\$2,051,680.00		\$2,051,680.00
CM Fee	\$741,625.00		\$741,625.00
P & P Bond	N/A		N/A
Permits	In GCs		In GCs
Approved Change Orders			
Change Order #1	N/A		(\$198,920.00)
Projected Final GMP w/o Potential Costs	\$34,402,718		\$34,134,856
PROJECTED FINAL COST			
Contingency projected to return	N/A		(\$282,711.00)
Potential Out-of-Scope Costs	N/A		\$569,596.00
Projected Final GMP w/ Pot. Costs	\$34,402,718		\$34,421,741

719,000 - still possible to control

Mechanical Maintenance Costs

Appendix C-M1 YPM Costs

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹									
ANNUALIZED									
PROJECT:	EAST HALL								
LOCATION:	US NATIONAL AVERAGES								
Escalation	6%								
De-Escalation to July 2009	1.03								
De-Escalation Factor to be Applied	0.97								
Green Factor	1.20	Assumed Value							
Qty	Assembly Number	Description	Labor Hours	Total In-House	Total Incl. O&P	Location Factor	Location Adjusted	Total O&P	De-Escalation Factor to July 2009 Costs
1.000	D3 02 5130 1950	Boiler, hot water, oil, gas, or comb. fired, up to 120 MBH, annualized	12.53	\$ 885.00	\$ 1,100.00	1.095	\$	1,204.50	0.97
1.000	D3 02 5110 1950	Boiler, electric, to 1500 gal., annualized	3.83	\$ 315.00	\$ 390.00	1.095	\$	427.05	0.97
1.000	D3 02 5130 2950	Boiler, hot water, oil, gas, or comb. fired, 120 - 500 MBH, annualized	15.45	\$ 1,100.00	\$ 1,375.00	1.095	\$	1,505.63	0.97
1.000	D3 02 5130 3950	Boiler, hot water, oil, gas, or comb. fired, 500 -1000 MBH, annualized	17.38	\$ 1,225.00	\$ 1,525.00	1.095	\$	1,669.88	0.97
1.000	D3 02 5130 4950	Boiler, hot water, oil, gas, or comb. fired, over 1000 MBH, annualized	19.70	\$ 1,400.00	\$ 1,725.00	1.095	\$	1,888.88	0.97
1.000	D3 02 5140 1950	Boiler, steam, oil, gas, or comb. fired, up to 120 MBH, annualized	16.19	\$ 1,200.00	\$ 1,475.00	1.095	\$	1,615.13	0.97
1.000	D3 02 5140 2950	Boiler, steam, oil, gas, or comb. fired, 120 to 500 MBH, annualized	18.98	\$ 1,425.00	\$ 1,750.00	1.095	\$	1,916.25	0.97
1.000	D3 02 5140 3950	Boiler, steam, oil, gas, or comb. fired, 500 to 1000 MBH, annualized	20.70	\$ 1,550.00	\$ 1,925.00	1.095	\$	2,107.88	0.97
1.000	D3 02 5140 4950	Boiler, steam, oil, gas, or comb. fired, over 1000 MBH, annualized	22.45	\$ 1,675.00	\$ 2,075.00	1.095	\$	2,272.13	0.97
1.000	D3 02 5210 1950	Deaerator tank, annualized	1.51	\$ 138.00	\$ 167.00	1.095	\$	182.87	0.97
1.000	D3 02 5310 1950	Pump, boiler fuel oil, annualized	1.23	\$ 132.00	\$ 159.00	1.095	\$	174.11	0.97
1.000	D3 02 5310 2950	Pump, condensate return, over 1 H.P., annualized	1.12	\$ 125.00	\$ 151.00	1.095	\$	165.35	0.97
1.000	D3 02 5310 3950	Pump, condensate return unit, 2 pumps, annualized	1.14	\$ 180.00	\$ 212.00	1.095	\$	232.14	0.97
1.000	D3 03 5110 1950	Water cooling tower, up to 50 tons, annualized	4.55	\$ 330.00	\$ 410.00	1.095	\$	448.95	0.97
1.000	D3 03 5110 2950	Water cooling tower, 50 thru 500 tons, annualized	9.91	\$ 705.00	\$ 870.00	1.095	\$	952.65	0.97
1.000	D3 03 5110 3950	Water cooling tower, 500 thru 1000 tons, annualized	17.73	\$ 1,300.00	\$ 1,600.00	1.095	\$	1,752.00	0.97
1.000	D3 03 5130 1950	Chiller, recip., air cooled, up to 25 tons, annualized	9.71	\$ 680.00	\$ 840.00	1.095	\$	919.80	0.97
1.000	D3 03 5130 2950	Chiller, recip., air cooled, over 25 tons, annualized	12.89	\$ 905.00	\$ 1,100.00	1.095	\$	1,204.50	0.97
1.000	D3 03 5135 1950	Chiller, recip., water cooled, up to 50 tons, annualized	7.94	\$ 570.00	\$ 700.00	1.095	\$	766.50	0.97
1.000	D3 03 5135 2950	Chiller, recip., water cooled, over 50 tons, annualized	10.91	\$ 760.00	\$ 945.00	1.095	\$	1,034.78	0.97
1.000	D3 03 5140 1950	Chiller, centrif., water cooled, up to 100 tons, annualized	26.76	\$ 1,975.00	\$ 2,425.00	1.095	\$	2,655.38	0.97
1.000	D3 03 5140 2950	Chiller, centrif., water cooled, over 100 tons, annualized	33.36	\$ 2,425.00	\$ 3,000.00	1.095	\$	3,285.00	0.97
1.000	D3 03 5150 1950	Chiller, absorption unit, up to 500 tons, annualized	6.22	\$ 490.00	\$ 600.00	1.095	\$	657.00	0.97
1.000	D3 03 5150 2950	Chiller, absorption unit, 500 to 5000 tons, annualized	9.42	\$ 835.00	\$ 1,025.00	1.095	\$	1,122.38	0.97
1.000	D3 03 5160 1950	Chiller, screw, water cooled, up to 100 tons, annualized	14.77	\$ 1,200.00	\$ 1,475.00	1.095	\$	1,615.13	0.97
1.000	D3 03 5160 2950	Chiller, screw, water cooled, over 100 tons, annualized	16.72	\$ 1,350.00	\$ 1,675.00	1.095	\$	1,834.13	0.97
1.000	D3 03 5170 1950	Evaporative cooler, annualized	1.25	\$ 110.00	\$ 134.00	1.095	\$	146.73	0.97
1.000	D3 03 5180 1950	Evaporative cooler, rotating drum, annualized	1.31	\$ 122.00	\$ 148.00	1.095	\$	162.06	0.97
1.000	D3 03 5210 1950	Condenser, air cooled, 3 tons to 25 tons, annualized	1.76	\$ 152.00	\$ 185.00	1.095	\$	202.58	0.97

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹							
ANNUALIZED							
PROJECT:	EAST HALL						
LOCATION:	US NATIONAL AVERAGES						
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green	GREEN FACTOR	Adjusted Total with Green Factor OH&P	De-Escalation Factor to July 2009 Costs	Total with All Adjustments
1.000	D3 02 5130 1950	Boiler, hot water, oil, gas, or comb. fired, up to 120 MBH, annualized	\$ 1,168.89	1.20	\$ 1,445.40	0.97	\$ 1,402.67
1.000	D3 02 5110 1950	Boiler, electric, to 1500 gal., annualized	\$ 414.43	1.20	\$ 512.46	0.97	\$ 497.31
1.000	D3 02 5130 2950	Boiler, hot water, oil, gas, or comb. fired, 120 - 500 MBH, annualized	\$ 1,461.11	1.20	\$ 1,806.75	0.97	\$ 1,753.34
1.000	D3 02 5130 3950	Boiler, hot water, oil, gas, or comb. fired, 500 -1000 MBH, annualized	\$ 1,620.51	1.20	\$ 2,003.85	0.97	\$ 1,944.61
1.000	D3 02 5130 4950	Boiler, hot water, oil, gas, or comb. fired, over 1000 MBH, annualized	\$ 1,833.03	1.20	\$ 2,266.65	0.97	\$ 2,199.64
1.000	D3 02 5140 1950	Boiler, steam, oil, gas, or comb. fired, up to 120 MBH, annualized	\$ 1,567.38	1.20	\$ 1,938.15	0.97	\$ 1,880.85
1.000	D3 02 5140 2950	Boiler, steam, oil, gas, or comb. fired, 120 to 500 MBH, annualized	\$ 1,859.60	1.20	\$ 2,299.50	0.97	\$ 2,231.52
1.000	D3 02 5140 3950	Boiler, steam, oil, gas, or comb. fired, 500 to 1000 MBH, annualized	\$ 2,045.56	1.20	\$ 2,529.45	0.97	\$ 2,454.67
1.000	D3 02 5140 4950	Boiler, steam, oil, gas, or comb. fired, over 1000 MBH, annualized	\$ 2,204.95	1.20	\$ 2,726.55	0.97	\$ 2,645.94
1.000	D3 02 5210 1950	Deaerator tank, annualized	\$ 177.46	1.20	\$ 219.44	0.97	\$ 212.95
1.000	D3 02 5310 1950	Pump, boiler fuel oil, annualized	\$ 168.96	1.20	\$ 208.93	0.97	\$ 202.75
1.000	D3 02 5310 2950	Pump, condensate return, over 1 H.P., annualized	\$ 160.46	1.20	\$ 198.41	0.97	\$ 192.55
1.000	D3 02 5310 3950	Pump, condensate return unit, 2 pumps, annualized	\$ 225.28	1.20	\$ 278.57	0.97	\$ 270.33
1.000	D3 03 5110 1950	Water cooling tower, up to 50 tons, annualized	\$ 435.68	1.20	\$ 538.74	0.97	\$ 522.81
1.000	D3 03 5110 2950	Water cooling tower, 50 thru 500 tons, annualized	\$ 924.49	1.20	\$ 1,143.18	0.97	\$ 1,109.38
1.000	D3 03 5110 3950	Water cooling tower, 500 thru 1000 tons, annualized	\$ 1,700.21	1.20	\$ 2,102.40	0.97	\$ 2,040.25
1.000	D3 03 5130 1950	Chiller, recip., air cooled, up to 25 tons, annualized	\$ 892.61	1.20	\$ 1,103.76	0.97	\$ 1,071.13
1.000	D3 03 5130 2950	Chiller, recip., air cooled, over 25 tons, annualized	\$ 1,168.89	1.20	\$ 1,445.40	0.97	\$ 1,402.67
1.000	D3 03 5135 1950	Chiller, recip., water cooled, up to 50 tons, annualized	\$ 743.84	1.20	\$ 919.80	0.97	\$ 892.61
1.000	D3 03 5135 2950	Chiller, recip., water cooled, over 50 tons, annualized	\$ 1,004.18	1.20	\$ 1,241.73	0.97	\$ 1,205.02
1.000	D3 03 5140 1950	Chiller, centrif., water cooled, up to 100 tons, annualized	\$ 2,576.87	1.20	\$ 3,186.45	0.97	\$ 3,092.25
1.000	D3 03 5140 2950	Chiller, centrif., water cooled, over 100 tons, annualized	\$ 3,187.89	1.20	\$ 3,942.00	0.97	\$ 3,825.46
1.000	D3 03 5150 1950	Chiller, absorption unit, up to 500 tons, annualized	\$ 637.58	1.20	\$ 788.40	0.97	\$ 765.09
1.000	D3 03 5150 2950	Chiller, absorption unit, 500 to 5000 tons, annualized	\$ 1,089.19	1.20	\$ 1,346.85	0.97	\$ 1,307.03
1.000	D3 03 5160 1950	Chiller, screw, water cooled, up to 100 tons, annualized	\$ 1,567.38	1.20	\$ 1,938.15	0.97	\$ 1,880.85
1.000	D3 03 5160 2950	Chiller, screw, water cooled, over 100 tons, annualized	\$ 1,779.90	1.20	\$ 2,200.95	0.97	\$ 2,135.88
1.000	D3 03 5170 1950	Evaporative cooler, annualized	\$ 142.39	1.20	\$ 176.08	0.97	\$ 170.87
1.000	D3 03 5180 1950	Evaporative cooler, rotating drum, annualized	\$ 157.27	1.20	\$ 194.47	0.97	\$ 188.72
1.000	D3 03 5210 1950	Condenser, air cooled, 3 tons to 25 tons, annualized	\$ 196.59	1.20	\$ 243.09	0.97	\$ 235.90

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE¹
ANNUALIZED

PROJECT:	EAST HALL							
LOCATION:	US NATIONAL AVERAGES							
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.20	Assumed Value						
Qty	Assembly Number	Description	Labor Hours	Total In-House	Total Incl. O&P	Location Factor	Location Adjusted Total O&P	De-Escalation Factor to July 2009 Costs
1.000	D3 03 5210 2950	Condenser, air cooled, 26 tons through 100 tons, annualized	1.99	\$ 200.00	\$ 242.00	1.095	\$ 264.99	0.97
1.000	D3 03 5210 3950	Condenser, air cooled, over 100 tons, annualized	2.19	\$ 245.00	\$ 294.00	1.095	\$ 321.93	0.97
1.000	D3 03 5220 1950	Condensing unit, air cooled, 3 to 25 tons, annualized	2.56	\$ 254.00	\$ 310.00	1.095	\$ 339.45	0.97
1.000	D3 03 5220 2950	Condensing unit, air cooled, 26 to 100 tons, annualized	2.98	\$ 310.00	\$ 375.00	1.095	\$ 410.63	0.97
1.000	D3 03 5220 3950	Condensing unit, air cooled, over 100 tons, annualized	3.51	\$ 375.00	\$ 450.00	1.095	\$ 492.75	0.97
1.000	D3 03 5240 1950	Condensing unit, water cooled, 3 to 24 tons, annualized	1.32	\$ 115.00	\$ 140.00	1.095	\$ 153.30	0.97
1.000	D3 03 5240 2950	Condensing unit, water cooled, 25 to 100 tons, annualized	2.85	\$ 258.00	\$ 315.00	1.095	\$ 344.93	0.97
1.000	D3 03 5240 3950	Condensing unit, water cooled, over 100 tons, annualized	2.85	\$ 305.00	\$ 365.00	1.095	\$ 399.68	0.97
1.000	D3 03 5260 1950	Compressor, DX Refrigeration, to 25 tons, annualized	2.44	\$ 173.00	\$ 214.00	1.095	\$ 234.33	0.97
1.000	D3 03 5260 2950	Compressor, DX refrigeration, 25 to 100 tons, annualized	3.14	\$ 216.00	\$ 269.00	1.095	\$ 294.56	0.97
1.000	D3 03 5290 1950	Fluid cooler, annualized	1.12	\$ 87.00	\$ 108.00	1.095	\$ 118.26	0.97
1.000	D3 04 5110 1950	Air handling unit, 3 thru 24 tons, annualized	2.06	\$ 232.00	\$ 279.00	1.095	\$ 305.51	0.97
1.000	D3 04 5110 2950	Air handling unit, 25 thru 50 tons, annualized	2.14	\$ 530.00	\$ 615.00	1.095	\$ 673.43	0.97
1.000	D3 04 5110 3950	Air handling unit, over 50 tons, annualized	3.27	\$ 715.00	\$ 840.00	1.095	\$ 919.80	0.97
1.000	D3 04 5112 1950	Air handling unit, computer room, annualized	3.42	\$ 281.00	\$ 345.00	1.095	\$ 377.78	0.97
1.000	D3 04 5120 1950	Fan coil unit, annualized	3.34	\$ 242.00	\$ 299.00	1.095	\$ 327.41	0.97
1.000	D3 04 5150 1950	Air filter, electrostatic, annualized	8.77	\$ 515.00	\$ 635.00	1.095	\$ 695.33	0.97
1.000	D3 04 5160 1950	VAV Boxes, annualized	0.93	\$ 68.00	\$ 84.00	1.095	\$ 91.98	0.97
1.000	D3 04 5170 1950	Fire dampers, annualized	1.16	\$ 80.50	\$ 100.00	1.095	\$ 109.50	0.97
1.000	D3 04 5210 1950	Fan, axial, up to 5,000 CFM, annualized	1.24	\$ 77.00	\$ 94.00	1.095	\$ 102.93	0.97

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE¹
ANNUALIZED

PROJECT:	EAST HALL						
LOCATION:	US NATIONAL AVERAGES						
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green	GREEN FACTOR	Adjusted Total with Green Factor OH&P	De-Escalation Factor to July 2009 Costs	Total with All Adjustments
1.000	D3 03 5210 2950	Condenser, air cooled, 26 tons through 100 tons, annualized	\$ 257.16	1.20	\$ 317.99	0.97	\$ 308.59
1.000	D3 03 5210 3950	Condenser, air cooled, over 100 tons, annualized	\$ 312.41	1.20	\$ 386.32	0.97	\$ 374.90
1.000	D3 03 5220 1950	Condensing unit, air cooled, 3 to 25 tons, annualized	\$ 329.41	1.20	\$ 407.34	0.97	\$ 395.30
1.000	D3 03 5220 2950	Condensing unit, air cooled, 26 to 100 tons, annualized	\$ 398.49	1.20	\$ 492.75	0.97	\$ 478.18
1.000	D3 03 5220 3950	Condensing unit, air cooled, over 100 tons, annualized	\$ 478.18	1.20	\$ 591.30	0.97	\$ 573.82
1.000	D3 03 5240 1950	Condensing unit, water cooled, 3 to 24 tons, annualized	\$ 148.77	1.20	\$ 183.96	0.97	\$ 178.52
1.000	D3 03 5240 2950	Condensing unit, water cooled, 25 to 100 tons, annualized	\$ 334.73	1.20	\$ 413.91	0.97	\$ 401.67
1.000	D3 03 5240 3950	Condensing unit, water cooled, over 100 tons, annualized	\$ 387.86	1.20	\$ 479.61	0.97	\$ 465.43
1.000	D3 03 5260 1950	Compressor, DX Refrigeration, to 25 tons, annualized	\$ 227.40	1.20	\$ 281.20	0.97	\$ 272.88
1.000	D3 03 5260 2950	Compressor, DX refrigeration, 25 to 100 tons, annualized	\$ 285.85	1.20	\$ 353.47	0.97	\$ 343.02
1.000	D3 03 5290 1950	Fluid cooler, annualized	\$ 114.76	1.20	\$ 141.91	0.97	\$ 137.72
1.000	D3 04 5110 1950	Air handling unit, 3 thru 24 tons, annualized	\$ 296.47	1.20	\$ 366.61	0.97	\$ 355.77
1.000	D3 04 5110 2950	Air handling unit, 25 thru 50 tons, annualized	\$ 653.52	1.20	\$ 808.11	0.97	\$ 784.22
1.000	D3 04 5110 3950	Air handling unit, over 50 tons, annualized	\$ 892.61	1.20	\$ 1,103.76	0.97	\$ 1,071.13
1.000	D3 04 5112 1950	Air handling unit, computer room, annualized	\$ 366.61	1.20	\$ 453.33	0.97	\$ 439.93
1.000	D3 04 5120 1950	Fan coil unit, annualized	\$ 317.73	1.20	\$ 392.89	0.97	\$ 381.27
1.000	D3 04 5150 1950	Air filter, electrostatic, annualized	\$ 674.77	1.20	\$ 834.39	0.97	\$ 809.72
1.000	D3 04 5160 1950	VAV Boxes, annualized	\$ 89.26	1.20	\$ 110.38	0.97	\$ 107.11
1.000	D3 04 5170 1950	Fire dampers, annualized	\$ 106.26	1.20	\$ 131.40	0.97	\$ 127.52
1.000	D3 04 5210 1950	Fan, axial, up to 5,000 CFM, annualized	\$ 99.89	1.20	\$ 123.52	0.97	\$ 119.86

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹								
ANNUALIZED								
PROJECT:	EAST HALL							
LOCATION:	US NATIONAL AVERAGES							
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.20	Assumed Value						
Qty	Assembly Number	Description	Labor Hours	Total In-House	Total Incl. O&P	Location Factor	Location Adjusted Total O&P	De-Escalation Factor to July 2009 Costs
1.000	D3 04 5210 2950	Fan, axial, 5,000 to 10,000 CFM, annualized	1.29	\$ 79.50	\$ 97.50	1.095	\$ 106.76	0.97
1.000	D3 04 5210 3950	Fan, axial, over 10,000 CFM, annualized	1.39	\$ 85.00	\$ 105.00	1.095	\$ 114.98	0.97
1.000	D3 04 5220 1950	Fan, centrifugal, up to 5,000 CFM, annualized	1.08	\$ 67.50	\$ 83.00	1.095	\$ 90.89	0.97
1.000	D3 04 5220 2950	Fan, centrifugal, 5,000 to 10,000 CFM, annualized	1.14	\$ 71.00	\$ 87.00	1.095	\$ 95.27	0.97
1.000	D3 04 5220 3950	Fan, centrifugal, over 10,000 CFM, annualized	1.18	\$ 73.50	\$ 90.00	1.095	\$ 98.55	0.97
1.000	D3 04 5250 1950	Hood and blower, annualized	2.32	\$ 218.00	\$ 259.00	1.095	\$ 283.61	0.97
1.000	D3 04 5410 1950	Centrifugal, over 1 HP, annualized	1.20	\$ 92.50	\$ 114.00	1.095	\$ 124.83	0.97
1.000	D3 04 5410 2950	Centrifugal, w/ reduction gear, over 1 H.P., annualized	1.28	\$ 98.00	\$ 121.00	1.095	\$ 132.50	0.97
1.000	D3 04 5420 1950	Pump w/ oil reservoir, electric, annualized	1.20	\$ 92.50	\$ 114.00	1.095	\$ 124.83	0.97
1.000	D3 04 5600 1950	Heat exchanger, steam, annualized	0.92	\$ 85.50	\$ 104.00	1.095	\$ 113.88	0.97
1.000	D3 05 5110 1950	Unit heater, gas radiant, annualized	1.01	\$ 68.00	\$ 84.50	1.095	\$ 92.53	0.97
1.000	D3 05 5110 2950	Unit heater, gas infrared, annualized	1.50	\$ 128.00	\$ 156.00	1.095	\$ 170.82	0.97
1.000	D3 05 5110 3950	Unit heater, steam, annualized	0.84	\$ 85.00	\$ 103.00	1.095	\$ 112.79	0.97
1.000	D3 05 5122 1950	Forced air heater, oil or gas fired, up to 120 MBH, annualized	5.80	\$ 490.00	\$ 600.00	1.095	\$ 657.00	0.97
1.000	D3 05 5122 2950	Forced air heater, oil or gas fired, over 120 MBH, annualized	7.41	\$ 635.00	\$ 775.00	1.095	\$ 848.63	0.97
1.000	D3 05 5210 1950	Package unit, air cooled, 3 thru 24 ton, annualized	2.40	\$ 229.00	\$ 278.00	1.095	\$ 304.41	0.97
1.000	D3 05 5210 2950	Package unit, air cooled, 25 thru 50 ton, annualized	3.25	\$ 315.00	\$ 380.00	1.095	\$ 416.10	0.97
1.000	D3 05 5220 1950	Package unit, water cooled, 3 thru 24 ton, annualized	2.40	\$ 229.00	\$ 278.00	1.095	\$ 304.41	0.97
1.000	D3 05 5220 2950	Package unit, water cooled, 25 thru 50 ton, annualized	3.25	\$ 315.00	\$ 380.00	1.095	\$ 416.10	0.97
1.000	D3 05 5230 1950	Package unit, computer room, annualized	4.34	\$ 340.00	\$ 420.00	1.095	\$ 459.90	0.97
1.000	D3 05 5240 1950	Package unit with duct gas heater, annualized	4.96	\$ 385.00	\$ 475.00	1.095	\$ 520.13	0.97
1.000	D3 05 5250 1950	Air conditioning,split system,DX air cooled,to 10 tons, annualized	3.54	\$ 305.00	\$ 370.00	1.095	\$ 405.15	0.97
1.000	D3 05 5250 2950	Air conditioning,split system,DX air cooled,over 10 tons, annualized	3.57	\$ 335.00	\$ 410.00	1.095	\$ 448.95	0.97
1.000	D3 05 5310 1950	Heat pump, air cooled, up to 5 ton, annualized	3.20	\$ 251.00	\$ 310.00	1.095	\$ 339.45	0.97
1.000	D3 05 5310 2950	Heat pump, air cooled, over 5 ton, annualized	3.59	\$ 305.00	\$ 375.00	1.095	\$ 410.63	0.97
1.000	D3 05 5320 1950	Heat pump, water cooled, up to 5 ton, annualized	3.56	\$ 274.00	\$ 335.00	1.095	\$ 366.83	0.97
1.000	D3 05 5320 2950	Heat pump, water cooled, over 5 ton, annualized	3.23	\$ 283.00	\$ 345.00	1.095	\$ 377.78	0.97
1.000	D3 06 5100 1950	Controls, central system, electro/pneumatic, annualized	1.92	\$ 168.00	\$ 205.00	1.095	\$ 224.48	0.97
1.000	D3 09 5110 1950	Air compressor, gas engine powered, annualized	16.57	\$ 1,325.00	\$ 1,600.00	1.095	\$ 1,752.00	0.97

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹							
ANNUALIZED							
PROJECT:	EAST HALL						
LOCATION:	US NATIONAL AVERAGES						
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green	GREEN FACTOR	Adjusted Total with Green Factor OH&P	De-Escalation Factor to July 2009 Costs	Total with All Adjustments
1.000	D3 04 5210 2950	Fan, axial, 5,000 to 10,000 CFM, annualized	\$ 103.61	1.20	\$ 128.12	0.97	\$ 124.33
1.000	D3 04 5210 3950	Fan, axial, over 10,000 CFM, annualized	\$ 111.58	1.20	\$ 137.97	0.97	\$ 133.89
1.000	D3 04 5220 1950	Fan, centrifugal, up to 5,000 CFM, annualized	\$ 88.20	1.20	\$ 109.06	0.97	\$ 105.84
1.000	D3 04 5220 2950	Fan, centrifugal, 5,000 to 10,000 CFM, annualized	\$ 92.45	1.20	\$ 114.32	0.97	\$ 110.94
1.000	D3 04 5220 3950	Fan, centrifugal, over 10,000 CFM, annualized	\$ 95.64	1.20	\$ 118.26	0.97	\$ 114.76
1.000	D3 04 5250 1950	Hood and blower, annualized	\$ 275.22	1.20	\$ 340.33	0.97	\$ 330.26
1.000	D3 04 5410 1950	Centrifugal, over 1 HP, annualized	\$ 121.14	1.20	\$ 149.80	0.97	\$ 145.37
1.000	D3 04 5410 2950	Centrifugal, w/ reduction gear, over 1 H.P., annualized	\$ 128.58	1.20	\$ 158.99	0.97	\$ 154.29
1.000	D3 04 5420 1950	Pump w/ oil reservoir, electric, annualized	\$ 121.14	1.20	\$ 149.80	0.97	\$ 145.37
1.000	D3 04 5600 1950	Heat exchanger, steam, annualized	\$ 110.51	1.20	\$ 136.66	0.97	\$ 132.62
1.000	D3 05 5110 1950	Unit heater, gas radiant, annualized	\$ 89.79	1.20	\$ 111.03	0.97	\$ 107.75
1.000	D3 05 5110 2950	Unit heater, gas infrared, annualized	\$ 165.77	1.20	\$ 204.98	0.97	\$ 198.92
1.000	D3 05 5110 3950	Unit heater, steam, annualized	\$ 109.45	1.20	\$ 135.34	0.97	\$ 131.34
1.000	D3 05 5122 1950	Forced air heater, oil or gas fired, up to 120 MBH, annualized	\$ 637.58	1.20	\$ 788.40	0.97	\$ 765.09
1.000	D3 05 5122 2950	Forced air heater, oil or gas fired, over 120 MBH, annualized	\$ 823.54	1.20	\$ 1,018.35	0.97	\$ 988.24
1.000	D3 05 5210 1950	Package unit, air cooled, 3 thru 24 ton, annualized	\$ 295.41	1.20	\$ 365.29	0.97	\$ 354.49
1.000	D3 05 5210 2950	Package unit, air cooled, 25 thru 50 ton, annualized	\$ 403.80	1.20	\$ 499.32	0.97	\$ 484.56
1.000	D3 05 5220 1950	Package unit, water cooled, 3 thru 24 ton, annualized	\$ 295.41	1.20	\$ 365.29	0.97	\$ 354.49
1.000	D3 05 5220 2950	Package unit, water cooled, 25 thru 50 ton, annualized	\$ 403.80	1.20	\$ 499.32	0.97	\$ 484.56
1.000	D3 05 5230 1950	Package unit, computer room, annualized	\$ 446.30	1.20	\$ 551.88	0.97	\$ 535.56
1.000	D3 05 5240 1950	Package unit with duct gas heater, annualized	\$ 504.75	1.20	\$ 624.15	0.97	\$ 605.70
1.000	D3 05 5250 1950	Air conditioning, split system, DX air cooled, to 10 tons, annualized	\$ 393.17	1.20	\$ 486.18	0.97	\$ 471.81
1.000	D3 05 5250 2950	Air conditioning, split system, DX air cooled, over 10 tons, annualized	\$ 435.68	1.20	\$ 538.74	0.97	\$ 522.81
1.000	D3 05 5310 1950	Heat pump, air cooled, up to 5 ton, annualized	\$ 329.41	1.20	\$ 407.34	0.97	\$ 395.30
1.000	D3 05 5310 2950	Heat pump, air cooled, over 5 ton, annualized	\$ 398.49	1.20	\$ 492.75	0.97	\$ 478.18
1.000	D3 05 5320 1950	Heat pump, water cooled, up to 5 ton, annualized	\$ 355.98	1.20	\$ 440.19	0.97	\$ 427.18
1.000	D3 05 5320 2950	Heat pump, water cooled, over 5 ton, annualized	\$ 366.61	1.20	\$ 453.33	0.97	\$ 439.93
1.000	D3 06 5100 1950	Controls, central system, electro/pneumatic, annualized	\$ 217.84	1.20	\$ 269.37	0.97	\$ 261.41
1.000	D3 09 5110 1950	Air compressor, gas engine powered, annualized	\$ 1,700.21	1.20	\$ 2,102.40	0.97	\$ 2,040.25

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE¹
ANNUALIZED

PROJECT:	EAST HALL							
LOCATION:	US NATIONAL AVERAGES							
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.20	Assumed Value						
Qty	Assembly Number	Description	Labor Hours	Total In-House	Total Incl. O&P	Location Factor	Location Adjusted Total O&P	De-Escalation Factor to July 2009 Costs
1.000	D3 09 5114 1950	Air compressor, centrifugal, to 40 H.P., annualized	3.41	\$ 286.00	\$ 350.00	1.095	\$ 383.25	0.97
1.000	D3 09 5114 2950	Air compressor, centrifugal, over 40 H.P., annualized	14.89	\$ 1,175.00	\$ 1,425.00	1.095	\$ 1,560.38	0.97
1.000	D3 09 5118 1950	Air compressor, reciprocating, less than 5 H.P., annualized	4.80	\$ 395.00	\$ 485.00	1.095	\$ 531.08	0.97
1.000	D3 09 5118 2950	Air compressor, reciprocating, 5 to 40 H.P., annualized	4.86	\$ 400.00	\$ 490.00	1.095	\$ 536.55	0.97
1.000	D3 09 5118 3950	Air compressor, reciprocating, over 40 H.P., annualized	5.72	\$ 455.00	\$ 560.00	1.095	\$ 613.20	0.97
1.000	D3 09 5210 1950	Steam humidification system, annualized	2.54	\$ 208.00	\$ 255.00	1.095	\$ 279.23	0.97
1.000	D3 09 5210 2950	Evaporative pan with heating coil humidification system, annualized	1.89	\$ 151.00	\$ 186.00	1.095	\$ 203.67	0.97
1.000	D3 09 5220 1950	Dehumidifier, desiccant wheel, annualized	5.06	\$ 430.00	\$ 515.00	1.095	\$ 563.93	0.97
1.000	D4 01 5100 1950	Backflow prevention device, up to 4", annualized	0.33	\$ 21.50	\$ 27.00	1.095	\$ 29.57	0.97
1.000	D4 01 5100 2950	Backflow prevention device, over 4", annualized	0.49	\$ 32.00	\$ 40.00	1.095	\$ 43.80	0.97
1.000	D4 01 5150 1950	Extinguishing system, wet pipe, annualized	11.34	\$ 870.00	\$ 1,075.00	1.095	\$ 1,177.13	0.97
1.000	D4 01 5180 1950	Extinguishing system, deluge / preaction, annualized	11.57	\$ 885.00	\$ 1,075.00	1.095	\$ 1,177.13	0.97
1.000	D4 01 5210 1950	Fire pump, electric motor driven, annualized	47.74	\$ 3,100.00	\$ 3,875.00	1.095	\$ 4,243.13	0.97
1.000	D4 01 5250 1950	Fire pump, motor/engine driven, annualized	69.88	\$ 4,575.00	\$ 5,700.00	1.095	\$ 6,241.50	0.97
1.000	D4 01 5310 1950	Extinguishing system, dry pipe, annualized	13.02	\$ 1,025.00	\$ 1,250.00	1.095	\$ 1,368.75	0.97
1.000	D4 09 5100 1950	Extinguishing system, CO2, annualized	9.47	\$ 795.00	\$ 975.00	1.095	\$ 1,067.63	0.97
1.000	D4 09 5200 1950	Extinguishing system, foam bottle, annualized	3.71	\$ 231.00	\$ 289.00	1.095	\$ 316.46	0.97
1.000	D4 09 5210 1950	Extinguishing system, foam pump electric, annualized	17.76	\$ 1,275.00	\$ 1,575.00	1.095	\$ 1,724.63	0.97
1.000	D4 09 5220 1950	Extinguishing system, foam pump diesel, annualized	22.16	\$ 1,625.00	\$ 2,000.00	1.095	\$ 2,190.00	0.97
1.000	D4 09 5400 1950	Extinguishing system, dry chemical, annualized	5.61	\$ 555.00	\$ 670.00	1.095	\$ 733.65	0.97
1.000	D4 09 5450 1950	Extinguishing system, FM200, annualized	9.26	\$ 740.00	\$ 905.00	1.095	\$ 990.98	0.97

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹							
ANNUALIZED							
PROJECT:	EAST HALL						
LOCATION:	US NATIONAL AVERAGES						
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green	GREEN FACTOR	Adjusted Total with Green Factor OH&P	De-Escalation Factor to July 2009 Costs	Total with All Adjustments
1.000	D3 09 5114 1950	Air compressor, centrifugal, to 40 H.P., annualized	\$ 371.92	1.20	\$ 459.90	0.97	\$ 446.30
1.000	D3 09 5114 2950	Air compressor, centrifugal, over 40 H.P., annualized	\$ 1,514.25	1.20	\$ 1,872.45	0.97	\$ 1,817.09
1.000	D3 09 5118 1950	Air compressor, reciprocating, less than 5 H.P., annualized	\$ 515.37	1.20	\$ 637.29	0.97	\$ 618.45
1.000	D3 09 5118 2950	Air compressor, reciprocating, 5 to 40 H.P., annualized	\$ 520.69	1.20	\$ 643.86	0.97	\$ 624.83
1.000	D3 09 5118 3950	Air compressor, reciprocating, over 40 H.P., annualized	\$ 595.07	1.20	\$ 735.84	0.97	\$ 714.09
1.000	D3 09 5210 1950	Steam humidification system, annualized	\$ 270.97	1.20	\$ 335.07	0.97	\$ 325.16
1.000	D3 09 5210 2950	Evaporative pan with heating coil humidification system, annualized	\$ 197.65	1.20	\$ 244.40	0.97	\$ 237.18
1.000	D3 09 5220 1950	Dehumidifier, desiccant wheel, annualized	\$ 547.25	1.20	\$ 676.71	0.97	\$ 656.70
1.000	D4 01 5100 1950	Backflow prevention device, up to 4", annualized	\$ 28.69	1.20	\$ 35.48	0.97	\$ 34.43
1.000	D4 01 5100 2950	Backflow prevention device, over 4", annualized	\$ 42.51	1.20	\$ 52.56	0.97	\$ 51.01
1.000	D4 01 5150 1950	Extinguishing system, wet pipe, annualized	\$ 1,142.33	1.20	\$ 1,412.55	0.97	\$ 1,370.79
1.000	D4 01 5180 1950	Extinguishing system, deluge / preaction, annualized	\$ 1,142.33	1.20	\$ 1,412.55	0.97	\$ 1,370.79
1.000	D4 01 5210 1950	Fire pump, electric motor driven, annualized	\$ 4,117.69	1.20	\$ 5,091.75	0.97	\$ 4,941.22
1.000	D4 01 5250 1950	Fire pump, motor/engine driven, annualized	\$ 6,056.98	1.20	\$ 7,489.80	0.97	\$ 7,268.38
1.000	D4 01 5310 1950	Extinguishing system, dry pipe, annualized	\$ 1,328.29	1.20	\$ 1,642.50	0.97	\$ 1,593.94
1.000	D4 09 5100 1950	Extinguishing system, CO2, annualized	\$ 1,036.06	1.20	\$ 1,281.15	0.97	\$ 1,243.28
1.000	D4 09 5200 1950	Extinguishing system, foam bottle, annualized	\$ 307.10	1.20	\$ 379.75	0.97	\$ 368.52
1.000	D4 09 5210 1950	Extinguishing system, foam pump electric, annualized	\$ 1,673.64	1.20	\$ 2,069.55	0.97	\$ 2,008.37
1.000	D4 09 5220 1950	Extinguishing system, foam pump diesel, annualized	\$ 2,125.26	1.20	\$ 2,628.00	0.97	\$ 2,550.31
1.000	D4 09 5400 1950	Extinguishing system, dry chemical, annualized	\$ 711.96	1.20	\$ 880.38	0.97	\$ 854.35
1.000	D4 09 5450 1950	Extinguishing system, FM200, annualized	\$ 961.68	1.20	\$ 1,189.17	0.97	\$ 1,154.01
			\$ 74,713.41				\$ 89,656.09
			\$ 18,678.35	Assumed 25%		Assumed 25%	\$ 22,414.02
			Non-Green	Of Total per year		Of Total per year	Green

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹								
ANNUALIZED								
PROJECT:	EAST HALL							
LOCATION:	US NATIONAL AVERAGES							
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.20	Assumed Value						
Qty	Assembly Number	Description	Labor Hours	Total In-House	Total Incl. O&P	Location Factor	Location Adjusted Total O&P	De-Escalation Factor to July 2009 Costs
SUMMARY OF FINDINGS								
		Description	Cost	% Difference	Comments			
		Yearly Non-Green Preventative Maintenance Costs	\$ 18,678.35					
		Yearly Green Preventative Maintenance Costs	\$ 22,414.02	16.67%	Green Costs are 16.67% higher than Non-Green based on this analysis			
FOOTNOTES:								
1	RS Means CostWorks 2010 Operations and Maintenance							

Appendix C-M2 FMRR Costs

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 - EAST HALL											
Based on National Averages											
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN											
Escalation	6%										
De-Escalation to July 2009	1.03										NON-GREEN
De-Escalation Factor to be Applied	0.97										
Green Factor	1.20	Assumed Value									
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Incl. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor
1.000	D3 04 3140 0020	Maintenance and inspection duct heater	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97
1.000	D3 05 3112 0020	Maintenance and inspection infrared heater suspended, commercial	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97
1.000	D3 05 3114 0020	Maintenance and inspection standard suspended heater	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97
1.000	D3 05 3116 0020	Maintenance and inspection explosionproof industrial heater	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97
1.000	D3 05 3160 0020	Maintenance and inspection convector suspended, commercial	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97
1.000	D3 05 3410 0020	Maintenance and inspection baseboard heating units	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97
							\$ 411.00	\$ 516.00			
1.000	D3 01 3160 0010	Preventive maintenance oil filter	1	1 Stpl	Ea.	0.05	\$ 5.45	\$ 6.60	1.095	\$ 7.23	0.97
1.000	D3 05 3112 0010	Maintenance and repair infrared heater suspended, commercial	1	1 Elec	Ea.	0.62	\$ 37.00	\$ 46.50	1.095	\$ 50.92	0.97
1.000	D3 05 3150 0020	Maintenance and inspection wall mounted/recessed heater, with fan	1	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97
1.000	D4 01 3310 1020	Inspect sprinkler system	1	1 Plum	Ea.	0.47	\$ 30.20	\$ 37.80	1.095	\$ 41.39	0.97
1.000	D4 01 3310 1040	Rebuild double check 3" backflow preventer sprinkler system	1	1 Plum	Ea.	5.21	\$ 694.00	\$ 825.00	1.095	\$ 903.38	0.97
1.000	D4 01 3310 1050	Rebuild double check 4" backflow preventer sprinkler system	1	1 Plum	Ea.	5.86	\$ 864.00	\$ 1,025.00	1.095	\$ 1,122.38	0.97
1.000	D4 01 3310 1060	Rebuild double check 6" backflow preventer sprinkler system	1	1 Plum	Ea.	6.50	\$ 994.00	\$ 1,180.00	1.095	\$ 1,292.10	0.97
1.000	D4 01 3310 1070	Rebuild reduced pressure 3" backflow preventer sprinkler system	1	1 Plum	Ea.	5.21	\$ 694.00	\$ 825.00	1.095	\$ 903.38	0.97
1.000	D4 01 3310 1080	Rebuild reduced pressure 4" backflow preventer sprinkler system	1	1 Plum	Ea.	5.86	\$ 864.00	\$ 1,025.00	1.095	\$ 1,122.38	0.97
1.000	D4 01 3310 1090	Rebuild reduced pressure 6" backflow preventer sprinkler system	1	1 Plum	Ea.	6.50	\$ 994.00	\$ 1,180.00	1.095	\$ 1,292.10	0.97
							\$ 5,245.15	\$ 6,236.90			
1.000	D3 04 3310 0020	Inspect for leaks steam converter	2	1 Stpl	Ea.	0.09	\$ 5.94	\$ 7.42	1.095	\$ 8.12	0.97
1.000	D3 05 3114 0010	Maintenance and repair standard suspended heater	2	1 Elec	Ea.	0.60	\$ 94.55	\$ 111.35	1.095	\$ 121.93	0.97
1.000	D3 05 3116 0010	Maintenance and repair explosionproof industrial heater	2	1 Elec	Ea.	0.82	\$ 132.00	\$ 156.05	1.095	\$ 170.87	0.97
1.000	D3 05 3160 0010	Maintenance and repair convector suspended, commercial	2	1 Elec	Ea.	0.62	\$ 37.00	\$ 46.50	1.095	\$ 50.92	0.97
1.000	D3 05 3410 0010	Maintenance and repair baseboard heating units	2	1 Elec	Ea.	0.62	\$ 37.00	\$ 46.50	1.095	\$ 50.92	0.97
							\$ 306.49	\$ 367.82			
1.000	D3 04 3520 3010	Repack drain valve gland, 3/4" valves	3	1 Stpl	Ea.	0.22	\$ 23.00	\$ 27.50	1.095	\$ 30.11	0.97
							\$ 23.00	\$ 27.50			

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹								
CostWorks 2010 - EAST HALL								
Based on National Averages								
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN								
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.20	Assumed Value						
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments	
1.000	D3 04 3140 0020	Maintenance and inspection duct heater	\$ 91.39	1.20	\$ 113.00	0.97	\$ 109.66	
1.000	D3 05 3112 0020	Maintenance and inspection infrared heater suspended, commercial	\$ 91.39	1.20	\$ 113.00	0.97	\$ 109.66	
1.000	D3 05 3114 0020	Maintenance and inspection standard suspended heater	\$ 91.39	1.20	\$ 113.00	0.97	\$ 109.66	
1.000	D3 05 3116 0020	Maintenance and inspection explosionproof industrial heater	\$ 91.39	1.20	\$ 113.00	0.97	\$ 109.66	
1.000	D3 05 3160 0020	Maintenance and inspection convector suspended, commercial	\$ 91.39	1.20	\$ 113.00	0.97	\$ 109.66	
1.000	D3 05 3410 0020	Maintenance and inspection baseboard heating units	\$ 91.39	1.20	\$ 113.00	0.97	\$ 109.66	
			\$ 548.32				\$ 657.98	
			\$ 274.16	Assume 50% required		Assume 50% required	\$ 328.99	
				PER 0.5 YEAR		PER 0.5 YEAR		
1.000	D3 01 3160 0010	Preventive maintenance oil filter	\$ 7.01	1.20	\$ 8.67	0.97	\$ 8.42	
1.000	D3 05 3112 0010	Maintenance and repair infrared heater suspended, commercial	\$ 49.41	1.20	\$ 61.10	0.97	\$ 59.29	
1.000	D3 05 3150 0020	Maintenance and inspection wall mounted/recessed heater, with fan	\$ 91.39	1.20	\$ 113.00	0.97	\$ 109.66	
1.000	D4 01 3310 1020	Inspect sprinkler system	\$ 40.17	1.20	\$ 49.67	0.97	\$ 48.20	
1.000	D4 01 3310 1040	Rebuild double check 3" backflow preventer sprinkler system	\$ 876.67	1.20	\$ 1,084.05	0.97	\$ 1,052.00	
1.000	D4 01 3310 1050	Rebuild double check 4" backflow preventer sprinkler system	\$ 1,089.19	1.20	\$ 1,346.85	0.97	\$ 1,307.03	
1.000	D4 01 3310 1060	Rebuild double check 6" backflow preventer sprinkler system	\$ 1,253.90	1.20	\$ 1,550.52	0.97	\$ 1,504.68	
1.000	D4 01 3310 1070	Rebuild reduced pressure 3" backflow preventer sprinkler system	\$ 876.67	1.20	\$ 1,084.05	0.97	\$ 1,052.00	
1.000	D4 01 3310 1080	Rebuild reduced pressure 4" backflow preventer sprinkler system	\$ 1,089.19	1.20	\$ 1,346.85	0.97	\$ 1,307.03	
1.000	D4 01 3310 1090	Rebuild reduced pressure 6" backflow preventer sprinkler system	\$ 1,253.90	1.20	\$ 1,550.52	0.97	\$ 1,504.68	
			\$ 6,627.51				\$ 7,953.01	
			\$ 3,313.75	Assume 50% required		Assume 50% required	\$ 3,976.50	
				PER YEAR		PER YEAR		
1.000	D3 04 3310 0020	Inspect for leaks steam converter	\$ 7.88	1.20	\$ 9.75	0.97	\$ 9.46	
1.000	D3 05 3114 0010	Maintenance and repair standard suspended heater	\$ 118.32	1.20	\$ 146.31	0.97	\$ 141.99	
1.000	D3 05 3116 0010	Maintenance and repair explosionproof industrial heater	\$ 165.82	1.20	\$ 205.05	0.97	\$ 198.99	
1.000	D3 05 3160 0010	Maintenance and repair convector suspended, commercial	\$ 49.41	1.20	\$ 61.10	0.97	\$ 59.29	
1.000	D3 05 3410 0010	Maintenance and repair baseboard heating units	\$ 49.41	1.20	\$ 61.10	0.97	\$ 59.29	
			\$ 390.86				\$ 469.03	
			\$ 195.43	Assume 50% required		Assume 50% required	\$ 234.51	
				PER 2 YEARS		PER 2 YEARS		
1.000	D3 04 3520 3010	Repack drain valve gland, 3/4" valves	\$ 29.22	1.20	\$ 36.14	0.97	\$ 35.07	
			\$ 29.22				\$ 35.07	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation	6%											
De-Escalation to July 2009	1.03											NON-GREEN
De-Escalation Factor to be Applied	0.97											
Green Factor	1.20	Assumed Value										

Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Incl. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor
1.000	D3 01 3150 0010	Preventive maintenance fuel level meter	5	1 Stpl	Ea.	0.50	\$ 32.00	\$ 40.00	1.095	\$ 43.80	0.97
1.000	D3 01 3240 0010	Check gas pressure natural gas, pressure reducing valve	5	1 Stpl	Ea.	0.13	\$ 8.35	\$ 10.45	1.095	\$ 11.44	0.97
1.000	D3 04 3310 0010	Repair steam converter	5	1 Stpl	Ea.	5.94	\$ 380.00	\$ 480.00	1.095	\$ 525.60	0.97
1.000	D3 04 3320 0010	Repair flash tank 24 gallon	5	1 Stpl	Ea.	5.94	\$ 380.00	\$ 480.00	1.095	\$ 525.60	0.97
1.000	D3 04 3530 1010	Repair circulator pump, 1/12 - 3/4 H.P.	5	1 Stpl	Ea.	0.51	\$ 80.33	\$ 94.55	1.095	\$ 103.53	0.97
1.000	D3 04 3530 2010	Repair circulator pump, 1 H.P.	5	1 Stpl	Ea.	0.51	\$ 80.53	\$ 94.80	1.095	\$ 103.81	0.97
1.000	D3 04 3540 0010	Refill expansion tank	5	1 Stpl	Ea.	0.20	\$ 12.85	\$ 16.10	1.095	\$ 17.63	0.97
1.000	D3 04 3550 1010	Repair damaged pipe insulation, fiberglass 1/2"	5	Q14	Ea.	0.26	\$ 15.88	\$ 19.50	1.095	\$ 21.35	0.97
1.000	D3 04 3550 1110	Repair damaged pipe insulation, fiberglass 3/4"	5	Q14	Ea.	0.27	\$ 16.70	\$ 20.45	1.095	\$ 22.39	0.97
1.000	D3 04 3550 1120	Repair damaged pipe insulation, fiberglass 1"	5	Q14	Ea.	0.28	\$ 17.50	\$ 21.40	1.095	\$ 23.43	0.97
1.000	D3 04 3550 1130	Repair damaged pipe insulation, fbgs 1-1/4"	5	Q14	Ea.	0.30	\$ 18.35	\$ 22.55	1.095	\$ 24.69	0.97
1.000	D3 04 3550 1140	Repair damaged pipe insulation, fbgs 1-1/2"	5	Q14	Ea.	0.30	\$ 18.65	\$ 22.80	1.095	\$ 24.97	0.97
1.000	D3 04 3550 1150	Repair damaged pipe insulation, fiberglass 2"	5	Q14	Ea.	0.31	\$ 19.60	\$ 24.10	1.095	\$ 26.39	0.97
1.000	D3 04 3550 1160	Repair damaged pipe insulation, fiberglass 3"	5	Q14	Ea.	0.35	\$ 22.25	\$ 27.10	1.095	\$ 29.67	0.97
1.000	D3 04 3550 1170	Repair damaged pipe insulation, fiberglass 4"	5	Q14	Ea.	0.42	\$ 27.20	\$ 33.15	1.095	\$ 36.30	0.97
1.000	D3 04 3550 1180	Repair damaged pipe insulation, fiberglass 6"	5	Q14	Ea.	0.52	\$ 33.70	\$ 40.90	1.095	\$ 44.79	0.97
1.000	D3 04 3550 1220	Replace pipe insulation, fiberglass 1/2"	5	Q14	M.L.F.	100.00	\$ 6,375.00	\$ 7,775.00	1.095	\$ 8,513.63	0.97
1.000	D3 04 3550 1230	Replace pipe insulation, fiberglass 3/4"	5	Q14	M.L.F.	104.35	\$ 6,675.00	\$ 8,175.00	1.095	\$ 8,951.63	0.97
1.000	D3 04 3550 1240	Replace pipe insulation, fiberglass 1"	5	Q14	M.L.F.	109.09	\$ 7,025.00	\$ 8,575.00	1.095	\$ 9,389.63	0.97
1.000	D3 04 3550 1250	Replace pipe insulation, fiberglass 1-1/4"	5	Q14	M.L.F.	114.29	\$ 7,375.00	\$ 9,025.00	1.095	\$ 9,882.38	0.97
1.000	D3 04 3550 1260	Replace pipe insulation, fiberglass 1-1/2"	5	Q14	M.L.F.	114.29	\$ 7,525.00	\$ 9,150.00	1.095	\$ 10,019.25	0.97
1.000	D3 04 3550 1270	Replace pipe insulation, fiberglass 2"	5	Q14	M.L.F.	120.00	\$ 7,925.00	\$ 9,650.00	1.095	\$ 10,566.75	0.97
1.000	D3 04 3550 1280	Replace pipe insulation, fiberglass 3"	5	Q14	M.L.F.	133.33	\$ 8,950.00	\$ 10,925.00	1.095	\$ 11,962.88	0.97
1.000	D3 04 3550 1290	Replace pipe insulation, fiberglass 4"	5	Q14	M.L.F.	160.00	\$ 10,975.00	\$ 13,350.00	1.095	\$ 14,618.25	0.97
1.000	D3 04 3550 1300	Replace pipe insulation, fiberglass 6"	5	Q14	M.L.F.	200.00	\$ 13,650.00	\$ 16,575.00	1.095	\$ 18,149.63	0.97
1.000	D3 04 3550 1410	Repair damaged pipe insulation rubber 1/2"	5	1 Asbe	Ea.	0.35	\$ 22.90	\$ 28.20	1.095	\$ 30.88	0.97
1.000	D3 04 3550 1420	Repair damaged pipe insulation rubber 3/4"	5	1 Asbe	Ea.	0.35	\$ 23.40	\$ 28.55	1.095	\$ 31.26	0.97
1.000	D3 04 3550 1430	Repair damaged pipe insulation rubber 1"	5	1 Asbe	Ea.	0.36	\$ 23.95	\$ 29.65	1.095	\$ 32.47	0.97
1.000	D3 04 3550 1440	Repair damaged pipe insulation rubber 1-1/4"	5	1 Asbe	Ea.	0.36	\$ 25.35	\$ 31.25	1.095	\$ 34.22	0.97
1.000	D3 04 3550 1450	Repair damaged pipe insulation rubber 1-1/2"	5	1 Asbe	Ea.	0.36	\$ 25.85	\$ 31.75	1.095	\$ 34.77	0.97
1.000	D3 04 3550 1460	Repair damaged pipe insulation rubber 2"	5	1 Asbe	Ea.	0.36	\$ 26.95	\$ 32.85	1.095	\$ 35.97	0.97
1.000	D3 04 3550 1470	Repair damaged pipe insulation rubber 3"	5	1 Asbe	Ea.	0.37	\$ 30.20	\$ 36.45	1.095	\$ 39.91	0.97
1.000	D3 04 3550 1480	Repair damaged pipe insulation rubber 4"	5	1 Asbe	Ea.	0.39	\$ 33.65	\$ 40.50	1.095	\$ 44.35	0.97
1.000	D3 04 3550 1490	Repair damaged pipe insulation rubber 6"	5	1 Asbe	Ea.	0.39	\$ 38.65	\$ 46.50	1.095	\$ 50.92	0.97
1.000	D3 04 3550 1510	Replace pipe insulation foam rubber 1/2"	5	1 Asbe	L.F.	0.27	\$ 18.10	\$ 22.20	1.095	\$ 24.31	0.97

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
			\$ 14.61	Assume 50% required		Assume 50% required	\$ 17.53
				PER 3 YEARS		PER 3 YEARS	
1.000	D3 01 3150 0010	Preventive maintenance fuel level meter	\$ 42.51	1.20	\$ 52.56	0.97	\$ 51.01
1.000	D3 01 3240 0010	Check gas pressure natural gas, pressure reducing valve	\$ 11.10	1.20	\$ 13.73	0.97	\$ 13.33
1.000	D3 04 3310 0010	Repair steam converter	\$ 510.06	1.20	\$ 630.72	0.97	\$ 612.07
1.000	D3 04 3320 0010	Repair flash tank 24 gallon	\$ 510.06	1.20	\$ 630.72	0.97	\$ 612.07
1.000	D3 04 3530 1010	Repair circulator pump, 1/12 - 3/4 H.P.	\$ 100.47	1.20	\$ 124.24	0.97	\$ 120.57
1.000	D3 04 3530 2010	Repair circulator pump, 1 H.P.	\$ 100.74	1.20	\$ 124.57	0.97	\$ 120.88
1.000	D3 04 3540 0010	Refill expansion tank	\$ 17.11	1.20	\$ 21.16	0.97	\$ 20.53
1.000	D3 04 3550 1010	Repair damaged pipe insulation, fiberglass 1/2"	\$ 20.72	1.20	\$ 25.62	0.97	\$ 24.87
1.000	D3 04 3550 1110	Repair damaged pipe insulation, fiberglass 3/4"	\$ 21.73	1.20	\$ 26.87	0.97	\$ 26.08
1.000	D3 04 3550 1120	Repair damaged pipe insulation, fiberglass 1"	\$ 22.74	1.20	\$ 28.12	0.97	\$ 27.29
1.000	D3 04 3550 1130	Repair damaged pipe insulation, fbgs 1-1/4"	\$ 23.96	1.20	\$ 29.63	0.97	\$ 28.75
1.000	D3 04 3550 1140	Repair damaged pipe insulation, fbgs 1-1/2"	\$ 24.23	1.20	\$ 29.96	0.97	\$ 29.07
1.000	D3 04 3550 1150	Repair damaged pipe insulation, fiberglass 2"	\$ 25.61	1.20	\$ 31.67	0.97	\$ 30.73
1.000	D3 04 3550 1160	Repair damaged pipe insulation, fiberglass 3"	\$ 28.80	1.20	\$ 35.61	0.97	\$ 34.56
1.000	D3 04 3550 1170	Repair damaged pipe insulation, fiberglass 4"	\$ 35.23	1.20	\$ 43.56	0.97	\$ 42.27
1.000	D3 04 3550 1180	Repair damaged pipe insulation, fiberglass 6"	\$ 43.46	1.20	\$ 53.74	0.97	\$ 52.15
1.000	D3 04 3550 1220	Replace pipe insulation, fiberglass 1/2"	\$ 8,261.94	1.20	\$ 10,216.35	0.97	\$ 9,914.32
1.000	D3 04 3550 1230	Replace pipe insulation, fiberglass 3/4"	\$ 8,686.99	1.20	\$ 10,741.95	0.97	\$ 10,424.39
1.000	D3 04 3550 1240	Replace pipe insulation, fiberglass 1"	\$ 9,112.04	1.20	\$ 11,267.55	0.97	\$ 10,934.45
1.000	D3 04 3550 1250	Replace pipe insulation, fiberglass 1-1/4"	\$ 9,590.22	1.20	\$ 11,858.85	0.97	\$ 11,508.27
1.000	D3 04 3550 1260	Replace pipe insulation, fiberglass 1-1/2"	\$ 9,723.05	1.20	\$ 12,023.10	0.97	\$ 11,667.66
1.000	D3 04 3550 1270	Replace pipe insulation, fiberglass 2"	\$ 10,254.37	1.20	\$ 12,680.10	0.97	\$ 12,305.24
1.000	D3 04 3550 1280	Replace pipe insulation, fiberglass 3"	\$ 11,609.22	1.20	\$ 14,355.45	0.97	\$ 13,931.06
1.000	D3 04 3550 1290	Replace pipe insulation, fiberglass 4"	\$ 14,186.09	1.20	\$ 17,541.90	0.97	\$ 17,023.31
1.000	D3 04 3550 1300	Replace pipe insulation, fiberglass 6"	\$ 17,613.07	1.20	\$ 21,779.55	0.97	\$ 21,135.68
1.000	D3 04 3550 1410	Repair damaged pipe insulation rubber 1/2"	\$ 29.97	1.20	\$ 37.05	0.97	\$ 36.96
1.000	D3 04 3550 1420	Repair damaged pipe insulation rubber 3/4"	\$ 30.34	1.20	\$ 37.51	0.97	\$ 36.41
1.000	D3 04 3550 1430	Repair damaged pipe insulation rubber 1"	\$ 31.51	1.20	\$ 38.96	0.97	\$ 37.81
1.000	D3 04 3550 1440	Repair damaged pipe insulation rubber 1-1/4"	\$ 33.21	1.20	\$ 41.06	0.97	\$ 39.85
1.000	D3 04 3550 1450	Repair damaged pipe insulation rubber 1-1/2"	\$ 33.74	1.20	\$ 41.72	0.97	\$ 40.49
1.000	D3 04 3550 1460	Repair damaged pipe insulation rubber 2"	\$ 34.91	1.20	\$ 43.16	0.97	\$ 41.89
1.000	D3 04 3550 1470	Repair damaged pipe insulation rubber 3"	\$ 38.73	1.20	\$ 47.90	0.97	\$ 46.48
1.000	D3 04 3550 1480	Repair damaged pipe insulation rubber 4"	\$ 43.04	1.20	\$ 53.22	0.97	\$ 51.64
1.000	D3 04 3550 1490	Repair damaged pipe insulation rubber 6"	\$ 49.41	1.20	\$ 61.10	0.97	\$ 59.29
1.000	D3 04 3550 1510	Replace pipe insulation foam rubber 1/2"	\$ 23.59	1.20	\$ 29.17	0.97	\$ 28.31

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation	6%											
De-Escalation to July 2009	1.03											NON-GREEN
De-Escalation Factor to be Applied	0.97											
Green Factor	1.20	Assumed Value										
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Incl. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 04 3550 1520	Replace pipe insulation foam rubber 3/4"	5	1 Asbe	L.F.	0.27	\$ 18.60	\$ 22.75	1.095	\$ 24.91	0.97	
1.000	D3 04 3550 1530	Replace pipe insulation foam rubber 1"	5	1 Asbe	L.F.	0.27	\$ 19.15	\$ 23.50	1.095	\$ 25.73	0.97	
1.000	D3 04 3550 1540	Replace pipe insulation foam rubber 1-1/4"	5	1 Asbe	L.F.	0.28	\$ 20.40	\$ 24.85	1.095	\$ 27.21	0.97	
1.000	D3 04 3550 1550	Replace pipe insulation foam rubber 1-1/2"	5	1 Asbe	L.F.	0.28	\$ 21.00	\$ 25.50	1.095	\$ 27.92	0.97	
1.000	D3 04 3550 1560	Replace pipe insulation foam rubber 2"	5	1 Asbe	L.F.	0.28	\$ 22.00	\$ 26.70	1.095	\$ 29.24	0.97	
1.000	D3 04 3550 1570	Replace pipe insulation foam rubber 3"	5	1 Asbe	L.F.	0.28	\$ 25.15	\$ 30.40	1.095	\$ 33.29	0.97	
1.000	D3 04 3550 1580	Replace pipe insulation foam rubber 4"	5	1 Asbe	L.F.	0.30	\$ 28.40	\$ 34.30	1.095	\$ 37.56	0.97	
1.000	D3 04 3550 1590	Replace pipe insulation foam rubber 6"	5	1 Asbe	L.F.	0.30	\$ 33.40	\$ 39.80	1.095	\$ 43.58	0.97	
1.000	D3 05 3150 0010	Maintenance and repair wall mounted/recessed heater, with fan	5	1 Elec	Ea.	0.98	\$ 136.05	\$ 161.85	1.095	\$ 177.23	0.97	
							\$ 78,232.04	\$ 95,365.40				
1.000	D3 04 3330 0010	Replace steam regulator valve 1-1/2" diameter	6	1 Stpl	Ea.	1.20	\$ 2,200.50	\$ 2,507.00	1.095	\$ 2,745.17	0.97	
1.000	D3 04 3330 0110	Replace steam regulator valve 2" diameter	6	1 Stpl	Ea.	1.42	\$ 2,680.50	\$ 3,063.00	1.095	\$ 3,353.99	0.97	
1.000	D3 04 3330 0210	Replace steam regulator valve 2-1/2" diameter	6	Q5	Ea.	2.60	\$ 3,400.00	\$ 3,887.50	1.095	\$ 4,256.81	0.97	
1.000	D3 04 3330 0310	Replace steam regulator valve 3" diameter	6	Q5	Ea.	2.84	\$ 4,229.50	\$ 4,818.50	1.095	\$ 5,276.26	0.97	
							\$ 12,510.50	\$ 14,276.00				
1.000	D3 02 3180 1010	Repair boiler, gas, 250 MBH	7	1 Stpl	Ea.	9.87	\$ 1,724.80	\$ 2,035.70	1.095	\$ 2,229.09	0.97	
1.000	D3 02 3180 2010	Repair boiler, gas, 2000 MBH	7	Q5	Ea.	19.53	\$ 4,553.55	\$ 5,294.20	1.095	\$ 5,797.15	0.97	
1.000	D3 02 3180 3010	Repair boiler, gas, 10,000 MBH	7	Q5	Ea.	38.04	\$ 14,628.05	\$ 16,867.20	1.095	\$ 18,469.58	0.97	
1.000	D3 02 3184 1010	Repair boiler, oil, 250 MBH	7	Q5	Ea.	10.49	\$ 1,325.20	\$ 1,585.70	1.095	\$ 1,736.34	0.97	
1.000	D3 02 3184 2010	Repair boiler, oil, 2000 MBH	7	1 Stpl	Ea.	10.78	\$ 1,337.45	\$ 1,597.70	1.095	\$ 1,749.48	0.97	
1.000	D3 02 3184 3010	Repair boiler, oil, 10,000 MBH	7	1 Stpl	Ea.	11.16	\$ 1,494.10	\$ 1,778.20	1.095	\$ 1,947.13	0.97	
1.000	D3 02 3186 1010	Repair boiler, gas/oil, 2000 MBH	7	Q5	Ea.	22.94	\$ 4,958.60	\$ 5,780.20	1.095	\$ 6,329.32	0.97	
1.000	D3 02 3186 2010	Repair boiler, gas/oil, 20,000 MBH	7	Q5	Ea.	43.27	\$ 15,233.40	\$ 17,587.60	1.095	\$ 19,258.42	0.97	
1.000	D3 04 3350 1030	Replace steam trap, 15 PSIG, 3/4" threaded	7	1 Stpl	Ea.	0.98	\$ 178.00	\$ 210.00	1.095	\$ 229.95	0.97	
1.000	D3 04 3350 1040	Replace steam trap, 15 PSIG, 1" threaded	7	1 Stpl	Ea.	1.04	\$ 206.50	\$ 243.00	1.095	\$ 266.09	0.97	
1.000	D3 04 3350 1050	Replace steam trap, 15 PSIG, 1-1/4" threaded	7	1 Stpl	Ea.	1.20	\$ 246.50	\$ 289.00	1.095	\$ 316.46	0.97	
1.000	D3 04 3350 1060	Replace steam trap, 15 PSIG, 1-1/2" threaded	7	1 Stpl	Ea.	1.73	\$ 357.00	\$ 416.50	1.095	\$ 456.07	0.97	
1.000	D3 04 3350 1070	Replace steam trap, 15 PSIG, 2" threaded	7	1 Stpl	Ea.	2.60	\$ 615.50	\$ 719.50	1.095	\$ 787.85	0.97	
							\$ 46,858.65	\$ 54,404.50				

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹								
CostWorks 2010 - EAST HALL								
Based on National Averages								
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN								
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.20	Assumed Value						
						GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments	
1.000	D3 04 3550 1520	Replace pipe insulation foam rubber 3/4"	\$ 24.17	1.20	\$ 29.89	0.97	\$ 29.01	
1.000	D3 04 3550 1530	Replace pipe insulation foam rubber 1"	\$ 24.97	1.20	\$ 30.88	0.97	\$ 29.97	
1.000	D3 04 3550 1540	Replace pipe insulation foam rubber 1-1/4"	\$ 26.41	1.20	\$ 32.65	0.97	\$ 31.69	
1.000	D3 04 3550 1550	Replace pipe insulation foam rubber 1-1/2"	\$ 27.10	1.20	\$ 33.51	0.97	\$ 32.52	
1.000	D3 04 3550 1560	Replace pipe insulation foam rubber 2"	\$ 28.37	1.20	\$ 35.08	0.97	\$ 34.05	
1.000	D3 04 3550 1570	Replace pipe insulation foam rubber 3"	\$ 32.30	1.20	\$ 39.95	0.97	\$ 38.76	
1.000	D3 04 3550 1580	Replace pipe insulation foam rubber 4"	\$ 36.45	1.20	\$ 45.07	0.97	\$ 43.74	
1.000	D3 04 3550 1590	Replace pipe insulation foam rubber 6"	\$ 42.29	1.20	\$ 52.30	0.97	\$ 50.75	
1.000	D3 05 3150 0010	Maintenance and repair wall mounted/recessed heater, with fan	\$ 171.99	1.20	\$ 212.67	0.97	\$ 206.38	
			\$ 101,337.99				\$ 121,605.59	
			\$ 50,669.00	Assume 50% required		Assume 50% required	\$ 60,802.80	
				PER 5 YEARS		PER 5 YEARS		
1.000	D3 04 3330 0010	Replace steam regulator valve 1-1/2" diameter	\$ 2,664.01	1.20	\$ 3,294.20	0.97	\$ 3,196.81	
1.000	D3 04 3330 0110	Replace steam regulator valve 2" diameter	\$ 3,254.83	1.20	\$ 4,024.78	0.97	\$ 3,905.80	
1.000	D3 04 3330 0210	Replace steam regulator valve 2-1/2" diameter	\$ 4,130.97	1.20	\$ 5,108.18	0.97	\$ 4,957.16	
1.000	D3 04 3330 0310	Replace steam regulator valve 3" diameter	\$ 5,120.28	1.20	\$ 6,331.51	0.97	\$ 6,144.33	
			\$ 15,170.08				\$ 18,204.10	
			\$ 7,585.04	Assume 50% required		Assume 50% required	\$ 9,102.05	
				PER 6 YEARS		PER 6 YEARS		
1.000	D3 02 3180 1010	Repair boiler, gas, 250 MBH	\$ 2,163.19	1.20	\$ 2,674.91	0.97	\$ 2,595.83	
1.000	D3 02 3180 2010	Repair boiler, gas, 2000 MBH	\$ 5,625.77	1.20	\$ 6,956.58	0.97	\$ 6,750.92	
1.000	D3 02 3180 3010	Repair boiler, gas, 10,000 MBH	\$ 17,923.57	1.20	\$ 22,163.50	0.97	\$ 21,508.28	
1.000	D3 02 3184 1010	Repair boiler, oil, 250 MBH	\$ 1,685.01	1.20	\$ 2,083.61	0.97	\$ 2,022.01	
1.000	D3 02 3184 2010	Repair boiler, oil, 2000 MBH	\$ 1,697.76	1.20	\$ 2,099.38	0.97	\$ 2,037.31	
1.000	D3 02 3184 3010	Repair boiler, oil, 10,000 MBH	\$ 1,889.57	1.20	\$ 2,336.55	0.97	\$ 2,267.48	
1.000	D3 02 3186 1010	Repair boiler, gas/oil, 2000 MBH	\$ 6,142.21	1.20	\$ 7,595.18	0.97	\$ 7,370.65	
1.000	D3 02 3186 2010	Repair boiler, gas/oil, 20,000 MBH	\$ 18,689.08	1.20	\$ 23,110.11	0.97	\$ 22,426.90	
1.000	D3 04 3350 1030	Replace steam trap, 15 PSIG, 3/4" threaded	\$ 223.15	1.20	\$ 275.94	0.97	\$ 267.78	
1.000	D3 04 3350 1040	Replace steam trap, 15 PSIG, 1" threaded	\$ 258.22	1.20	\$ 319.30	0.97	\$ 309.86	
1.000	D3 04 3350 1050	Replace steam trap, 15 PSIG, 1-1/4" threaded	\$ 307.10	1.20	\$ 379.75	0.97	\$ 368.52	
1.000	D3 04 3350 1060	Replace steam trap, 15 PSIG, 1-1/2" threaded	\$ 442.58	1.20	\$ 547.28	0.97	\$ 531.10	
1.000	D3 04 3350 1070	Replace steam trap, 15 PSIG, 2" threaded	\$ 764.56	1.20	\$ 945.42	0.97	\$ 917.47	
			\$ 57,811.77				\$ 69,374.13	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation	6%											
De-Escalation to July 2009	1.03											NON-GREEN
De-Escalation Factor to be Applied	0.97											
Green Factor	1.20	Assumed Value										
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Incl. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 04 3520 3020	Replace drain valve stem assembly, 3/4" valves	8	1 Stpl	Ea.	0.55	\$ 45.74	\$ 56.37	1.095	\$ 61.73	0.97	
1.000	D3 05 3265 1010	Repair air conditioner, window, 1 ton	8	1 Stpl	Ea.	1.07	\$ 75.75	\$ 93.65	1.095	\$ 102.55	0.97	
1.000	D3 05 3266 2010	Repair air conditioner, window, 2 ton	8	1 Stpl	Ea.	1.13	\$ 87.00	\$ 107.00	1.095	\$ 117.17	0.97	
							\$ 208.49	\$ 257.02				
1.000	D3 01 3170 0010	Remake flare type joint fuel oil storage: pipe & fittings, copper	10	1 Stpl	M.L.F.	0.29	\$ 18.35	\$ 23.00	1.095	\$ 25.19	0.97	
1.000	D3 02 3198 1010	Repair boiler blowoff system	10	1 Stpl	Ea.	1.00	\$ 64.50	\$ 80.50	1.095	\$ 88.15	0.97	
1.000	D3 02 3296 1010	Repair deaerator	10	1 Stpl	Ea.	1.00	\$ 64.50	\$ 80.50	1.095	\$ 88.15	0.97	
1.000	D3 02 3388 1010	Repair spreader, pneumatic coal	10	2 Stpl	Ea.	22.33	\$ 4,949.50	\$ 5,776.00	1.095	\$ 6,324.72	0.97	
1.000	D3 02 3390 1010	Repair fuel oil equipment, pump	10	1 Stpl	Ea.	5.42	\$ 392.05	\$ 485.50	1.095	\$ 531.62	0.97	
1.000	D3 03 3115 1010	Repair cooling tower, 50 ton	10	2 Stpl	Ea.	8.17	\$ 960.00	\$ 1,148.00	1.095	\$ 1,257.06	0.97	
1.000	D3 03 3115 2010	Repair cooling tower, 100 ton	10	2 Stpl	Ea.	28.25	\$ 3,491.00	\$ 4,170.50	1.095	\$ 4,566.70	0.97	
1.000	D3 03 3115 3010	Repair cooling tower, 300 ton	10	2 Stpl	Ea.	43.58	\$ 5,947.50	\$ 7,097.50	1.095	\$ 7,771.76	0.97	
1.000	D3 03 3115 4010	Repair cooling tower, 1000 ton	10	2 Stpl	Ea.	76.41	\$ 13,669.50	\$ 16,111.50	1.095	\$ 17,642.09	0.97	
1.000	D3 03 3130 1010	Repair water cooled chiller, 20 ton, reciprocating	10	Q6	Ea.	79.24	\$ 21,967.50	\$ 25,490.50	1.095	\$ 27,912.10	0.97	
1.000	D3 03 3130 2010	Repair water cooled chiller, 50 ton, reciprocating	10	Q6	Ea.	190.33	\$ 53,667.50	\$ 62,505.50	1.095	\$ 68,443.52	0.97	
1.000	D3 03 3130 3010	Repair water cooled chiller, 100 ton, reciprocating	10	Q6	Ea.	484.44	\$ 69,624.50	\$ 82,555.50	1.095	\$ 90,398.27	0.97	
1.000	D3 03 3130 5010	Repair water cooled chiller, 200 ton, reciprocating	10	Q7	Ea.	489.03	\$ 71,339.50	\$ 84,655.50	1.095	\$ 92,697.77	0.97	
1.000	D3 03 3135 1010	Repair recip. chiller, air cooled, 20 ton	10	2 Stpl	Ea.	95.12	\$ 23,680.50	\$ 27,565.50	1.095	\$ 30,184.22	0.97	
1.000	D3 03 3135 2010	Repair recip. chiller, air cooled, 50 ton	10	Q6	Ea.	215.43	\$ 56,231.50	\$ 65,533.50	1.095	\$ 71,759.18	0.97	
1.000	D3 03 3135 3010	Repair chiller, air cooled, 100 ton chiller	10	Q6	Ea.	425.64	\$ 55,498.50	\$ 66,039.50	1.095	\$ 72,313.25	0.97	
1.000	D3 03 3137 4010	Repair water cooled chiller, 5 ton, reciprocating	10	1 Stpl	Ea.	11.80	\$ 1,379.00	\$ 1,654.50	1.095	\$ 1,811.68	0.97	
1.000	D3 03 3137 5010	Repair water cooled chiller, 10 ton, reciprocating	10	2 Stpl	Ea.	26.79	\$ 3,025.50	\$ 3,633.50	1.095	\$ 3,978.68	0.97	
1.000	D3 03 3137 6010	Repair water cooled chiller, 15 ton, reciprocating	10	Q5	Ea.	53.80	\$ 5,714.50	\$ 6,850.50	1.095	\$ 7,501.30	0.97	
1.000	D3 03 3140 1010	Repair hermetic centrifugal chiller, 100 ton	10	Q7	Ea.	242.03	\$ 41,653.00	\$ 48,961.00	1.095	\$ 53,612.30	0.97	
1.000	D3 03 3140 2010	Repair hermetic centrifugal chiller, 300 ton	10	Q7	Ea.	560.26	\$ 96,365.00	\$ 113,192.50	1.095	\$ 123,945.79	0.97	
1.000	D3 03 3140 3010	Repair hermetic centrifugal chiller, 1000 ton	10	Q7	Ea.	1,767.34	\$ 303,562.50	\$ 356,854.50	1.095	\$ 390,755.68	0.97	
1.000	D3 03 3142 1010	Repair open centrifugal chiller, 300 ton	10	Q7	Ea.	578.94	\$ 97,404.50	\$ 114,460.50	1.095	\$ 125,334.25	0.97	
1.000	D3 03 3142 2010	Repair open centrifugal chiller, 1000 ton	10	Q7	Ea.	1,808.56	\$ 307,714.50	\$ 361,880.50	1.095	\$ 396,259.15	0.97	
1.000	D3 03 3145 1010	Repair chiller, absorption, 100 ton	10	2 Stpl	Ea.	35.51	\$ 15,938.50	\$ 18,353.50	1.095	\$ 20,097.08	0.97	
1.000	D3 03 3145 2010	Repair chiller, absorption, 350 ton	10	2 Stpl	Ea.	39.71	\$ 16,837.50	\$ 19,424.50	1.095	\$ 21,269.83	0.97	
1.000	D3 03 3145 3010	Repair chiller, absorption, 950 ton	10	4 Stpl	Ea.	54.20	\$ 20,777.50	\$ 23,959.50	1.095	\$ 26,235.65	0.97	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
			\$ 28,905.89	Assume 50% required		Assume 50% required	\$ 34,687.06
				PER 7 YEARS		PER 7 YEARS	
1.000	D3 04 3520 3020	Replace drain valve stem assembly, 3/4" valves	\$ 59.90	1.20	\$ 74.07	0.97	\$ 71.88
1.000	D3 05 3265 1010	Repair air conditioner, window, 1 ton	\$ 99.52	1.20	\$ 123.06	0.97	\$ 119.42
1.000	D3 05 3266 2010	Repair air conditioner, window, 2 ton	\$ 113.70	1.20	\$ 140.60	0.97	\$ 136.44
			\$ 273.12				\$ 327.74
			\$ 136.56	Assume 50% required		Assume 50% required	\$ 163.87
				PER 8 YEARS		PER 8 YEARS	
1.000	D3 01 3170 0010	Remake flare type joint fuel oil storage: pipe & fittings, copper	\$ 24.44	1.20	\$ 30.22	0.97	\$ 29.33
1.000	D3 02 3198 1010	Repair boiler blowoff system	\$ 85.54	1.20	\$ 105.78	0.97	\$ 102.65
1.000	D3 02 3296 1010	Repair deaerator	\$ 85.54	1.20	\$ 105.78	0.97	\$ 102.65
1.000	D3 02 3388 1010	Repair spreader, pneumatic coal	\$ 6,137.74	1.20	\$ 7,589.66	0.97	\$ 7,365.29
1.000	D3 02 3390 1010	Repair fuel oil equipment, pump	\$ 515.91	1.20	\$ 637.95	0.97	\$ 619.09
1.000	D3 03 3115 1010	Repair cooling tower, 50 ton	\$ 1,219.90	1.20	\$ 1,508.47	0.97	\$ 1,463.88
1.000	D3 03 3115 2010	Repair cooling tower, 100 ton	\$ 4,431.69	1.20	\$ 5,480.04	0.97	\$ 5,318.03
1.000	D3 03 3115 3010	Repair cooling tower, 300 ton	\$ 7,542.01	1.20	\$ 9,326.12	0.97	\$ 9,050.41
1.000	D3 03 3115 4010	Repair cooling tower, 1000 ton	\$ 17,120.54	1.20	\$ 21,170.51	0.97	\$ 20,544.65
1.000	D3 03 3130 1010	Repair water cooled chiller, 20 ton, reciprocating	\$ 27,086.93	1.20	\$ 33,494.52	0.97	\$ 32,504.32
1.000	D3 03 3130 2010	Repair water cooled chiller, 50 ton, reciprocating	\$ 66,420.13	1.20	\$ 82,132.23	0.97	\$ 79,704.15
1.000	D3 03 3130 3010	Repair water cooled chiller, 100 ton, reciprocating	\$ 87,725.83	1.20	\$ 108,477.93	0.97	\$ 105,270.99
1.000	D3 03 3130 5010	Repair water cooled chiller, 200 ton, reciprocating	\$ 89,957.35	1.20	\$ 111,237.33	0.97	\$ 107,948.82
1.000	D3 03 3135 1010	Repair recip. chiller, air cooled, 20 ton	\$ 29,291.89	1.20	\$ 36,221.07	0.97	\$ 35,150.26
1.000	D3 03 3135 2010	Repair recip. chiller, air cooled, 50 ton	\$ 69,637.76	1.20	\$ 86,111.02	0.97	\$ 83,565.32
1.000	D3 03 3135 3010	Repair chiller, air cooled, 100 ton chiller	\$ 70,175.45	1.20	\$ 86,775.90	0.97	\$ 84,210.55
1.000	D3 03 3137 4010	Repair water cooled chiller, 5 ton, reciprocating	\$ 1,758.12	1.20	\$ 2,174.01	0.97	\$ 2,109.74
1.000	D3 03 3137 5010	Repair water cooled chiller, 10 ton, reciprocating	\$ 3,861.06	1.20	\$ 4,774.42	0.97	\$ 4,633.27
1.000	D3 03 3137 6010	Repair water cooled chiller, 15 ton, reciprocating	\$ 7,279.54	1.20	\$ 9,001.56	0.97	\$ 8,735.44
1.000	D3 03 3140 1010	Repair hermetic centrifugal chiller, 100 ton	\$ 52,027.35	1.20	\$ 64,334.75	0.97	\$ 62,432.82
1.000	D3 03 3140 2010	Repair hermetic centrifugal chiller, 300 ton	\$ 120,281.58	1.20	\$ 148,734.95	0.97	\$ 144,337.89
1.000	D3 03 3140 3010	Repair hermetic centrifugal chiller, 1000 ton	\$ 379,203.76	1.20	\$ 468,906.81	0.97	\$ 455,044.51
1.000	D3 03 3142 1010	Repair open centrifugal chiller, 300 ton	\$ 121,628.99	1.20	\$ 150,401.10	0.97	\$ 145,954.79
1.000	D3 03 3142 2010	Repair open centrifugal chiller, 1000 ton	\$ 384,544.53	1.20	\$ 475,510.98	0.97	\$ 461,453.44
1.000	D3 03 3145 1010	Repair chiller, absorption, 100 ton	\$ 19,502.95	1.20	\$ 24,116.50	0.97	\$ 23,403.54
1.000	D3 03 3145 2010	Repair chiller, absorption, 350 ton	\$ 20,641.03	1.20	\$ 25,523.79	0.97	\$ 24,769.23
1.000	D3 03 3145 3010	Repair chiller, absorption, 950 ton	\$ 25,460.05	1.20	\$ 31,482.78	0.97	\$ 30,552.06

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 - EAST HALL											
Based on National Averages											
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN											
Escalation	6%										
De-Escalation to July 2009	1.03										NON-GREEN
De-Escalation Factor to be Applied	0.97										
Green Factor	1.20	Assumed Value									
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Incl. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor
1.000	D3 03 3210 1010	Repair condenser, air cooled, 5 ton	10	1 Stpl	Ea.	4.61	\$ 598.00	\$ 715.00	1.095	\$ 782.93	0.97
1.000	D3 03 3210 2010	Repair condenser, air cooled, 20 ton	10	2 Stpl	Ea.	7.93	\$ 1,213.50	\$ 1,441.50	1.095	\$ 1,578.44	0.97
1.000	D3 03 3210 3010	Repair condenser, air cooled, 50 ton	10	2 Stpl	Ea.	11.40	\$ 1,838.50	\$ 2,159.50	1.095	\$ 2,364.65	0.97
1.000	D3 03 3210 4010	Repair condenser, air cooled, 100 ton	10	2 Stpl	Ea.	21.80	\$ 3,609.50	\$ 4,240.50	1.095	\$ 4,643.35	0.97
1.000	D3 03 3260 1010	Repair evaporative condenser, 20 ton	10	2 Stpl	Ea.	75.77	\$ 8,799.50	\$ 10,542.50	1.095	\$ 11,544.04	0.97
1.000	D3 03 3260 2010	Repair evaporative condenser, 100 ton	10	2 Stpl	Ea.	109.64	\$ 12,635.50	\$ 15,101.50	1.095	\$ 16,536.14	0.97
1.000	D3 03 3260 3010	Repair evaporative condenser, 300 ton	10	2 Stpl	Ea.	116.45	\$ 15,611.50	\$ 18,507.50	1.095	\$ 20,265.71	0.97
1.000	D3 04 3120 1010	Repair fan coil unit, 1 ton	10	1 Stpl	Ea.	3.15	\$ 387.00	\$ 461.50	1.095	\$ 505.34	0.97
1.000	D3 04 3120 2010	Repair fan coil unit, 3 ton	10	1 Stpl	Ea.	3.15	\$ 497.00	\$ 586.50	1.095	\$ 642.22	0.97
1.000	D3 04 3120 3010	Repair fan coil unit, 5 ton	10	1 Stpl	Ea.	3.51	\$ 527.00	\$ 626.50	1.095	\$ 686.02	0.97
1.000	D3 04 3120 4010	Repair fan coil unit, 10 ton	10	1 Stpl	Ea.	3.71	\$ 605.00	\$ 713.00	1.095	\$ 780.74	0.97
1.000	D3 04 3120 5010	Repair fan coil unit, 20 ton	10	1 Stpl	Ea.	3.91	\$ 713.00	\$ 839.00	1.095	\$ 918.71	0.97
1.000	D3 04 3120 6010	Repair fan coil unit, 30 ton	10	1 Stpl	Ea.	4.40	\$ 996.00	\$ 1,170.00	1.095	\$ 1,281.15	0.97
1.000	D3 04 3122 1010	Repair fan coil, DX 1-1/2 ton, cooling only	10	1 Stpl	Ea.	13.52	\$ 1,397.30	\$ 1,692.50	1.095	\$ 1,853.29	0.97
1.000	D3 04 3122 2010	Repair fan coil, DX 2 ton, cooling only	10	1 Stpl	Ea.	13.93	\$ 1,439.80	\$ 1,739.00	1.095	\$ 1,904.21	0.97
1.000	D3 04 3122 3010	Repair fan coil, DX 2-1/2 ton, cooling only	10	1 Stpl	Ea.	14.40	\$ 1,637.30	\$ 1,965.00	1.095	\$ 2,151.68	0.97
1.000	D3 04 3122 4010	Repair fan coil, DX 3 ton, cooling only	10	1 Stpl	Ea.	13.91	\$ 1,587.30	\$ 1,900.00	1.095	\$ 2,080.50	0.97
1.000	D3 04 3122 5050	Repair fan coil, DX 5 ton, cooling only	10	1 Stpl	Ea.	15.02	\$ 1,852.30	\$ 2,215.00	1.095	\$ 2,425.43	0.97
1.000	D3 04 3122 7070	Repair fan coil, DX 10 ton, cooling only	10	Q6	Ea.	51.44	\$ 13,478.30	\$ 15,704.00	1.095	\$ 17,195.88	0.97
1.000	D3 04 3122 9090	Repair fan coil, DX 20 ton, cooling only	10	Q6	Ea.	74.75	\$ 20,248.30	\$ 23,539.00	1.095	\$ 25,775.21	0.97
1.000	D3 04 3124 5010	Replace fan coil, DX 5 ton, with heat	10	Q5	Ea.	14.64	\$ 2,873.00	\$ 3,379.00	1.095	\$ 3,700.01	0.97
1.000	D3 04 3124 6010	Replace fan coil, DX 10 ton, with heat	10	Q6	Ea.	25.33	\$ 5,800.00	\$ 6,750.00	1.095	\$ 7,391.25	0.97
1.000	D3 04 3124 7010	Replace fan coil, DX 20 ton, with heat	10	Q6	Ea.	94.22	\$ 14,000.00	\$ 16,450.00	1.095	\$ 18,012.75	0.97
1.000	D3 04 3128 1010	Repair unit ventilator, 750 CFM, 2 ton	10	1 Stpl	Ea.	3.96	\$ 434.35	\$ 520.60	1.095	\$ 570.06	0.97
1.000	D3 04 3128 2010	Repair unit ventilator, 1250 CFM, 3 ton	10	1 Stpl	Ea.	3.96	\$ 544.35	\$ 645.60	1.095	\$ 706.93	0.97
1.000	D3 04 3128 2040	Repair unit ventilator, 2000 CFM, 5 ton	10	1 Stpl	Ea.	4.42	\$ 580.80	\$ 693.50	1.095	\$ 759.38	0.97
1.000	D3 04 3210 1010	Repair fan, induced draft, 2000 CFM	10	1 Stpl	Ea.	3.00	\$ 242.50	\$ 297.50	1.095	\$ 325.76	0.97
1.000	D3 04 3210 2010	Repair fan, induced draft, 6700 CFM	10	1 Stpl	Ea.	3.00	\$ 242.50	\$ 297.50	1.095	\$ 325.76	0.97
1.000	D3 04 3210 3010	Repair fan, induced draft, 17,700 CFM	10	1 Stpl	Ea.	3.22	\$ 262.50	\$ 322.50	1.095	\$ 353.14	0.97
1.000	D3 04 3220 3010	Replace utility set, belt drive, 800 CFM exhaust fan	10	Q20	Ea.	6.50	\$ 1,222.00	\$ 1,427.00	1.095	\$ 1,562.57	0.97
1.000	D3 04 3220 3020	Replace utility set, belt drive, 3600 CFM exhaust fan	10	Q20	Ea.	9.75	\$ 2,308.00	\$ 2,679.00	1.095	\$ 2,933.51	0.97
1.000	D3 04 3220 3030	Replace utility set, belt drive, 11,000 CFM exhaust fan	10	Q20	Ea.	19.50	\$ 5,740.00	\$ 6,655.00	1.095	\$ 7,287.23	0.97
1.000	D3 04 3220 3040	Replace utility set, belt drive, 3600 CFM exhaust fan	10	Q20	Ea.	48.77	\$ 8,990.00	\$ 10,550.00	1.095	\$ 11,552.25	0.97
1.000	D3 04 3220 4010	Replace axial flow fan, 3800 CFM exhaust fan	10	Q20	Ea.	11.47	\$ 5,590.00	\$ 6,444.00	1.095	\$ 7,056.18	0.97
1.000	D3 04 3220 4020	Replace axial flow fan, 6400 CFM exhaust fan	10	Q20	Ea.	13.93	\$ 6,312.00	\$ 7,250.00	1.095	\$ 7,938.75	0.97
1.000	D3 04 3220 4030	Replace axial flow fan, 15,600 CFM exhaust fan	10	Q20	Ea.	24.37	\$ 10,035.00	\$ 11,570.00	1.095	\$ 12,669.15	0.97
1.000	D3 04 3220 4040	Replace axial flow fan, 28,000 CFM exhaust fan	10	Q20	Ea.	97.46	\$ 20,325.00	\$ 23,800.00	1.095	\$ 26,061.00	0.97
1.000	D3 04 3520 1010	Repack gate valve gland, 3/8" - 1 - 1/2" valves	10	1 Stpl	Ea.	0.22	\$ 23.00	\$ 27.50	1.095	\$ 30.11	0.97

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 - EAST HALL								
Based on National Averages								
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN								
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.20	Assumed Value						

Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	GREEN Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 03 3210 1010	Repair condenser, air cooled, 5 ton	\$ 759.78	1.20	\$ 939.51	0.97	\$ 911.74
1.000	D3 03 3210 2010	Repair condenser, air cooled, 20 ton	\$ 1,531.78	1.20	\$ 1,894.13	0.97	\$ 1,838.13
1.000	D3 03 3210 3010	Repair condenser, air cooled, 50 ton	\$ 2,294.75	1.20	\$ 2,837.58	0.97	\$ 2,753.70
1.000	D3 03 3210 4010	Repair condenser, air cooled, 100 ton	\$ 4,506.08	1.20	\$ 5,572.02	0.97	\$ 5,407.29
1.000	D3 03 3260 1010	Repair evaporative condenser, 20 ton	\$ 11,202.76	1.20	\$ 13,852.85	0.97	\$ 13,443.31
1.000	D3 03 3260 2010	Repair evaporative condenser, 100 ton	\$ 16,047.28	1.20	\$ 19,843.37	0.97	\$ 19,256.74
1.000	D3 03 3260 3010	Repair evaporative condenser, 300 ton	\$ 19,666.60	1.20	\$ 24,318.86	0.97	\$ 23,599.92
1.000	D3 04 3120 1010	Repair fan coil unit, 1 ton	\$ 490.40	1.20	\$ 606.41	0.97	\$ 588.48
1.000	D3 04 3120 2010	Repair fan coil unit, 3 ton	\$ 623.23	1.20	\$ 770.66	0.97	\$ 747.88
1.000	D3 04 3120 3010	Repair fan coil unit, 5 ton	\$ 665.74	1.20	\$ 823.22	0.97	\$ 798.88
1.000	D3 04 3120 4010	Repair fan coil unit, 10 ton	\$ 757.65	1.20	\$ 936.88	0.97	\$ 909.18
1.000	D3 04 3120 5010	Repair fan coil unit, 20 ton	\$ 891.55	1.20	\$ 1,102.45	0.97	\$ 1,069.85
1.000	D3 04 3120 6010	Repair fan coil unit, 30 ton	\$ 1,243.28	1.20	\$ 1,537.38	0.97	\$ 1,491.93
1.000	D3 04 3122 1010	Repair fan coil, DX 1-1/2 ton, cooling only	\$ 1,798.50	1.20	\$ 2,223.95	0.97	\$ 2,158.20
1.000	D3 04 3122 2010	Repair fan coil, DX 2 ton, cooling only	\$ 1,847.91	1.20	\$ 2,285.05	0.97	\$ 2,217.49
1.000	D3 04 3122 3010	Repair fan coil, DX 2-1/2 ton, cooling only	\$ 2,088.07	1.20	\$ 2,582.01	0.97	\$ 2,505.68
1.000	D3 04 3122 4010	Repair fan coil, DX 3 ton, cooling only	\$ 2,018.99	1.20	\$ 2,496.60	0.97	\$ 2,422.79
1.000	D3 04 3122 5050	Repair fan coil, DX 5 ton, cooling only	\$ 2,353.72	1.20	\$ 2,910.51	0.97	\$ 2,824.47
1.000	D3 04 3122 7070	Repair fan coil, DX 10 ton, cooling only	\$ 16,687.52	1.20	\$ 20,635.06	0.97	\$ 20,025.02
1.000	D3 04 3122 9090	Repair fan coil, DX 20 ton, cooling only	\$ 25,013.21	1.20	\$ 30,930.25	0.97	\$ 30,015.85
1.000	D3 04 3124 5010	Replace fan coil, DX 5 ton, with heat	\$ 3,590.62	1.20	\$ 4,440.01	0.97	\$ 4,308.75
1.000	D3 04 3124 6010	Replace fan coil, DX 10 ton, with heat	\$ 7,172.74	1.20	\$ 8,869.50	0.97	\$ 8,607.29
1.000	D3 04 3124 7010	Replace fan coil, DX 20 ton, with heat	\$ 17,480.24	1.20	\$ 21,615.30	0.97	\$ 20,976.29
1.000	D3 04 3128 1010	Repair unit ventilator, 750 CFM, 2 ton	\$ 553.20	1.20	\$ 684.07	0.97	\$ 663.85
1.000	D3 04 3128 2010	Repair unit ventilator, 1250 CFM, 3 ton	\$ 686.03	1.20	\$ 848.32	0.97	\$ 823.24
1.000	D3 04 3128 2040	Repair unit ventilator, 2000 CFM, 5 ton	\$ 736.93	1.20	\$ 911.26	0.97	\$ 884.32
1.000	D3 04 3210 1010	Repair fan, induced draft, 2000 CFM	\$ 316.13	1.20	\$ 390.92	0.97	\$ 379.36
1.000	D3 04 3210 2010	Repair fan, induced draft, 6700 CFM	\$ 316.13	1.20	\$ 390.92	0.97	\$ 379.36
1.000	D3 04 3210 3010	Repair fan, induced draft, 17,700 CFM	\$ 342.70	1.20	\$ 423.77	0.97	\$ 411.24
1.000	D3 04 3220 3010	Replace utility set, belt drive, 800 CFM exhaust fan	\$ 1,516.37	1.20	\$ 1,875.08	0.97	\$ 1,819.65
1.000	D3 04 3220 3020	Replace utility set, belt drive, 3600 CFM exhaust fan	\$ 2,846.78	1.20	\$ 3,520.21	0.97	\$ 3,416.14
1.000	D3 04 3220 3030	Replace utility set, belt drive, 11,000 CFM exhaust fan	\$ 7,071.79	1.20	\$ 8,744.67	0.97	\$ 8,486.15
1.000	D3 04 3220 3040	Replace utility set, belt drive, 3600 CFM exhaust fan	\$ 11,210.73	1.20	\$ 13,862.70	0.97	\$ 13,452.88
1.000	D3 04 3220 4010	Replace axial flow fan, 3800 CFM exhaust fan	\$ 6,847.58	1.20	\$ 8,467.42	0.97	\$ 8,217.09
1.000	D3 04 3220 4020	Replace axial flow fan, 6400 CFM exhaust fan	\$ 7,704.06	1.20	\$ 9,526.50	0.97	\$ 9,244.87
1.000	D3 04 3220 4030	Replace axial flow fan, 15,600 CFM exhaust fan	\$ 12,294.61	1.20	\$ 15,202.98	0.97	\$ 14,753.53
1.000	D3 04 3220 4040	Replace axial flow fan, 28,000 CFM exhaust fan	\$ 25,290.56	1.20	\$ 31,273.20	0.97	\$ 30,348.67
1.000	D3 04 3520 1010	Repack gate valve gland, 3/8" - 1 - 1/2" valves	\$ 29.22	1.20	\$ 36.14	0.97	\$ 35.07

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 - EAST HALL											
Based on National Averages											
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN											
Escalation	6%										
De-Escalation to July 2009	1.03										NON-GREEN
De-Escalation Factor to be Applied	0.97										
Green Factor	1.20	Assumed Value									

Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Incl. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor
1.000	D3 04 3520 2010	Repack gate valve gland, 2" - 3" valves	10	1 Stpl	Ea.	0.29	\$ 30.50	\$ 36.50	1.095	\$ 39.97	0.97
1.000	D3 05 3110 1010	Repair unit heater, 12 MBH, 2 PSI steam	10	1 Stpl	Ea.	3.13	\$ 385.35	\$ 459.60	1.095	\$ 503.26	0.97
1.000	D3 05 3110 2010	Repair unit heater, 36 MBH, 2 PSI steam	10	1 Stpl	Ea.	3.13	\$ 485.35	\$ 574.60	1.095	\$ 629.19	0.97
1.000	D3 05 3110 3010	Repair unit heater, 85 MBH, 2 PSI steam	10	1 Stpl	Ea.	3.13	\$ 495.35	\$ 584.60	1.095	\$ 640.14	0.97
1.000	D3 05 3110 4010	Repair unit heater, 250 MBH, 2 PSI steam	10	1 Stpl	Ea.	3.67	\$ 532.35	\$ 633.10	1.095	\$ 693.24	0.97
1.000	D3 05 3110 5010	Repair unit heater, 400 MBH, 2 PSI steam	10	1 Stpl	Ea.	3.67	\$ 582.35	\$ 688.10	1.095	\$ 753.47	0.97
1.000	D3 05 3170 1010	Repair terminal reheat, 12" x 24" coil	10	1 Stpl	Ea.	1.20	\$ 77.00	\$ 96.50	1.095	\$ 105.67	0.97
1.000	D3 05 3170 2010	Repair terminal reheat, 18" x 24" coil	10	1 Stpl	Ea.	1.40	\$ 90.00	\$ 113.00	1.095	\$ 123.74	0.97
1.000	D3 05 3170 3010	Repair terminal reheat, 36" x 36" coil	10	1 Stpl	Ea.	2.20	\$ 141.00	\$ 177.00	1.095	\$ 193.82	0.97
1.000	D3 05 3170 4010	Repair terminal reheat, 48" x 126" coil	10	1 Stpl	Ea.	4.00	\$ 257.00	\$ 320.00	1.095	\$ 350.40	0.97
1.000	D3 05 3245 1010	Repair heat pump, 1.5 ton, air to air split	10	1 Stpl	Ea.	15.66	\$ 1,662.00	\$ 2,008.50	1.095	\$ 2,199.31	0.97
1.000	D3 05 3245 2010	Repair heat pump, 5 ton, air to air split	10	1 Stpl	Ea.	17.68	\$ 2,172.50	\$ 2,597.00	1.095	\$ 2,843.72	0.97
1.000	D3 05 3245 3010	Repair heat pump, 10 ton, air to air split	10	Q5	Ea.	23.74	\$ 3,525.50	\$ 4,177.00	1.095	\$ 4,573.82	0.97
1.000	D3 05 3245 4010	Repair heat pump, 25 ton, air to air split	10	Q5	Ea.	43.48	\$ 6,931.50	\$ 8,175.50	1.095	\$ 8,952.17	0.97
1.000	D3 05 3245 5010	Repair heat pump, 50 ton, air to air split	10	Q6	Ea.	253.91	\$ 37,759.50	\$ 44,695.00	1.095	\$ 48,941.03	0.97
1.000	D3 05 3245 6010	Repair heat pump, thru-wall unit, 1.5 ton	10	1 Stpl	Ea.	15.66	\$ 1,662.00	\$ 2,008.50	1.095	\$ 2,199.31	0.97
1.000	D3 05 3245 7010	Repair heat pump, thru-wall unit, 5 ton	10	1 Stpl	Ea.	17.68	\$ 2,172.50	\$ 2,597.00	1.095	\$ 2,843.72	0.97
1.000	D3 05 3265 1030	Replace air conditioner, window, 1 ton	10	L2	Ea.	3.30	\$ 853.00	\$ 988.00	1.095	\$ 1,081.86	0.97
1.000	D3 05 3266 2030	Replace air conditioner, window, 2 ton	10	L2	Ea.	7.80	\$ 1,551.00	\$ 1,806.00	1.095	\$ 1,977.57	0.97
1.000	D3 05 3272 1010	Repair air conditioner, DX, 5 ton	10	1 Stpl	Ea.	27.64	\$ 3,668.00	\$ 4,368.00	1.095	\$ 4,782.96	0.97
1.000	D3 05 3272 2010	Repair air conditioner, DX, 20 ton	10	Q6	Ea.	97.65	\$ 25,654.00	\$ 29,831.50	1.095	\$ 32,665.49	0.97
1.000	D3 05 3272 3010	Repair air conditioner, DX, 50 ton	10	Q6	Ea.	265.86	\$ 43,711.50	\$ 51,544.50	1.095	\$ 56,441.23	0.97
1.000	D3 05 3274 1010	Repair computer room air conditioner, air cooled, 5 ton	10	1 Stpl	Ea.	28.44	\$ 3,779.00	\$ 4,500.00	1.095	\$ 4,927.50	0.97
1.000	D3 05 3274 1020	Repair computer room air conditioner, air cooled, 10 ton	10	1 Stpl	Ea.	66.20	\$ 15,726.50	\$ 18,367.00	1.095	\$ 20,111.87	0.97
1.000	D3 05 3274 1030	Repair computer room air conditioner, air cooled, 15 ton	10	1 Stpl	Ea.	89.56	\$ 22,293.00	\$ 25,997.00	1.095	\$ 28,466.72	0.97
1.000	D3 05 3274 1040	Repair computer room air conditioner, air cooled, 20 ton	10	1 Stpl	Ea.	99.78	\$ 25,990.00	\$ 30,225.50	1.095	\$ 33,096.92	0.97
1.000	D3 05 3276 1010	Repair computer room A/C, chilled water, 5 ton	10	1 Stpl	Ea.	34.12	\$ 6,773.00	\$ 7,931.00	1.095	\$ 8,684.45	0.97
1.000	D3 05 3276 1020	Repair computer room A/C, chilled water, 10 ton	10	1 Stpl	Ea.	34.12	\$ 6,822.50	\$ 7,986.00	1.095	\$ 8,744.67	0.97
1.000	D3 05 3276 1030	Repair computer room A/C, chilled water, 15 ton	10	1 Stpl	Ea.	34.22	\$ 6,844.00	\$ 8,009.00	1.095	\$ 8,769.86	0.97
1.000	D3 05 3276 1040	Repair computer room A/C, chilled water, 20 ton	10	1 Stpl	Ea.	54.46	\$ 18,669.00	\$ 21,559.00	1.095	\$ 23,607.11	0.97
1.000	D3 05 3278 1010	Repair multi-zone rooftop unit, 15 ton	10	Q6	Ea.	73.34	\$ 19,768.00	\$ 23,005.50	1.095	\$ 25,191.02	0.97
1.000	D3 05 3278 2010	Repair multi-zone rooftop unit, 25 ton	10	Q6	Ea.	97.07	\$ 27,388.00	\$ 31,844.50	1.095	\$ 34,869.73	0.97
1.000	D3 05 3278 3010	Repair multi-zone rooftop unit, 40 ton	10	Q6	Ea.	123.97	\$ 27,378.50	\$ 32,003.50	1.095	\$ 35,043.83	0.97
1.000	D3 05 3278 4010	Repair multi-zone rooftop unit, 70 ton	10	Q7	Ea.	251.23	\$ 39,529.50	\$ 46,743.50	1.095	\$ 51,184.13	0.97
1.000	D3 05 3278 5010	Repair multi-zone rooftop unit, 105 ton	10	Q7	Ea.	273.02	\$ 41,014.50	\$ 48,531.50	1.095	\$ 53,141.99	0.97
1.000	D3 05 3280 1001	Repair single zone rt. unit, 3 ton	10	2 Stpl	Ea.	17.84	\$ 1,966.80	\$ 2,365.00	1.095	\$ 2,589.68	0.97
1.000	D3 05 3280 1003	Repair single zone rt. unit, 5 ton	10	2 Stpl	Ea.	18.27	\$ 2,136.80	\$ 2,565.00	1.095	\$ 2,808.68	0.97
1.000	D3 05 3280 1005	Repair single zone rt. unit, 7.5 ton	10	2 Stpl	Ea.	21.83	\$ 2,953.00	\$ 3,507.00	1.095	\$ 3,840.17	0.97

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 04 3520 2010	Repack gate valve gland, 2" - 3" valves	\$ 38.79	1.20	\$ 47.96	0.97	\$ 46.54
1.000	D3 05 3110 1010	Repair unit heater, 12 MBH, 2 PSI steam	\$ 488.38	1.20	\$ 603.91	0.97	\$ 586.06
1.000	D3 05 3110 2010	Repair unit heater, 36 MBH, 2 PSI steam	\$ 610.59	1.20	\$ 755.02	0.97	\$ 732.70
1.000	D3 05 3110 3010	Repair unit heater, 85 MBH, 2 PSI steam	\$ 621.21	1.20	\$ 768.16	0.97	\$ 745.46
1.000	D3 05 3110 4010	Repair unit heater, 250 MBH, 2 PSI steam	\$ 672.75	1.20	\$ 831.89	0.97	\$ 807.30
1.000	D3 05 3110 5010	Repair unit heater, 400 MBH, 2 PSI steam	\$ 731.19	1.20	\$ 904.16	0.97	\$ 877.43
1.000	D3 05 3170 1010	Repair terminal reheat, 12" x 24" coil	\$ 102.54	1.20	\$ 126.80	0.97	\$ 123.05
1.000	D3 05 3170 2010	Repair terminal reheat, 18" x 24" coil	\$ 120.08	1.20	\$ 148.48	0.97	\$ 144.09
1.000	D3 05 3170 3010	Repair terminal reheat, 36" x 36" coil	\$ 188.09	1.20	\$ 232.58	0.97	\$ 225.70
1.000	D3 05 3170 4010	Repair terminal reheat, 48" x 126" coil	\$ 340.04	1.20	\$ 420.48	0.97	\$ 408.05
1.000	D3 05 3245 1010	Repair heat pump, 1.5 ton, air to air split	\$ 2,134.29	1.20	\$ 2,639.17	0.97	\$ 2,561.15
1.000	D3 05 3245 2010	Repair heat pump, 5 ton, air to air split	\$ 2,759.65	1.20	\$ 3,412.46	0.97	\$ 3,311.58
1.000	D3 05 3245 3010	Repair heat pump, 10 ton, air to air split	\$ 4,438.60	1.20	\$ 5,488.58	0.97	\$ 5,326.32
1.000	D3 05 3245 4010	Repair heat pump, 25 ton, air to air split	\$ 8,687.52	1.20	\$ 10,742.61	0.97	\$ 10,425.02
1.000	D3 05 3245 5010	Repair heat pump, 50 ton, air to air split	\$ 47,494.18	1.20	\$ 58,729.23	0.97	\$ 56,993.02
1.000	D3 05 3245 6010	Repair heat pump, thru-wall unit, 1.5 ton	\$ 2,134.29	1.20	\$ 2,639.17	0.97	\$ 2,561.15
1.000	D3 05 3245 7010	Repair heat pump, thru-wall unit, 5 ton	\$ 2,759.65	1.20	\$ 3,412.46	0.97	\$ 3,311.58
1.000	D3 05 3265 1030	Replace air conditioner, window, 1 ton	\$ 1,049.88	1.20	\$ 1,298.23	0.97	\$ 1,259.85
1.000	D3 05 3266 2030	Replace air conditioner, window, 2 ton	\$ 1,919.11	1.20	\$ 2,373.08	0.97	\$ 2,302.93
1.000	D3 05 3272 1010	Repair air conditioner, DX, 5 ton	\$ 4,641.56	1.20	\$ 5,739.55	0.97	\$ 5,569.87
1.000	D3 05 3272 2010	Repair air conditioner, DX, 20 ton	\$ 31,699.80	1.20	\$ 39,198.59	0.97	\$ 38,039.76
1.000	D3 05 3272 3010	Repair air conditioner, DX, 50 ton	\$ 54,772.65	1.20	\$ 67,729.47	0.97	\$ 65,727.19
1.000	D3 05 3274 1010	Repair computer room air conditioner, air cooled, 5 ton	\$ 4,781.83	1.20	\$ 5,913.00	0.97	\$ 5,738.19
1.000	D3 05 3274 1020	Repair computer room air conditioner, air cooled, 10 ton	\$ 19,517.30	1.20	\$ 24,134.24	0.97	\$ 23,420.76
1.000	D3 05 3274 1030	Repair computer room air conditioner, air cooled, 15 ton	\$ 27,625.15	1.20	\$ 34,160.06	0.97	\$ 33,150.18
1.000	D3 05 3274 1040	Repair computer room air conditioner, air cooled, 20 ton	\$ 32,118.48	1.20	\$ 39,716.31	0.97	\$ 38,542.17
1.000	D3 05 3276 1010	Repair computer room A/C, chilled water, 5 ton	\$ 8,427.71	1.20	\$ 10,421.33	0.97	\$ 10,113.25
1.000	D3 05 3276 1020	Repair computer room A/C, chilled water, 10 ton	\$ 8,486.15	1.20	\$ 10,493.60	0.97	\$ 10,183.38
1.000	D3 05 3276 1030	Repair computer room A/C, chilled water, 15 ton	\$ 8,510.59	1.20	\$ 10,523.83	0.97	\$ 10,212.71
1.000	D3 05 3276 1040	Repair computer room A/C, chilled water, 20 ton	\$ 22,909.21	1.20	\$ 28,328.53	0.97	\$ 27,491.05
1.000	D3 05 3278 1010	Repair multi-zone rooftop unit, 15 ton	\$ 24,446.30	1.20	\$ 30,229.23	0.97	\$ 29,335.56
1.000	D3 05 3278 2010	Repair multi - zone rooftop unit, 25 ton	\$ 33,838.87	1.20	\$ 41,843.67	0.97	\$ 40,606.65
1.000	D3 05 3278 3010	Repair multi-zone rooftop unit, 40 ton	\$ 34,007.83	1.20	\$ 42,052.60	0.97	\$ 40,809.40
1.000	D3 05 3278 4010	Repair multi-zone rooftop unit, 70 ton	\$ 49,670.98	1.20	\$ 61,420.96	0.97	\$ 59,605.17
1.000	D3 05 3278 5010	Repair multi-zone rooftop unit, 105 ton	\$ 51,570.96	1.20	\$ 63,770.39	0.97	\$ 61,885.15
1.000	D3 05 3280 1001	Repair single zone rt. unit, 3 ton	\$ 2,513.12	1.20	\$ 3,107.61	0.97	\$ 3,015.74
1.000	D3 05 3280 1003	Repair single zone rt. unit, 5 ton	\$ 2,725.64	1.20	\$ 3,370.41	0.97	\$ 3,270.77
1.000	D3 05 3280 1005	Repair single zone rt. unit, 7.5 ton	\$ 3,726.64	1.20	\$ 4,608.20	0.97	\$ 4,471.97

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation	6%											
De-Escalation to July 2009	1.03											NON-GREEN
De-Escalation Factor to be Applied	0.97											
Green Factor	1.20	Assumed Value										
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Incl. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 05 3280 1007	Repair single zone rt. unit, 10 ton	10	2 Stpl	Ea.	54.79	\$ 13,769.00	\$ 16,062.00	1.095	\$ 17,587.89	0.97	
1.000	D3 05 3280 1010	Repair single zone rooftop unit, 15 ton	10	2 Stpl	Ea.	76.72	\$ 20,010.50	\$ 23,315.00	1.095	\$ 25,529.93	0.97	
1.000	D3 05 3280 2010	Repair single zone rooftop unit, 25 ton	10	Q6	Ea.	96.57	\$ 27,355.50	\$ 31,804.00	1.095	\$ 34,825.38	0.97	
1.000	D3 05 3280 3010	Repair single zone rooftop unit, 60 ton	10	Q6	Ea.	298.68	\$ 43,236.00	\$ 51,258.00	1.095	\$ 56,127.51	0.97	
1.000	D3 05 3280 4010	Repair single zone rooftop unit, 100 ton	10	Q7	Ea.	330.39	\$ 49,332.00	\$ 58,291.00	1.095	\$ 63,828.65	0.97	
1.000	D3 05 3282 1010	Repair multi-zone variable volume, 50 ton	10	Q6	Ea.	251.40	\$ 36,162.50	\$ 42,863.00	1.095	\$ 46,934.99	0.97	
1.000	D3 05 3282 2010	Repair multi-zone variable volume, 70 ton	10	Q7	Ea.	251.53	\$ 39,548.50	\$ 46,768.00	1.095	\$ 51,210.96	0.97	
1.000	D3 05 3282 3010	Repair multi-zone variable volume, 90 ton	10	Q7	Ea.	301.32	\$ 47,118.50	\$ 55,770.00	1.095	\$ 61,068.15	0.97	
1.000	D3 05 3282 4010	Repair multi-zone variable volume, 105 ton	10	Q7	Ea.	273.99	\$ 41,158.50	\$ 48,681.00	1.095	\$ 53,305.70	0.97	
1.000	D3 05 3282 5010	Repair multi-zone variable volume, 140 ton	10	Q7	Ea.	367.75	\$ 54,993.50	\$ 65,023.00	1.095	\$ 71,200.19	0.97	
1.000	D3 05 3284 1010	Repair single zone variable volume, 20 ton	10	Q6	Ea.	79.76	\$ 22,028.00	\$ 25,577.50	1.095	\$ 28,007.36	0.97	
1.000	D3 05 3284 1040	Replace single zone variable volume, 20 ton	10	Q7	Ea.	136.49	\$ 38,175.00	\$ 44,275.00	1.095	\$ 48,481.13	0.97	
1.000	D3 05 3284 2010	Repair single zone variable volume, 30 ton	10	Q6	Ea.	114.54	\$ 32,813.00	\$ 38,054.50	1.095	\$ 41,669.68	0.97	
1.000	D3 05 3284 2040	Replace single zone variable volume, 30 ton	10	Q7	Ea.	196.29	\$ 47,975.00	\$ 55,875.00	1.095	\$ 61,183.13	0.97	
1.000	D3 05 3284 3010	Repair single zone variable volume, 40 ton	10	Q6	Ea.	123.35	\$ 27,403.00	\$ 32,024.50	1.095	\$ 35,066.83	0.97	
1.000	D3 05 3284 3040	Replace single zone variable volume, 40 ton	10	Q7	Ea.	265.10	\$ 64,250.00	\$ 75,400.00	1.095	\$ 82,563.00	0.97	
1.000	D3 05 3284 4010	Repair single zone variable volume, 60 ton	10	Q6	Ea.	298.02	\$ 43,121.00	\$ 51,128.00	1.095	\$ 55,985.16	0.97	
1.000	D3 05 3284 4040	Replace single zone variable volume, 60 ton	10	Q7	Ea.	374.00	\$ 86,100.00	\$ 100,000.00	1.095	\$ 109,500.00	0.97	
1.000	D3 05 3286 1010	Repair central station A.H.U., 1300 CFM	10	1 Stpl	Ea.	3.45	\$ 516.30	\$ 610.50	1.095	\$ 668.50	0.97	
1.000	D3 05 3286 2010	Repair central station A.H.U., 1900 CFM	10	1 Stpl	Ea.	3.81	\$ 546.30	\$ 650.50	1.095	\$ 712.30	0.97	
1.000	D3 05 3286 3010	Repair central station A.H.U., 5400 CFM	10	1 Stpl	Ea.	4.01	\$ 624.30	\$ 737.00	1.095	\$ 807.02	0.97	
1.000	D3 05 3286 4010	Repair central station A.H.U., 8000 CFM	10	1 Stpl	Ea.	4.21	\$ 732.30	\$ 863.00	1.095	\$ 944.99	0.97	
1.000	D3 05 3286 5010	Repair central station A.H.U., 16,000 CFM	10	1 Stpl	Ea.	4.70	\$ 1,015.30	\$ 1,194.00	1.095	\$ 1,307.43	0.97	
1.000	D3 05 3286 6010	Repair central station A.H.U., 33,500 CFM	10	1 Stpl	Ea.	8.10	\$ 2,725.30	\$ 3,145.00	1.095	\$ 3,443.78	0.97	
1.000	D3 05 3286 7010	Repair central station A.H.U., 63,000 CFM	10	1 Stpl	Ea.	13.33	\$ 4,179.30	\$ 4,849.00	1.095	\$ 5,309.66	0.97	
1.000	D3 05 3310 1010	Repair furnace, gas, 25 MBH residential	10	Q1	Ea.	7.25	\$ 888.35	\$ 1,058.00	1.095	\$ 1,158.51	0.97	
1.000	D3 05 3310 2010	Repair furnace, gas, 100 MBH residential	10	Q1	Ea.	7.89	\$ 1,317.80	\$ 1,555.50	1.095	\$ 1,703.27	0.97	
1.000	D3 05 3310 3010	Repair furnace, gas, 200 MBH residential	10	Q1	Ea.	17.88	\$ 2,630.50	\$ 3,122.50	1.095	\$ 3,419.14	0.97	
1.000	D3 05 3320 1010	Repair furnace, oil, 55 MBH residential	10	Q1	Ea.	17.85	\$ 1,706.50	\$ 2,059.00	1.095	\$ 2,254.61	0.97	
1.000	D3 05 3320 2010	Repair furnace, oil, 100 MBH residential	10	Q1	Ea.	17.91	\$ 1,729.00	\$ 2,085.50	1.095	\$ 2,283.62	0.97	
1.000	D3 05 3320 3010	Repair furnace, oil, 200 MBH residential	10	Q1	Ea.	17.99	\$ 1,763.50	\$ 2,124.50	1.095	\$ 2,326.33	0.97	
1.000	D3 05 3330 1010	Repair furnace, electric, 25 MBH residential	10	Q20	Ea.	6.03	\$ 1,853.50	\$ 2,144.50	1.095	\$ 2,348.23	0.97	
1.000	D3 05 3330 2010	Repair furnace, electric, 50 MBH residential	10	Q20	Ea.	6.21	\$ 1,882.00	\$ 2,174.00	1.095	\$ 2,380.53	0.97	
1.000	D3 05 3330 3010	Repair furnace, electric, 85 MBH residential	10	Q20	Ea.	6.68	\$ 3,090.50	\$ 3,549.50	1.095	\$ 3,886.70	0.97	
1.000	D4 01 3110 3010	Rebuild 4" diameter reduced pressure backflow preventer	10	1 Plum	Ea.	2.92	\$ 509.40	\$ 598.95	1.095	\$ 655.85	0.97	
1.000	D4 01 3110 3020	Rebuild 6" diameter reduced pressure backflow preventer	10	1 Plum	Ea.	3.94	\$ 590.40	\$ 700.15	1.095	\$ 766.66	0.97	
1.000	D4 01 3110 3030	Rebuild 8" diameter reduced pressure backflow preventer	10	1 Plum	Ea.	4.95	\$ 736.55	\$ 876.65	1.095	\$ 959.93	0.97	
1.000	D4 01 3110 3040	Rebuild 10" diameter reduced pressure backflow preventer	10	1 Plum	Ea.	5.97	\$ 873.00	\$ 1,038.40	1.095	\$ 1,137.05	0.97	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 - EAST HALL								
Based on National Averages								
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN								
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.20	Assumed Value						
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments	
1.000	D3 05 3280 1007	Repair single zone rt. unit, 10 ton	\$ 17,067.94	1.20	\$ 21,105.47	0.97	\$ 20,481.53	
1.000	D3 05 3280 1010	Repair single zone rooftop unit, 15 ton	\$ 24,775.18	1.20	\$ 30,635.91	0.97	\$ 29,730.22	
1.000	D3 05 3280 2010	Repair single zone rooftop unit, 25 ton	\$ 33,795.84	1.20	\$ 41,790.46	0.97	\$ 40,555.00	
1.000	D3 05 3280 3010	Repair single zone rooftop unit, 60 ton	\$ 54,468.21	1.20	\$ 67,353.01	0.97	\$ 65,361.85	
1.000	D3 05 3280 4010	Repair single zone rooftop unit, 100 ton	\$ 61,941.68	1.20	\$ 76,594.37	0.97	\$ 74,330.01	
1.000	D3 05 3282 1010	Repair multi-zone variable volume, 50 ton	\$ 45,547.45	1.20	\$ 56,321.98	0.97	\$ 54,656.93	
1.000	D3 05 3282 2010	Repair multi-zone variable volume, 70 ton	\$ 49,697.01	1.20	\$ 61,453.15	0.97	\$ 59,636.41	
1.000	D3 05 3282 3010	Repair multi-zone variable volume, 90 ton	\$ 59,262.79	1.20	\$ 73,281.78	0.97	\$ 71,115.35	
1.000	D3 05 3282 4010	Repair multi-zone variable volume, 105 ton	\$ 51,729.82	1.20	\$ 63,966.83	0.97	\$ 62,075.78	
1.000	D3 05 3282 5010	Repair multi-zone variable volume, 140 ton	\$ 69,095.29	1.20	\$ 85,440.22	0.97	\$ 82,914.35	
1.000	D3 05 3284 1010	Repair single zone variable volume, 20 ton	\$ 27,179.38	1.20	\$ 33,608.84	0.97	\$ 32,615.26	
1.000	D3 05 3284 1040	Replace single zone variable volume, 20 ton	\$ 47,047.88	1.20	\$ 58,177.35	0.97	\$ 56,457.45	
1.000	D3 05 3284 2010	Repair single zone variable volume, 30 ton	\$ 40,437.80	1.20	\$ 50,003.61	0.97	\$ 48,525.36	
1.000	D3 05 3284 2040	Replace single zone variable volume, 30 ton	\$ 59,374.37	1.20	\$ 73,419.75	0.97	\$ 71,249.24	
1.000	D3 05 3284 3010	Repair single zone variable volume, 40 ton	\$ 34,030.15	1.20	\$ 42,080.19	0.97	\$ 40,836.18	
1.000	D3 05 3284 3040	Replace single zone variable volume, 40 ton	\$ 80,122.19	1.20	\$ 99,075.60	0.97	\$ 96,146.63	
1.000	D3 05 3284 4010	Repair single zone variable volume, 60 ton	\$ 54,330.07	1.20	\$ 67,182.19	0.97	\$ 65,196.08	
1.000	D3 05 3284 4040	Replace single zone variable volume, 60 ton	\$ 106,262.85	1.20	\$ 131,400.00	0.97	\$ 127,515.42	
1.000	D3 05 3286 1010	Repair central station A.H.U., 1300 CFM	\$ 648.73	1.20	\$ 802.20	0.97	\$ 778.48	
1.000	D3 05 3286 2010	Repair central station A.H.U., 1900 CFM	\$ 691.24	1.20	\$ 854.76	0.97	\$ 829.49	
1.000	D3 05 3286 3010	Repair central station A.H.U., 5400 CFM	\$ 783.16	1.20	\$ 968.42	0.97	\$ 939.79	
1.000	D3 05 3286 4010	Repair central station A.H.U., 8000 CFM	\$ 917.05	1.20	\$ 1,133.98	0.97	\$ 1,100.46	
1.000	D3 05 3286 5010	Repair central station A.H.U., 16,000 CFM	\$ 1,268.78	1.20	\$ 1,568.92	0.97	\$ 1,522.53	
1.000	D3 05 3286 6010	Repair central station A.H.U., 33,500 CFM	\$ 3,341.97	1.20	\$ 4,132.53	0.97	\$ 4,010.36	
1.000	D3 05 3286 7010	Repair central station A.H.U., 63,000 CFM	\$ 5,152.69	1.20	\$ 6,371.59	0.97	\$ 6,183.22	
1.000	D3 05 3310 1010	Repair furnace, gas, 25 MBH residential	\$ 1,124.26	1.20	\$ 1,390.21	0.97	\$ 1,349.11	
1.000	D3 05 3310 2010	Repair furnace, gas, 100 MBH residential	\$ 1,652.92	1.20	\$ 2,043.93	0.97	\$ 1,983.50	
1.000	D3 05 3310 3010	Repair furnace, gas, 200 MBH residential	\$ 3,318.06	1.20	\$ 4,102.97	0.97	\$ 3,981.67	
1.000	D3 05 3320 1010	Repair furnace, oil, 55 MBH residential	\$ 2,187.95	1.20	\$ 2,705.53	0.97	\$ 2,625.54	
1.000	D3 05 3320 2010	Repair furnace, oil, 100 MBH residential	\$ 2,216.11	1.20	\$ 2,740.35	0.97	\$ 2,659.33	
1.000	D3 05 3320 3010	Repair furnace, oil, 200 MBH residential	\$ 2,257.55	1.20	\$ 2,791.59	0.97	\$ 2,709.07	
1.000	D3 05 3330 1010	Repair furnace, electric, 25 MBH residential	\$ 2,278.81	1.20	\$ 2,817.87	0.97	\$ 2,734.57	
1.000	D3 05 3330 2010	Repair furnace, electric, 50 MBH residential	\$ 2,310.15	1.20	\$ 2,856.64	0.97	\$ 2,772.19	
1.000	D3 05 3330 3010	Repair furnace, electric, 85 MBH residential	\$ 3,771.80	1.20	\$ 4,664.04	0.97	\$ 4,526.16	
1.000	D4 01 3110 3010	Rebuild 4" diameter reduced pressure backflow preventer	\$ 636.46	1.20	\$ 787.02	0.97	\$ 763.75	
1.000	D4 01 3110 3020	Rebuild 6" diameter reduced pressure backflow preventer	\$ 744.00	1.20	\$ 920.00	0.97	\$ 892.80	
1.000	D4 01 3110 3030	Rebuild 8" diameter reduced pressure backflow preventer	\$ 931.55	1.20	\$ 1,151.92	0.97	\$ 1,117.86	
1.000	D4 01 3110 3040	Rebuild 10" diameter reduced pressure backflow preventer	\$ 1,103.43	1.20	\$ 1,364.46	0.97	\$ 1,324.12	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 - EAST HALL											
Based on National Averages											
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN											
Escalation	6%										
De-Escalation to July 2009	1.03										NON-GREEN
De-Escalation Factor to be Applied	0.97										
Green Factor	1.20	Assumed Value									

Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Incl. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor
							\$ 2,635,025.95	\$ 3,095,086.35			
1.000	D3 01 3210 0110	Replace 10' of buried 2" diam steel pipe/M.L.F. natural gas	12	Q4	Ea.	10.68	\$ 659.67	\$ 804.59	1.095	\$ 881.03	0.97
1.000	D3 01 3210 0120	Replace 10' of buried 3" diam steel pipe/M.L.F. natural gas	12	Q4	Ea.	10.83	\$ 758.17	\$ 911.09	1.095	\$ 997.64	0.97
1.000	D3 01 3210 0130	Replace 10' of buried 4" diam steel pipe/M.L.F. natural gas	12	B35	Ea.	11.91	\$ 910.67	\$ 1,089.09	1.095	\$ 1,192.55	0.97
1.000	D3 01 3210 0140	Replace 10' of buried 6" diam steel pipe/M.L.F. natural gas	12	B35	Ea.	13.20	\$ 1,215.67	\$ 1,445.09	1.095	\$ 1,582.37	0.97
1.000	D3 01 3210 0410	Replace 10' of hung 2" diam steel pipe/M.L.F. natural gas	12	Q1	Ea.	6.79	\$ 542.53	\$ 666.29	1.095	\$ 729.59	0.97
1.000	D3 01 3210 0420	Replace 10' of hung 3" diam steel pipe/M.L.F. natural gas	12	Q15	Ea.	8.18	\$ 629.67	\$ 769.09	1.095	\$ 842.15	0.97
1.000	D3 01 3210 0430	Replace 10' of hung 4" diam steel pipe/M.L.F. natural gas	12	Q15	Ea.	9.36	\$ 758.67	\$ 920.09	1.095	\$ 1,007.50	0.97
1.000	D3 01 3210 0440	Replace 10' of hung 6" diam steel pipe/M.L.F. natural gas	12	Q16	Ea.	13.93	\$ 1,179.67	\$ 1,434.09	1.095	\$ 1,570.33	0.97
1.000	D3 01 3260 0120	Replace 10' steel pipe 1/2" diam. per M.L.F. LPG distribution	12	1 Plum	Ea.	3.40	\$ 259.17	\$ 318.59	1.095	\$ 348.86	0.97
1.000	D3 01 3260 0220	Replace 10' steel pipe 3/4" diam. per M.L.F. LPG distribution	12	1 Plum	Ea.	3.09	\$ 246.67	\$ 303.09	1.095	\$ 331.88	0.97
1.000	D3 01 3260 0320	Replace 10' steel pipe 1" diam. per M.L.F. LPG distribution	12	1 Plum	Ea.	3.87	\$ 319.17	\$ 390.09	1.095	\$ 427.15	0.97
1.000	D3 01 3260 0420	Replace 10' steel pipe 1-1/4" diam. M.L.F. LPG distribution	12	Q1	Ea.	4.43	\$ 352.67	\$ 428.09	1.095	\$ 468.76	0.97
1.000	D3 01 3260 0520	Replace 10' steel pipe 1-1/2" diam. M.L.F. LPG distribution	12	Q1	Ea.	4.83	\$ 390.17	\$ 473.59	1.095	\$ 518.58	0.97
1.000	D3 01 3260 0620	Replace 10' section steel pipe 2" diam. M.L.F. LPG distribution	12	Q1	Ea.	5.80	\$ 479.17	\$ 587.09	1.095	\$ 642.86	0.97
1.000	D3 02 3388 1060	Replace coal spreader pneumatic	12	4 Stpl	Ea.	195.04	\$ 19,875.00	\$ 24,125.00	1.095	\$ 26,416.88	0.97
							\$ 28,576.74	\$ 34,664.96			
1.000	D3 01 3240 0110	Replace pressure regulator 1/2" diam. pipe natural gas	14	1 Stpl	Ea.	0.66	\$ 89.09	\$ 106.25	1.095	\$ 116.34	0.97
1.000	D3 01 3240 0120	Replace pressure regulator 1" diam. pipe natural gas	14	1 Stpl	Ea.	0.83	\$ 148.24	\$ 174.80	1.095	\$ 191.41	0.97
1.000	D3 01 3240 0130	Replace pressure regulator 1-1/2" diam. pipe natural gas	14	1 Stpl	Ea.	1.21	\$ 686.14	\$ 792.80	1.095	\$ 868.12	0.97
1.000	D3 01 3240 0140	Replace pressure regulator 2" diam. pipe natural gas	14	1 Stpl	Ea.	1.43	\$ 701.14	\$ 808.80	1.095	\$ 885.64	0.97
							\$ 1,624.61	\$ 1,882.65			
1.000	D3 01 3601 0010	Replace solar panel 3' x 8'	15	Q1	Ea.	5.67	\$ 1,285.00	\$ 1,487.00	1.095	\$ 1,628.27	0.97
1.000	D3 02 3198 1020	Replace boiler blowoff system	15	Q5	Ea.	8.33	\$ 3,935.00	\$ 4,551.00	1.095	\$ 4,983.35	0.97
1.000	D3 02 3292 1010	Repair chemical feed system	15	1 Stpl	Ea.	6.02	\$ 793.57	\$ 947.22	1.095	\$ 1,037.21	0.97
1.000	D3 02 3292 1030	Replace chemical feed system	15	2 Stpl	Ea.	2.50	\$ 740.00	\$ 860.00	1.095	\$ 941.70	0.97

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	GREEN Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
			\$ 3,288,926.96				\$ 3,946,712.36
			\$ 657,785.39	Assume 20% required		Assume 20% required	\$ 789,342.47
				PER 10 YEARS		PER 10 YEARS	
1.000	D3 01 3210 0110	Replace 10' of buried 2" diam steel pipe/M.L.F. natural gas	\$ 854.98	1.20	\$ 1,057.23	0.97	\$ 1,025.98
1.000	D3 01 3210 0120	Replace 10' of buried 3" diam steel pipe/M.L.F. natural gas	\$ 968.15	1.20	\$ 1,197.17	0.97	\$ 1,161.78
1.000	D3 01 3210 0130	Replace 10' of buried 4" diam steel pipe/M.L.F. natural gas	\$ 1,157.30	1.20	\$ 1,431.06	0.97	\$ 1,388.76
1.000	D3 01 3210 0140	Replace 10' of buried 6" diam steel pipe/M.L.F. natural gas	\$ 1,535.59	1.20	\$ 1,898.85	0.97	\$ 1,842.71
1.000	D3 01 3210 0410	Replace 10' of hung 2" diam steel pipe/M.L.F. natural gas	\$ 708.02	1.20	\$ 875.51	0.97	\$ 849.62
1.000	D3 01 3210 0420	Replace 10' of hung 3" diam steel pipe/M.L.F. natural gas	\$ 817.26	1.20	\$ 1,010.58	0.97	\$ 980.71
1.000	D3 01 3210 0430	Replace 10' of hung 4" diam steel pipe/M.L.F. natural gas	\$ 977.71	1.20	\$ 1,209.00	0.97	\$ 1,173.26
1.000	D3 01 3210 0440	Replace 10' of hung 6" diam steel pipe/M.L.F. natural gas	\$ 1,523.90	1.20	\$ 1,884.39	0.97	\$ 1,828.69
1.000	D3 01 3260 0120	Replace 10' steel pipe 1/2" diam. per M.L.F. LPG distribution	\$ 338.54	1.20	\$ 418.63	0.97	\$ 406.25
1.000	D3 01 3260 0220	Replace 10' steel pipe 3/4" diam. per M.L.F. LPG distribution	\$ 322.07	1.20	\$ 398.26	0.97	\$ 386.49
1.000	D3 01 3260 0320	Replace 10' steel pipe 1" diam. per M.L.F. LPG distribution	\$ 414.52	1.20	\$ 512.58	0.97	\$ 497.42
1.000	D3 01 3260 0420	Replace 10' steel pipe 1-1/4" diam. M.L.F. LPG distribution	\$ 454.90	1.20	\$ 562.51	0.97	\$ 545.88
1.000	D3 01 3260 0520	Replace 10' steel pipe 1-1/2" diam. M.L.F. LPG distribution	\$ 503.25	1.20	\$ 622.30	0.97	\$ 603.90
1.000	D3 01 3260 0620	Replace 10' section steel pipe 2" diam. M.L.F. LPG distribution	\$ 623.86	1.20	\$ 771.44	0.97	\$ 748.63
1.000	D3 02 3388 1060	Replace coal spreader pneumatic	\$ 25,635.91	1.20	\$ 31,700.25	0.97	\$ 30,763.10
			\$ 36,835.97				\$ 44,203.17
			\$ 18,417.99	Assume 50% required		Assume 50% required	\$ 22,101.58
				PER 12 YEARS		PER 12 YEARS	
1.000	D3 01 3240 0110	Replace pressure regulator 1/2" diam. pipe natural gas	\$ 112.90	1.20	\$ 139.61	0.97	\$ 135.49
1.000	D3 01 3240 0120	Replace pressure regulator 1" diam. pipe natural gas	\$ 185.75	1.20	\$ 229.69	0.97	\$ 222.90
1.000	D3 01 3240 0130	Replace pressure regulator 1-1/2" diam. pipe natural gas	\$ 842.45	1.20	\$ 1,041.74	0.97	\$ 1,010.94
1.000	D3 01 3240 0140	Replace pressure regulator 2" diam. pipe natural gas	\$ 859.45	1.20	\$ 1,062.76	0.97	\$ 1,031.34
			\$ 2,000.56				\$ 2,400.67
			\$ 1,000.28	Assume 50% required		Assume 50% required	\$ 1,200.33
				PER 14 YEARS		PER 14 YEARS	
1.000	D3 01 3601 0010	Replace solar panel 3' x 8'	\$ 1,580.13	1.20	\$ 1,953.92	0.97	\$ 1,896.15
1.000	D3 02 3198 1020	Replace boiler blowoff system	\$ 4,836.02	1.20	\$ 5,980.01	0.97	\$ 5,803.23
1.000	D3 02 3292 1010	Repair chemical feed system	\$ 1,006.54	1.20	\$ 1,244.65	0.97	\$ 1,207.85
1.000	D3 02 3292 1030	Replace chemical feed system	\$ 913.86	1.20	\$ 1,130.04	0.97	\$ 1,096.63

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

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Based on National Averages											
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN											
Escalation	6%										
De-Escalation to July 2009	1.03										NON-GREEN
De-Escalation Factor to be Applied	0.97										
Green Factor	1.20	Assumed Value									
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Incl. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor
1.000	D3 02 3294 1010	Repair feed water supply pump	15	1 Stpl	Ea.	9.45	\$ 2,565.00	\$ 2,974.50	1.095	\$ 3,257.08	0.97
1.000	D3 02 3294 1030	Replace feed water pump	15	Q2	Ea.	33.33	\$ 15,170.00	\$ 17,535.00	1.095	\$ 19,200.83	0.97
1.000	D3 02 3310 0010	Replace metal flue, all fuel SS, 6" diameter metal flue / chimney	15	Q9	L.F.	0.39	\$ 96.50	\$ 112.00	1.095	\$ 122.64	0.97
1.000	D3 02 3310 0020	Replace metal flue, all fuel SS, 10" diameter metal flue / chimney	15	Q9	L.F.	0.48	\$ 130.00	\$ 150.00	1.095	\$ 164.25	0.97
1.000	D3 02 3310 0030	Replace metal flue, all fuel SS, 20" diameter metal flue / chimney	15	Q10	L.F.	0.97	\$ 239.00	\$ 278.00	1.095	\$ 304.41	0.97
1.000	D3 02 3310 0040	Replace metal flue, all fuel SS, 32" diameter metal flue / chimney	15	Q10	L.F.	1.29	\$ 380.00	\$ 440.00	1.095	\$ 481.80	0.97
1.000	D3 02 3310 0050	Replace metal flue, all fuel SS, 48" diameter metal flue / chimney	15	Q10	L.F.	1.83	\$ 585.00	\$ 675.00	1.095	\$ 739.13	0.97
1.000	D3 02 3390 1030	Replace fuel oil 25 GPH pump / motor set	15	Q5	Ea.	5.20	\$ 1,175.00	\$ 1,375.00	1.095	\$ 1,505.63	0.97
1.000	D3 02 3390 1040	Replace fuel oil 45 GPH pump / motor set	15	Q5	Ea.	5.20	\$ 1,175.00	\$ 1,375.00	1.095	\$ 1,505.63	0.97
1.000	D3 02 3390 1050	Replace fuel oil 90 GPH pump / motor set	15	Q5	Ea.	6.24	\$ 1,220.00	\$ 1,451.00	1.095	\$ 1,588.85	0.97
1.000	D3 02 3390 1060	Replace fuel oil 160 GPH pump / motor set	15	Q5	Ea.	7.79	\$ 1,375.00	\$ 1,613.00	1.095	\$ 1,766.24	0.97
1.000	D3 03 3115 1030	Replace cooling tower, 50 ton	15	Q6	Ea.	31.18	\$ 12,625.00	\$ 14,580.00	1.095	\$ 15,965.10	0.97
1.000	D3 03 3115 2030	Replace cooling tower, 100 ton	15	Q6	Ea.	42.86	\$ 18,555.00	\$ 21,375.00	1.095	\$ 23,405.63	0.97
1.000	D3 03 3115 3030	Replace cooling tower, 300 ton	15	Q6	Ea.	108.86	\$ 34,875.00	\$ 40,425.00	1.095	\$ 44,265.38	0.97
1.000	D3 03 3115 4030	Replace cooling tower, 1000 ton	15	Q6	Ea.	313.05	\$ 87,750.00	\$ 101,850.00	1.095	\$ 111,525.75	0.97
1.000	D3 03 3210 1030	Replace condenser, air cooled, 5 ton	15	Q5	Ea.	15.58	\$ 2,900.00	\$ 3,400.00	1.095	\$ 3,723.00	0.97
1.000	D3 03 3210 2030	Replace condenser, air cooled, 20 ton	15	Q5	Ea.	31.17	\$ 7,125.00	\$ 8,325.00	1.095	\$ 9,115.88	0.97
1.000	D3 03 3210 3030	Replace condenser, air cooled, 50 ton	15	Q6	Ea.	116.88	\$ 22,250.00	\$ 26,025.00	1.095	\$ 28,497.38	0.97
1.000	D3 03 3210 4030	Replace condenser, air cooled, 100 ton	15	Q7	Ea.	207.26	\$ 43,650.00	\$ 51,000.00	1.095	\$ 55,845.00	0.97
1.000	D3 03 3260 1030	Replace evaporative condenser, 20 ton	15	Q5	Ea.	66.33	\$ 10,425.00	\$ 12,300.00	1.095	\$ 13,468.50	0.97
1.000	D3 03 3260 2030	Replace evaporative condenser, 100 ton	15	Q7	Ea.	172.76	\$ 28,625.00	\$ 33,825.00	1.095	\$ 37,038.38	0.97
1.000	D3 03 3260 3030	Replace evaporative condenser, 300 ton	15	Q7	Ea.	457.03	\$ 75,850.00	\$ 89,700.00	1.095	\$ 98,221.50	0.97
1.000	D3 04 3120 1030	Replace fan coil unit, 1 ton	15	Q5	Ea.	5.20	\$ 1,200.00	\$ 1,400.00	1.095	\$ 1,533.00	0.97
1.000	D3 04 3120 2030	Replace fan coil unit, 3 ton	15	Q5	Ea.	7.79	\$ 2,350.00	\$ 2,713.00	1.095	\$ 2,970.74	0.97
1.000	D3 04 3120 3030	Replace fan coil unit, 5 ton	15	Q5	Ea.	8.05	\$ 3,155.00	\$ 3,644.00	1.095	\$ 3,990.18	0.97
1.000	D3 04 3120 4030	Replace fan coil unit, 10 ton	15	Q6	Ea.	34.62	\$ 5,515.00	\$ 6,490.00	1.095	\$ 7,106.55	0.97
1.000	D3 04 3120 5030	Replace fan coil unit, 20 ton	15	Q6	Ea.	58.54	\$ 9,050.00	\$ 10,675.00	1.095	\$ 11,689.13	0.97
1.000	D3 04 3120 6030	Replace fan coil unit, 30 ton	15	Q6	Ea.	77.92	\$ 13,650.00	\$ 16,050.00	1.095	\$ 17,574.75	0.97
1.000	D3 04 3122 1040	Replace fan coil, DX 1-1/2 ton, no heat	15	Q5	Ea.	6.24	\$ 1,120.00	\$ 1,325.00	1.095	\$ 1,450.88	0.97
1.000	D3 04 3122 2040	Replace fan coil, DX 2 ton, no heat	15	Q5	Ea.	6.50	\$ 1,200.00	\$ 1,407.00	1.095	\$ 1,540.67	0.97
1.000	D3 04 3122 3040	Replace fan coil, DX 2-1/2 ton, no heat	15	Q5	Ea.	7.09	\$ 1,287.00	\$ 1,496.00	1.095	\$ 1,638.12	0.97
1.000	D3 04 3122 4040	Replace fan coil, DX 3 ton, no heat	15	Q5	Ea.	8.21	\$ 1,558.00	\$ 1,823.00	1.095	\$ 1,996.19	0.97
1.000	D3 04 3122 6060	Replace fan coil, DX 5 ton, no heat	15	Q5	Ea.	10.40	\$ 2,051.00	\$ 2,401.00	1.095	\$ 2,629.10	0.97
1.000	D3 04 3122 8080	Replace fan coil, DX 10 ton, no heat	15	Q6	Ea.	18.00	\$ 4,135.00	\$ 4,825.00	1.095	\$ 5,283.38	0.97
1.000	D3 04 3122 9590	Replace fan coil, DX 20 ton, no heat	15	Q6	Ea.	66.89	\$ 9,925.00	\$ 11,775.00	1.095	\$ 12,893.63	0.97
1.000	D3 04 3124 1010	Replace fan coil, DX 1-1/2 ton, with heat	15	Q5	Ea.	8.79	\$ 1,559.00	\$ 1,842.00	1.095	\$ 2,016.99	0.97
1.000	D3 04 3124 2010	Replace fan coil, DX 2 ton, with heat	15	Q5	Ea.	9.15	\$ 1,689.00	\$ 1,974.00	1.095	\$ 2,161.53	0.97
1.000	D3 04 3124 3010	Replace fan coil, DX 2-1/2 ton, with heat	15	Q5	Ea.	9.98	\$ 1,802.00	\$ 2,115.00	1.095	\$ 2,315.93	0.97

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 - EAST HALL								
Based on National Averages								
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN								
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.20	Assumed Value						
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments	
1.000	D3 02 3294 1010	Repair feed water supply pump	\$ 3,160.79	1.20	\$ 3,908.49	0.97	\$ 3,792.95	
1.000	D3 02 3294 1030	Replace feed water pump	\$ 18,633.19	1.20	\$ 23,040.99	0.97	\$ 22,359.83	
1.000	D3 02 3310 0010	Replace metal flue, all fuel SS, 6" diameter metal flue / chimney	\$ 119.01	1.20	\$ 147.17	0.97	\$ 142.82	
1.000	D3 02 3310 0020	Replace metal flue, all fuel SS, 10" diameter metal flue / chimney	\$ 159.39	1.20	\$ 197.10	0.97	\$ 191.27	
1.000	D3 02 3310 0030	Replace metal flue, all fuel SS, 20" diameter metal flue / chimney	\$ 295.41	1.20	\$ 365.29	0.97	\$ 354.49	
1.000	D3 02 3310 0040	Replace metal flue, all fuel SS, 32" diameter metal flue / chimney	\$ 467.56	1.20	\$ 578.16	0.97	\$ 561.07	
1.000	D3 02 3310 0050	Replace metal flue, all fuel SS, 48" diameter metal flue / chimney	\$ 717.27	1.20	\$ 886.95	0.97	\$ 860.73	
1.000	D3 02 3390 1030	Replace fuel oil 25 GPH pump / motor set	\$ 1,461.11	1.20	\$ 1,806.75	0.97	\$ 1,753.34	
1.000	D3 02 3390 1040	Replace fuel oil 45 GPH pump / motor set	\$ 1,461.11	1.20	\$ 1,806.75	0.97	\$ 1,753.34	
1.000	D3 02 3390 1050	Replace fuel oil 90 GPH pump / motor set	\$ 1,541.87	1.20	\$ 1,906.61	0.97	\$ 1,850.25	
1.000	D3 02 3390 1060	Replace fuel oil 160 GPH pump / motor set	\$ 1,714.02	1.20	\$ 2,119.48	0.97	\$ 2,056.82	
1.000	D3 03 3115 1030	Replace cooling tower, 50 ton	\$ 15,493.12	1.20	\$ 19,158.12	0.97	\$ 18,591.75	
1.000	D3 03 3115 2030	Replace cooling tower, 100 ton	\$ 22,713.68	1.20	\$ 28,086.75	0.97	\$ 27,256.42	
1.000	D3 03 3115 3030	Replace cooling tower, 300 ton	\$ 42,956.76	1.20	\$ 53,118.45	0.97	\$ 51,548.11	
1.000	D3 03 3115 4030	Replace cooling tower, 1000 ton	\$ 108,228.71	1.20	\$ 133,830.90	0.97	\$ 129,874.46	
1.000	D3 03 3210 1030	Replace condenser, air cooled, 5 ton	\$ 3,612.94	1.20	\$ 4,467.60	0.97	\$ 4,335.52	
1.000	D3 03 3210 2030	Replace condenser, air cooled, 20 ton	\$ 8,846.38	1.20	\$ 10,939.05	0.97	\$ 10,615.66	
1.000	D3 03 3210 3030	Replace condenser, air cooled, 50 ton	\$ 27,654.91	1.20	\$ 34,196.85	0.97	\$ 33,185.89	
1.000	D3 03 3210 4030	Replace condenser, air cooled, 100 ton	\$ 54,194.05	1.20	\$ 67,014.00	0.97	\$ 65,032.86	
1.000	D3 03 3260 1030	Replace evaporative condenser, 20 ton	\$ 13,070.33	1.20	\$ 16,162.20	0.97	\$ 15,684.40	
1.000	D3 03 3260 2030	Replace evaporative condenser, 100 ton	\$ 35,943.41	1.20	\$ 44,446.05	0.97	\$ 43,132.09	
1.000	D3 03 3260 3030	Replace evaporative condenser, 300 ton	\$ 95,317.78	1.20	\$ 117,865.80	0.97	\$ 114,381.33	
1.000	D3 04 3120 1030	Replace fan coil unit, 1 ton	\$ 1,487.68	1.20	\$ 1,839.60	0.97	\$ 1,785.22	
1.000	D3 04 3120 2030	Replace fan coil unit, 3 ton	\$ 2,882.91	1.20	\$ 3,564.88	0.97	\$ 3,459.49	
1.000	D3 04 3120 3030	Replace fan coil unit, 5 ton	\$ 3,872.22	1.20	\$ 4,788.22	0.97	\$ 4,646.66	
1.000	D3 04 3120 4030	Replace fan coil unit, 10 ton	\$ 6,896.46	1.20	\$ 8,527.86	0.97	\$ 8,275.75	
1.000	D3 04 3120 5030	Replace fan coil unit, 20 ton	\$ 11,343.56	1.20	\$ 14,026.95	0.97	\$ 13,612.27	
1.000	D3 04 3120 6030	Replace fan coil unit, 30 ton	\$ 17,055.19	1.20	\$ 21,089.70	0.97	\$ 20,466.22	
1.000	D3 04 3122 1040	Replace fan coil, DX 1-1/2 ton, no heat	\$ 1,407.98	1.20	\$ 1,741.05	0.97	\$ 1,689.58	
1.000	D3 04 3122 2040	Replace fan coil, DX 2 ton, no heat	\$ 1,495.12	1.20	\$ 1,848.80	0.97	\$ 1,794.14	
1.000	D3 04 3122 3040	Replace fan coil, DX 2-1/2 ton, no heat	\$ 1,589.69	1.20	\$ 1,965.74	0.97	\$ 1,907.63	
1.000	D3 04 3122 4040	Replace fan coil, DX 3 ton, no heat	\$ 1,937.17	1.20	\$ 2,395.42	0.97	\$ 2,324.61	
1.000	D3 04 3122 6060	Replace fan coil, DX 5 ton, no heat	\$ 2,551.37	1.20	\$ 3,154.91	0.97	\$ 3,061.65	
1.000	D3 04 3122 8080	Replace fan coil, DX 10 ton, no heat	\$ 5,127.18	1.20	\$ 6,340.05	0.97	\$ 6,152.62	
1.000	D3 04 3122 9590	Replace fan coil, DX 20 ton, no heat	\$ 12,512.45	1.20	\$ 15,472.35	0.97	\$ 15,014.94	
1.000	D3 04 3124 1010	Replace fan coil, DX 1-1/2 ton, with heat	\$ 1,957.36	1.20	\$ 2,420.39	0.97	\$ 2,348.83	
1.000	D3 04 3124 2010	Replace fan coil, DX 2 ton, with heat	\$ 2,097.63	1.20	\$ 2,593.84	0.97	\$ 2,517.15	
1.000	D3 04 3124 3010	Replace fan coil, DX 2-1/2 ton, with heat	\$ 2,247.46	1.20	\$ 2,779.11	0.97	\$ 2,696.95	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 - EAST HALL											
Based on National Averages											
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN											
Escalation	6%										
De-Escalation to July 2009	1.03										NON-GREEN
De-Escalation Factor to be Applied	0.97										
Green Factor	1.20	Assumed Value									
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Incl. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor
1.000	D3 04 3124 4010	Replace fan coil, DX 3 ton, with heat	15	Q5	Ea.	11.56	\$ 2,176.00	\$ 2,570.00	1.095	\$ 2,814.15	0.97
1.000	D3 04 3128 1030	Replace unit ventilator, 750 CFM, heat/cool coils	15	Q6	Ea.	23.40	\$ 5,395.00	\$ 6,285.00	1.095	\$ 6,882.08	0.97
1.000	D3 04 3128 2030	Replace unit ventilator, 1250 CFM, heat/cool coils	15	Q6	Ea.	33.43	\$ 6,870.00	\$ 8,035.00	1.095	\$ 8,798.33	0.97
1.000	D3 04 3128 2050	Replace unit ventilator, 2000 CFM, heat/cool coils	15	Q6	Ea.	93.55	\$ 11,725.00	\$ 13,950.00	1.095	\$ 15,275.25	0.97
1.000	D3 04 3140 0030	Replace duct heater	15	1 Elec	Ea.	2.67	\$ 1,965.00	\$ 2,275.00	1.095	\$ 2,491.13	0.97
1.000	D3 04 3220 1010	Replace fan & motor, propeller exh., 375 CFM exhaust fan	15	Q20	Ea.	3.90	\$ 693.50	\$ 811.50	1.095	\$ 888.59	0.97
1.000	D3 04 3220 1030	Replace fan & motor, propeller exh., 1000 CFM exhaust fan	15	Q20	Ea.	4.88	\$ 1,006.50	\$ 1,164.00	1.095	\$ 1,274.58	0.97
1.000	D3 04 3220 1040	Replace fan & motor, propeller exh., 4700 CFM exhaust fan	15	Q20	Ea.	7.80	\$ 1,622.00	\$ 1,883.00	1.095	\$ 2,061.89	0.97
1.000	D3 04 3320 0030	Replace flash tank 24 gallon	15	Q5	Ea.	2.23	\$ 738.00	\$ 854.00	1.095	\$ 935.13	0.97
1.000	D3 04 3340 0010	Repair condensate meter	15	1 Stpl	Ea.	4.14	\$ 1,164.00	\$ 1,355.00	1.095	\$ 1,483.73	0.97
1.000	D3 04 3530 1030	Replace circulator pump, 1/12 - 3/4 H.P.	15	Q1	Ea.	7.79	\$ 2,876.00	\$ 3,314.00	1.095	\$ 3,628.83	0.97
1.000	D3 04 3530 2030	Replace circulator, pump, 1 H.P.	15	Q1	Ea.	7.80	\$ 4,351.00	\$ 5,014.00	1.095	\$ 5,490.33	0.97
1.000	D3 05 3110 1030	Replace unit heater, 12 MBH, 2 PSI steam	15	Q5	Ea.	2.60	\$ 520.00	\$ 607.50	1.095	\$ 665.21	0.97
1.000	D3 05 3110 2030	Replace unit heater, 36 MBH, 2 PSI steam	15	Q5	Ea.	3.90	\$ 780.00	\$ 914.00	1.095	\$ 1,000.83	0.97
1.000	D3 05 3110 3030	Replace unit heater, 85 MBH, 2 PSI steam	15	Q5	Ea.	4.80	\$ 937.50	\$ 1,096.00	1.095	\$ 1,200.12	0.97
1.000	D3 05 3110 4030	Replace unit heater, 250 MBH, 2 PSI steam	15	Q5	Ea.	12.48	\$ 2,416.00	\$ 2,850.00	1.095	\$ 3,120.75	0.97
1.000	D3 05 3110 5020	Replace unit heater, 400 MBH, 2 PSI steam	15	Q5	Ea.	19.51	\$ 3,875.00	\$ 4,545.00	1.095	\$ 4,976.78	0.97
1.000	D3 05 3112 0030	Replace infrared heater suspended, commercial	15	1 Elec	Ea.	2.77	\$ 410.00	\$ 485.00	1.095	\$ 531.08	0.97
1.000	D3 05 3114 0030	Replace heater standard suspended heater	15	1 Elec	Ea.	3.87	\$ 795.00	\$ 930.00	1.095	\$ 1,018.35	0.97
1.000	D3 05 3116 0030	Replace heater explosionproof industrial heater	15	1 Elec	Ea.	4.61	\$ 5,923.00	\$ 6,760.00	1.095	\$ 7,402.20	0.97
1.000	D3 05 3160 0030	Replace heater convector suspended, commercial	15	1 Elec	Ea.	2.67	\$ 2,165.00	\$ 2,475.00	1.095	\$ 2,710.13	0.97
1.000	D3 05 3170 1040	Replace terminal reheat, 12" x 24" coil	15	Q5	Ea.	2.57	\$ 924.50	\$ 1,062.00	1.095	\$ 1,162.89	0.97
1.000	D3 05 3170 2040	Replace terminal reheat, 18" x 24" coil	15	Q5	Ea.	3.85	\$ 1,124.50	\$ 1,318.00	1.095	\$ 1,443.21	0.97
1.000	D3 05 3170 3040	Replace terminal reheat, 36" x 36" coil	15	Q5	Ea.	11.56	\$ 2,198.00	\$ 2,579.00	1.095	\$ 2,824.01	0.97
1.000	D3 05 3170 4040	Replace terminal reheat, 48" x 126" coil	15	Q5	Ea.	53.81	\$ 7,850.00	\$ 9,275.00	1.095	\$ 10,156.13	0.97
1.000	D3 05 3278 1040	Replace multi-zone rooftop unit, 15 ton	15	Q7	Ea.	164.70	\$ 72,800.00	\$ 83,750.00	1.095	\$ 91,706.25	0.97
1.000	D3 05 3278 2040	Replace multi-zone rooftop unit, 25 ton	15	Q7	Ea.	210.81	\$ 93,550.00	\$ 107,850.00	1.095	\$ 118,095.75	0.97
1.000	D3 05 3278 3040	Replace multi-zone rooftop unit, 40 ton	15	Q7	Ea.	323.00	\$ 137,500.00	\$ 158,700.00	1.095	\$ 173,776.50	0.97
1.000	D3 05 3278 4040	Replace multi-zone rooftop unit, 70 ton	15	Q7	Ea.	495.00	\$ 189,100.00	\$ 218,800.00	1.095	\$ 239,586.00	0.97
1.000	D3 05 3278 5040	Replace multi-zone rooftop unit, 105 ton	15	Q7	Ea.	737.00	\$ 254,700.00	\$ 294,600.00	1.095	\$ 322,587.00	0.97
1.000	D3 05 3280 1002	Replace single zone rt. unit, 3 ton	15	Q5	Ea.	38.48	\$ 6,040.00	\$ 7,130.00	1.095	\$ 7,807.35	0.97
1.000	D3 05 3280 1004	Replace single zone rt. unit, 5 ton	15	Q5	Ea.	56.57	\$ 8,600.00	\$ 10,175.00	1.095	\$ 11,141.63	0.97
1.000	D3 05 3280 1006	Replace single zone rt. unit, 7.5 ton	15	Q5	Ea.	69.03	\$ 12,300.00	\$ 14,475.00	1.095	\$ 15,850.13	0.97
1.000	D3 05 3280 1008	Replace single zone rt. unit, 10 ton	15	Q6	Ea.	81.90	\$ 16,525.00	\$ 19,450.00	1.095	\$ 21,297.75	0.97
1.000	D3 05 3280 1040	Replace single zone rooftop unit, 15 ton	15	Q6	Ea.	106.39	\$ 22,925.00	\$ 26,775.00	1.095	\$ 29,318.63	0.97
1.000	D3 05 3280 2040	Replace single zone rooftop unit, 25 ton	15	Q7	Ea.	153.66	\$ 36,900.00	\$ 43,000.00	1.095	\$ 47,085.00	0.97
1.000	D3 05 3280 3040	Replace single zone rooftop unit, 60 ton	15	Q7	Ea.	369.00	\$ 75,000.00	\$ 87,900.00	1.095	\$ 96,250.50	0.97
1.000	D3 05 3280 4040	Replace single zone rooftop unit, 100 ton	15	Q7	Ea.	600.00	\$ 146,600.00	\$ 171,200.00	1.095	\$ 187,464.00	0.97

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value					

Qty	Assembly Number	Description	GREEN				
			Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 04 3124 4010	Replace fan coil, DX 3 ton, with heat	\$ 2,730.96	1.20	\$ 3,376.98	0.97	\$ 3,277.15
1.000	D3 04 3128 1030	Replace unit ventilator, 750 CFM, heat/cool coils	\$ 6,678.62	1.20	\$ 8,258.49	0.97	\$ 8,014.34
1.000	D3 04 3128 2030	Replace unit ventilator, 1250 CFM, heat/cool coils	\$ 8,538.22	1.20	\$ 10,557.99	0.97	\$ 10,245.86
1.000	D3 04 3128 2050	Replace unit ventilator, 2000 CFM, heat/cool coils	\$ 14,823.67	1.20	\$ 18,330.30	0.97	\$ 17,788.40
1.000	D3 04 3140 0030	Replace duct heater	\$ 2,417.48	1.20	\$ 2,989.35	0.97	\$ 2,900.98
1.000	D3 04 3220 1010	Replace fan & motor, propeller exh., 375 CFM exhaust fan	\$ 862.32	1.20	\$ 1,066.31	0.97	\$ 1,034.79
1.000	D3 04 3220 1030	Replace fan & motor, propeller exh., 1000 CFM exhaust fan	\$ 1,236.90	1.20	\$ 1,529.50	0.97	\$ 1,484.28
1.000	D3 04 3220 1040	Replace fan & motor, propeller exh., 4700 CFM exhaust fan	\$ 2,000.93	1.20	\$ 2,474.26	0.97	\$ 2,401.12
1.000	D3 04 3320 0030	Replace flash tank 24 gallon	\$ 907.48	1.20	\$ 1,122.16	0.97	\$ 1,088.98
1.000	D3 04 3340 0010	Repair condensate meter	\$ 1,439.86	1.20	\$ 1,780.47	0.97	\$ 1,727.83
1.000	D3 04 3530 1030	Replace circulator pump, 1/12 - 3/4 H.P.	\$ 3,521.55	1.20	\$ 4,354.60	0.97	\$ 4,225.86
1.000	D3 04 3530 2030	Replace circulator, pump, 1 H.P.	\$ 5,328.02	1.20	\$ 6,588.40	0.97	\$ 6,393.62
1.000	D3 05 3110 1030	Replace unit heater, 12 MBH, 2 PSI steam	\$ 645.55	1.20	\$ 798.26	0.97	\$ 774.66
1.000	D3 05 3110 2030	Replace unit heater, 36 MBH, 2 PSI steam	\$ 971.24	1.20	\$ 1,201.00	0.97	\$ 1,165.49
1.000	D3 05 3110 3030	Replace unit heater, 85 MBH, 2 PSI steam	\$ 1,164.64	1.20	\$ 1,440.14	0.97	\$ 1,397.57
1.000	D3 05 3110 4030	Replace unit heater, 250 MBH, 2 PSI steam	\$ 3,028.49	1.20	\$ 3,744.90	0.97	\$ 3,634.19
1.000	D3 05 3110 5020	Replace unit heater, 400 MBH, 2 PSI steam	\$ 4,829.65	1.20	\$ 5,972.13	0.97	\$ 5,795.58
1.000	D3 05 3112 0030	Replace infrared heater suspended, commercial	\$ 515.37	1.20	\$ 637.29	0.97	\$ 618.45
1.000	D3 05 3114 0030	Replace heater standard suspended heater	\$ 988.24	1.20	\$ 1,222.02	0.97	\$ 1,185.89
1.000	D3 05 3116 0030	Replace heater explosionproof industrial heater	\$ 7,183.37	1.20	\$ 8,882.64	0.97	\$ 8,620.04
1.000	D3 05 3160 0030	Replace heater convactor suspended, commercial	\$ 2,630.01	1.20	\$ 3,252.15	0.97	\$ 3,156.01
1.000	D3 05 3170 1040	Replace terminal reheat, 12" x 24" coil	\$ 1,128.51	1.20	\$ 1,395.47	0.97	\$ 1,354.21
1.000	D3 05 3170 2040	Replace terminal reheat, 18" x 24" coil	\$ 1,400.54	1.20	\$ 1,731.85	0.97	\$ 1,680.65
1.000	D3 05 3170 3040	Replace terminal reheat, 36" x 36" coil	\$ 2,740.52	1.20	\$ 3,388.81	0.97	\$ 3,288.62
1.000	D3 05 3170 4040	Replace terminal reheat, 48" x 126" coil	\$ 9,855.88	1.20	\$ 12,187.35	0.97	\$ 11,827.06
1.000	D3 05 3278 1040	Replace multi-zone rooftop unit, 15 ton	\$ 88,995.14	1.20	\$ 110,047.50	0.97	\$ 106,794.16
1.000	D3 05 3278 2040	Replace multi-zone rooftop unit, 25 ton	\$ 114,604.48	1.20	\$ 141,714.90	0.97	\$ 137,525.38
1.000	D3 05 3278 3040	Replace multi-zone rooftop unit, 40 ton	\$ 168,639.14	1.20	\$ 208,531.80	0.97	\$ 202,366.97
1.000	D3 05 3278 4040	Replace multi-zone rooftop unit, 70 ton	\$ 232,503.12	1.20	\$ 287,503.20	0.97	\$ 279,003.74
1.000	D3 05 3278 5040	Replace multi-zone rooftop unit, 105 ton	\$ 313,050.36	1.20	\$ 387,104.40	0.97	\$ 375,660.43
1.000	D3 05 3280 1002	Replace single zone rt. unit, 3 ton	\$ 7,576.54	1.20	\$ 9,368.82	0.97	\$ 9,091.85
1.000	D3 05 3280 1004	Replace single zone rt. unit, 5 ton	\$ 10,812.24	1.20	\$ 13,369.95	0.97	\$ 12,974.69
1.000	D3 05 3280 1006	Replace single zone rt. unit, 7.5 ton	\$ 15,381.55	1.20	\$ 19,020.15	0.97	\$ 18,457.86
1.000	D3 05 3280 1008	Replace single zone rt. unit, 10 ton	\$ 20,668.12	1.20	\$ 25,557.30	0.97	\$ 24,801.75
1.000	D3 05 3280 1040	Replace single zone rooftop unit, 15 ton	\$ 28,451.88	1.20	\$ 35,182.35	0.97	\$ 34,142.25
1.000	D3 05 3280 2040	Replace single zone rooftop unit, 25 ton	\$ 45,693.03	1.20	\$ 56,502.00	0.97	\$ 54,831.63
1.000	D3 05 3280 3040	Replace single zone rooftop unit, 60 ton	\$ 93,405.05	1.20	\$ 115,500.60	0.97	\$ 112,086.05
1.000	D3 05 3280 4040	Replace single zone rooftop unit, 100 ton	\$ 181,922.00	1.20	\$ 224,956.80	0.97	\$ 218,306.40

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

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Based on National Averages											
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN											
Escalation	6%										
De-Escalation to July 2009	1.03										NON-GREEN
De-Escalation Factor to be Applied	0.97										
Green Factor	1.20	Assumed Value									
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Incl. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor
1.000	D3 05 3282 1040	Replace multi-zone variable volume, 50 ton	15	Q7	Ea.	379.00	\$ 132,300.00	\$ 152,700.00	1.095	\$ 167,206.50	0.97
1.000	D3 05 3282 2040	Replace multi-zone variable volume, 70 ton	15	Q7	Ea.	535.00	\$ 185,100.00	\$ 214,300.00	1.095	\$ 234,658.50	0.97
1.000	D3 05 3282 3040	Replace multi-zone variable volume, 90 ton	15	Q7	Ea.	691.00	\$ 217,100.00	\$ 251,700.00	1.095	\$ 275,611.50	0.97
1.000	D3 05 3282 4040	Replace multi-zone variable volume, 105 ton	15	Q7	Ea.	791.00	\$ 244,200.00	\$ 283,100.00	1.095	\$ 309,994.50	0.97
1.000	D3 05 3282 5040	Replace multi-zone variable volume, 140 ton	15	Q7	Ea.	1,108.00	\$ 307,600.00	\$ 357,500.00	1.095	\$ 391,462.50	0.97
1.000	D3 05 3286 1040	Replace central station A.H.U., 1300 CFM	15	Q5	Ea.	26.00	\$ 7,275.00	\$ 8,450.00	1.095	\$ 9,252.75	0.97
1.000	D3 05 3286 2040	Replace central station A.H.U., 1900 CFM	15	Q5	Ea.	28.37	\$ 10,520.00	\$ 12,185.00	1.095	\$ 13,342.58	0.97
1.000	D3 05 3286 3040	Replace central station A.H.U., 5400 CFM	15	Q6	Ea.	58.52	\$ 25,075.00	\$ 28,875.00	1.095	\$ 31,618.13	0.97
1.000	D3 05 3286 4040	Replace central station A.H.U., 8000 CFM	15	Q6	Ea.	77.92	\$ 39,250.00	\$ 45,150.00	1.095	\$ 49,439.25	0.97
1.000	D3 05 3286 5040	Replace central station A.H.U., 16,000 CFM	15	Q6	Ea.	123.22	\$ 74,450.00	\$ 85,575.00	1.095	\$ 93,704.63	0.97
1.000	D3 05 3286 6040	Replace central station A.H.U., 33,500 CFM	15	Q6	Ea.	246.19	\$ 170,925.00	\$ 196,175.00	1.095	\$ 214,811.63	0.97
1.000	D3 05 3286 7040	Replace central station A.H.U., 63,000 CFM	15	Q7	Ea.	480.00	\$ 323,300.00	\$ 370,700.00	1.095	\$ 405,916.50	0.97
1.000	D3 05 3310 1030	Replace furnace, gas, 25 MBH residential	15	Q9	Ea.	6.00	\$ 966.00	\$ 1,133.00	1.095	\$ 1,240.64	0.97
1.000	D3 05 3310 2030	Replace furnace, gas, 100 MBH residential	15	Q9	Ea.	9.75	\$ 1,305.00	\$ 1,550.00	1.095	\$ 1,697.25	0.97
1.000	D3 05 3310 3030	Replace furnace, gas, 200 MBH residential	15	Q9	Ea.	12.00	\$ 3,322.00	\$ 3,852.00	1.095	\$ 4,217.94	0.97
1.000	D3 05 3320 1030	Replace furnace, oil, 55 MBH residential	15	Q9	Ea.	8.67	\$ 2,510.00	\$ 2,925.00	1.095	\$ 3,202.88	0.97
1.000	D3 05 3320 2030	Replace furnace, oil, 100 MBH residential	15	Q1	Ea.	9.18	\$ 2,570.00	\$ 2,986.00	1.095	\$ 3,269.67	0.97
1.000	D3 05 3320 3030	Replace furnace, oil, 200 MBH residential	15	Q1	Ea.	12.00	\$ 3,222.00	\$ 3,727.00	1.095	\$ 4,081.07	0.97
1.000	D3 05 3330 1030	Replace furnace, electric, 25 MBH residential	15	Q20	Ea.	8.48	\$ 1,139.00	\$ 1,349.00	1.095	\$ 1,477.16	0.97
1.000	D3 05 3330 2030	Replace furnace, electric, 50 MBH residential	15	Q20	Ea.	9.29	\$ 1,249.00	\$ 1,468.00	1.095	\$ 1,607.46	0.97
1.000	D3 05 3330 3030	Replace furnace, electric, 85 MBH residential	15	Q20	Ea.	10.84	\$ 1,472.00	\$ 1,727.00	1.095	\$ 1,891.07	0.97
							\$ 3,334,630.57	\$ 3,863,922.72			
1.000	D3 01 3150 0020	Replace remote tank fuel gauge	20	1 Stpl	Ea.	6.25	\$ 4,134.00	\$ 4,742.00	1.095	\$ 5,192.49	0.97
1.000	D3 01 3170 0020	Install 10' sect. 3/8" type L copper per M.L.F. fuel oil storage	20	1 Plum	Ea.	1.86	\$ 145.00	\$ 178.00	1.095	\$ 194.91	0.97
1.000	D3 01 3170 0030	Install 10' sect. 1/2" type L copper per M.L.F. fuel oil storage	20	1 Plum	Ea.	1.93	\$ 151.50	\$ 187.00	1.095	\$ 204.77	0.97
1.000	D3 01 3170 0040	Install 10' sect. 5/8" type L copper per M.L.F. fuel oil storage	20	1 Plum	Ea.	1.98	\$ 170.50	\$ 207.00	1.095	\$ 226.67	0.97
1.000	D3 01 3170 0050	Install 10' sect. 3/4" type L copper per M.L.F. fuel oil storage	20	1 Plum	Ea.	2.05	\$ 175.00	\$ 213.00	1.095	\$ 233.24	0.97
1.000	D3 01 3170 0060	Install 10' section 1" type L copper per M.L.F. fuel oil storage	20	1 Plum	Ea.	2.29	\$ 213.50	\$ 259.50	1.095	\$ 284.15	0.97
1.000	D3 02 3182 1010	Repair boiler, coal, 4600 MBH	20	4 Stpl	Ea.	109.54	\$ 28,117.50	\$ 32,790.00	1.095	\$ 35,905.05	0.97
1.000	D3 02 3296 1030	Replace deaerator	20	4 Stpl	Ea.	186.50	\$ 41,250.00	\$ 48,365.00	1.095	\$ 52,959.68	0.97
1.000	D3 03 3130 1030	Replace chiller, water cooled, 20 ton, reciprocating	20	Q7	Ea.	151.63	\$ 29,000.00	\$ 33,975.00	1.095	\$ 37,202.63	0.97
1.000	D3 03 3130 2030	Replace chiller, water cooled 50 ton, reciprocating	20	Q7	Ea.	222.07	\$ 47,125.00	\$ 55,075.00	1.095	\$ 60,307.13	0.97
1.000	D3 03 3130 3030	Replace chiller, water cooled, 100 ton, reciprocating	20	Q7	Ea.	349.00	\$ 85,600.00	\$ 99,950.00	1.095	\$ 109,445.25	0.97
1.000	D3 03 3130 5030	Replace chiller, water cooled, 200 ton, reciprocating	20	Q7	Ea.	489.00	\$ 125,975.00	\$ 147,000.00	1.095	\$ 160,965.00	0.97

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value					

Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 05 3282 1040	Replace multi-zone variable volume, 50 ton	\$ 162,263.37	1.20	\$ 200,647.80	0.97	\$ 194,716.05
1.000	D3 05 3282 2040	Replace multi-zone variable volume, 70 ton	\$ 227,721.29	1.20	\$ 281,590.20	0.97	\$ 273,265.54
1.000	D3 05 3282 3040	Replace multi-zone variable volume, 90 ton	\$ 267,463.59	1.20	\$ 330,733.80	0.97	\$ 320,956.31
1.000	D3 05 3282 4040	Replace multi-zone variable volume, 105 ton	\$ 300,830.13	1.20	\$ 371,993.40	0.97	\$ 360,996.15
1.000	D3 05 3282 5040	Replace multi-zone variable volume, 140 ton	\$ 379,889.69	1.20	\$ 469,755.00	0.97	\$ 455,867.63
1.000	D3 05 3286 1040	Replace central station A.H.U., 1300 CFM	\$ 8,979.21	1.20	\$ 11,103.30	0.97	\$ 10,775.05
1.000	D3 05 3286 2040	Replace central station A.H.U., 1900 CFM	\$ 12,948.13	1.20	\$ 16,011.09	0.97	\$ 15,537.75
1.000	D3 05 3286 3040	Replace central station A.H.U., 5400 CFM	\$ 30,683.40	1.20	\$ 37,941.75	0.97	\$ 36,820.08
1.000	D3 05 3286 4040	Replace central station A.H.U., 8000 CFM	\$ 47,977.68	1.20	\$ 59,327.10	0.97	\$ 57,573.21
1.000	D3 05 3286 5040	Replace central station A.H.U., 16,000 CFM	\$ 90,934.43	1.20	\$ 112,445.55	0.97	\$ 109,121.32
1.000	D3 05 3286 6040	Replace central station A.H.U., 33,500 CFM	\$ 208,461.15	1.20	\$ 257,773.95	0.97	\$ 250,153.38
1.000	D3 05 3286 7040	Replace central station A.H.U., 63,000 CFM	\$ 393,916.38	1.20	\$ 487,099.80	0.97	\$ 472,699.66
1.000	D3 05 3310 1030	Replace furnace, gas, 25 MBH residential	\$ 1,203.96	1.20	\$ 1,488.76	0.97	\$ 1,444.75
1.000	D3 05 3310 2030	Replace furnace, gas, 100 MBH residential	\$ 1,647.07	1.20	\$ 2,036.70	0.97	\$ 1,976.49
1.000	D3 05 3310 3030	Replace furnace, gas, 200 MBH residential	\$ 4,093.24	1.20	\$ 5,061.53	0.97	\$ 4,911.89
1.000	D3 05 3320 1030	Replace furnace, oil, 55 MBH residential	\$ 3,108.19	1.20	\$ 3,843.45	0.97	\$ 3,729.83
1.000	D3 05 3320 2030	Replace furnace, oil, 100 MBH residential	\$ 3,173.01	1.20	\$ 3,923.60	0.97	\$ 3,807.61
1.000	D3 05 3320 3030	Replace furnace, oil, 200 MBH residential	\$ 3,960.42	1.20	\$ 4,897.28	0.97	\$ 4,752.50
1.000	D3 05 3330 1030	Replace furnace, electric, 25 MBH residential	\$ 1,433.49	1.20	\$ 1,772.59	0.97	\$ 1,720.18
1.000	D3 05 3330 2030	Replace furnace, electric, 50 MBH residential	\$ 1,559.94	1.20	\$ 1,928.95	0.97	\$ 1,871.93
1.000	D3 05 3330 3030	Replace furnace, electric, 85 MBH residential	\$ 1,835.16	1.20	\$ 2,269.28	0.97	\$ 2,202.19
			\$ 4,105,914.40				\$ 4,927,097.28
			\$ 1,231,774.32	Assume 30% required		Assume 30% required	\$ 1,478,129.18
				PER 15 YEARS		PER 15 YEARS	
1.000	D3 01 3150 0020	Replace remote tank fuel gauge	\$ 5,038.98	1.20	\$ 6,230.99	0.97	\$ 6,046.78
1.000	D3 01 3170 0020	Install 10' sect. 3/8" type L copper per M.L.F. fuel oil storage	\$ 189.15	1.20	\$ 233.89	0.97	\$ 226.98
1.000	D3 01 3170 0030	Install 10' sect. 1/2" type L copper per M.L.F. fuel oil storage	\$ 198.71	1.20	\$ 245.72	0.97	\$ 238.45
1.000	D3 01 3170 0040	Install 10' sect. 5/8" type L copper per M.L.F. fuel oil storage	\$ 219.96	1.20	\$ 272.00	0.97	\$ 263.96
1.000	D3 01 3170 0050	Install 10' sect. 3/4" type L copper per M.L.F. fuel oil storage	\$ 226.34	1.20	\$ 279.88	0.97	\$ 271.61
1.000	D3 01 3170 0060	Install 10' section 1" type L copper per M.L.F. fuel oil storage	\$ 275.75	1.20	\$ 340.98	0.97	\$ 330.90
1.000	D3 02 3182 1010	Repair boiler, coal, 4600 MBH	\$ 34,843.59	1.20	\$ 43,086.06	0.97	\$ 41,812.31
1.000	D3 02 3296 1030	Replace deaerator	\$ 51,394.03	1.20	\$ 63,551.61	0.97	\$ 61,672.83
1.000	D3 03 3130 1030	Replace chiller, water cooled, 20 ton, reciprocating	\$ 36,102.80	1.20	\$ 44,643.15	0.97	\$ 43,323.36
1.000	D3 03 3130 2030	Replace chiller, water cooled 50 ton, reciprocating	\$ 58,524.26	1.20	\$ 72,368.55	0.97	\$ 70,229.12
1.000	D3 03 3130 3030	Replace chiller, water cooled, 100 ton, reciprocating	\$ 106,209.72	1.20	\$ 131,334.30	0.97	\$ 127,451.66
1.000	D3 03 3130 5030	Replace chiller, water cooled, 200 ton, reciprocating	\$ 156,206.39	1.20	\$ 193,158.00	0.97	\$ 187,447.67

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation	6%											
De-Escalation to July 2009	1.03											NON-GREEN
De-Escalation Factor to be Applied	0.97											
Green Factor	1.20	Assumed Value										
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Incl. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 03 3135 1030	Replace chiller, air cooled, 20 ton	20	Q7	Ea.	160.86	\$ 35,775.00	\$ 41,825.00	1.095	\$ 45,798.38	0.97	
1.000	D3 03 3135 2030	Replace chiller, air cooled, 50 ton	20	Q7	Ea.	219.40	\$ 53,800.00	\$ 62,625.00	1.095	\$ 68,574.38	0.97	
1.000	D3 03 3135 3030	Replace chiller, air cooled, 100 ton	20	Q7	Ea.	252.21	\$ 94,150.00	\$ 108,950.00	1.095	\$ 119,300.25	0.97	
1.000	D3 03 3137 4030	Replace chiller, water cooled, 5 ton, reciprocating	20	Q5	Ea.	54.55	\$ 6,700.00	\$ 7,975.00	1.095	\$ 8,732.63	0.97	
1.000	D3 03 3137 5030	Replace chiller, water cooled, 10 ton, reciprocating	20	Q6	Ea.	130.44	\$ 14,600.00	\$ 17,450.00	1.095	\$ 19,107.75	0.97	
1.000	D3 03 3137 6030	Replace chiller, water cooled, 15 ton, reciprocating	20	Q6	Ea.	128.57	\$ 25,275.00	\$ 29,625.00	1.095	\$ 32,439.38	0.97	
1.000	D3 03 3140 1030	Replace hermetic centrifugal chiller, 100 ton	20	Q7	Ea.	489.00	\$ 119,975.00	\$ 140,000.00	1.095	\$ 153,300.00	0.97	
1.000	D3 03 3140 2030	Replace hermetic centrifugal chiller, 300 ton	20	Q7	Ea.	520.00	\$ 174,100.00	\$ 201,800.00	1.095	\$ 220,971.00	0.97	
1.000	D3 03 3140 3030	Replace hermetic centrifugal chiller, 1000 ton	20	Q7	Ea.	726.00	\$ 502,800.00	\$ 576,100.00	1.095	\$ 630,829.50	0.97	
1.000	D3 03 3142 1030	Replace open centrifugal chiller, 300 ton	20	Q7	Ea.	998.87	\$ 236,600.00	\$ 276,000.00	1.095	\$ 302,220.00	0.97	
1.000	D3 03 3142 2030	Replace open centrifugal chiller, 1000 ton	20	Q7	Ea.	3,417.40	\$ 810,200.00	\$ 944,000.00	1.095	\$ 1,033,680.00	0.97	
1.000	D3 03 3145 1030	Replace chiller, absorption, 100 ton	20	Q7	Ea.	465.00	\$ 166,000.00	\$ 191,900.00	1.095	\$ 210,130.50	0.97	
1.000	D3 03 3145 2030	Replace chiller, absorption, 350 ton	20	Q7	Ea.	600.00	\$ 364,700.00	\$ 418,300.00	1.095	\$ 458,038.50	0.97	
1.000	D3 03 3145 3030	Replace chiller, absorption, 950 ton	20	Q7	Ea.	799.00	\$ 719,300.00	\$ 822,900.00	1.095	\$ 901,075.50	0.97	
1.000	D3 04 3210 1030	Replace fan, induced draft, 2000 CFM	20	Q9	Ea.	9.46	\$ 5,050.00	\$ 5,818.00	1.095	\$ 6,370.71	0.97	
1.000	D3 04 3210 2030	Replace fan, induced draft, 6700 CFM	20	Q9	Ea.	13.57	\$ 6,776.00	\$ 7,790.00	1.095	\$ 8,530.05	0.97	
1.000	D3 04 3210 3030	Replace fan, induced draft, 17,700 CFM	20	Q9	Ea.	39.01	\$ 13,620.00	\$ 15,700.00	1.095	\$ 17,191.50	0.97	
1.000	D3 04 3220 2030	Replace roof mounted exhaust fan, 800 CFM exhaust fan	20	Q20	Ea.	7.80	\$ 1,272.00	\$ 1,483.00	1.095	\$ 1,623.89	0.97	
1.000	D3 04 3220 2040	Replace roof mounted exhaust fan, 2000 CFM exhaust fan	20	Q20	Ea.	9.75	\$ 2,133.00	\$ 2,504.00	1.095	\$ 2,741.88	0.97	
1.000	D3 04 3220 2050	Replace roof mounted exhaust fan, 8500 CFM exhaust fan	20	Q20	Ea.	13.00	\$ 3,369.00	\$ 3,905.00	1.095	\$ 4,275.98	0.97	
1.000	D3 04 3220 2060	Replace roof mounted exhaust fan, 20,300 CFM exhaust fan	20	Q20	Ea.	39.01	\$ 9,485.00	\$ 11,015.00	1.095	\$ 12,061.43	0.97	
1.000	D3 04 3430 0010	Replace radiator, baseboard 10' section	20	Q5	Ea.	6.78	\$ 751.00	\$ 894.00	1.095	\$ 978.93	0.97	
1.000	D3 04 3440 0010	Replace finned radiator wall, 10' section	20	Q5	Ea.	10.40	\$ 1,135.00	\$ 1,350.00	1.095	\$ 1,478.25	0.97	
1.000	D3 04 3520 1020	Replace gate valve, partial, 3/8" - 1/2" valves	20	1 Stpl	Ea.	1.35	\$ 243.09	\$ 285.87	1.095	\$ 313.03	0.97	
1.000	D3 04 3520 2020	Replace gate valve, partial, 2" - 3" valves	20	Q1	Ea.	2.06	\$ 739.59	\$ 851.87	1.095	\$ 932.80	0.97	
1.000	D3 04 3520 3030	Replace drain valve, 3/4" valves	20	1 Stpl	Ea.	0.63	\$ 50.89	\$ 62.37	1.095	\$ 68.30	0.97	
1.000	D3 05 3150 0030	Replace heater wall mounted/recessed heater, with fan	20	1 Elec	Ea.	3.33	\$ 395.00	\$ 470.00	1.095	\$ 514.65	0.97	
1.000	D3 05 3245 1030	Replace heat pump, 1.5 ton, air to air split	20	Q5	Ea.	12.99	\$ 3,026.00	\$ 3,540.00	1.095	\$ 3,876.30	0.97	
1.000	D3 05 3245 2030	Replace heat pump, 5 ton, air to air split	20	Q5	Ea.	62.37	\$ 7,375.00	\$ 8,775.00	1.095	\$ 9,608.63	0.97	
1.000	D3 05 3245 3030	Replace heat pump, 10 ton, air to air split	20	Q6	Ea.	73.47	\$ 13,075.00	\$ 15,425.00	1.095	\$ 16,890.38	0.97	
1.000	D3 05 3245 4030	Replace heat pump, 25 ton, air to air split	20	Q7	Ea.	184.54	\$ 31,975.00	\$ 37,600.00	1.095	\$ 41,172.00	0.97	
1.000	D3 05 3245 5030	Replace heat pump, 50 ton, air to air split	20	Q7	Ea.	303.97	\$ 69,925.00	\$ 81,925.00	1.095	\$ 89,707.88	0.97	
1.000	D3 05 3245 6030	Replace heat pump, thru-wall unit, 1.5 ton	20	Q5	Ea.	20.13	\$ 3,965.00	\$ 4,635.00	1.095	\$ 5,075.33	0.97	
1.000	D3 05 3245 7030	Replace heat pump, thru-wall unit, 5 ton	20	Q5	Ea.	48.00	\$ 7,350.00	\$ 8,675.00	1.095	\$ 9,499.13	0.97	
1.000	D3 05 3272 1030	Replace air conditioner, DX, 5 ton	20	Q6	Ea.	39.00	\$ 6,655.00	\$ 7,825.00	1.095	\$ 8,568.38	0.97	
1.000	D3 05 3272 2030	Replace air conditioner, DX, 20 ton	20	Q7	Ea.	69.35	\$ 19,125.00	\$ 22,175.00	1.095	\$ 24,281.63	0.97	
1.000	D3 05 3272 3030	Replace air conditioner, DX, 50 ton	20	Q7	Ea.	124.68	\$ 53,550.00	\$ 61,675.00	1.095	\$ 67,534.13	0.97	
1.000	D3 05 3274 1015	Replace computer room A/C, incl. remote air cooled cond, 5 ton	20	Q6	Ea.	48.56	\$ 21,780.00	\$ 25,075.00	1.095	\$ 27,457.13	0.97	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹								
CostWorks 2010 - EAST HALL								
Based on National Averages								
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN								
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.20	Assumed Value						
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments	
1.000	D3 03 3135 1030	Replace chiller, air cooled, 20 ton	\$ 44,444.44	1.20	\$ 54,958.05	0.97	\$ 53,333.32	
1.000	D3 03 3135 2030	Replace chiller, air cooled, 50 ton	\$ 66,547.11	1.20	\$ 82,289.25	0.97	\$ 79,856.53	
1.000	D3 03 3135 3030	Replace chiller, air cooled, 100 ton	\$ 115,773.38	1.20	\$ 143,160.30	0.97	\$ 138,928.05	
1.000	D3 03 3137 4030	Replace chiller, water cooled, 5 ton, reciprocating	\$ 8,474.46	1.20	\$ 10,479.15	0.97	\$ 10,169.35	
1.000	D3 03 3137 5030	Replace chiller, water cooled, 10 ton, reciprocating	\$ 18,542.87	1.20	\$ 22,929.30	0.97	\$ 22,251.44	
1.000	D3 03 3137 6030	Replace chiller, water cooled, 15 ton, reciprocating	\$ 31,480.37	1.20	\$ 38,927.25	0.97	\$ 37,776.44	
1.000	D3 03 3140 1030	Replace hermetic centrifugal chiller, 100 ton	\$ 148,767.99	1.20	\$ 183,960.00	0.97	\$ 178,521.59	
1.000	D3 03 3140 2030	Replace hermetic centrifugal chiller, 300 ton	\$ 214,438.43	1.20	\$ 265,165.20	0.97	\$ 257,326.12	
1.000	D3 03 3140 3030	Replace hermetic centrifugal chiller, 1000 ton	\$ 612,180.28	1.20	\$ 756,995.40	0.97	\$ 734,616.33	
1.000	D3 03 3142 1030	Replace open centrifugal chiller, 300 ton	\$ 293,285.47	1.20	\$ 362,664.00	0.97	\$ 351,942.56	
1.000	D3 03 3142 2030	Replace open centrifugal chiller, 1000 ton	\$ 1,003,121.30	1.20	\$ 1,240,416.00	0.97	\$ 1,203,745.56	
1.000	D3 03 3145 1030	Replace chiller, absorption, 100 ton	\$ 203,918.41	1.20	\$ 252,156.60	0.97	\$ 244,702.09	
1.000	D3 03 3145 2030	Replace chiller, absorption, 350 ton	\$ 444,497.50	1.20	\$ 549,646.20	0.97	\$ 533,397.00	
1.000	D3 03 3145 3030	Replace chiller, absorption, 950 ton	\$ 874,436.99	1.20	\$ 1,081,290.60	0.97	\$ 1,049,324.39	
1.000	D3 04 3210 1030	Replace fan, induced draft, 2000 CFM	\$ 6,182.37	1.20	\$ 7,644.85	0.97	\$ 7,418.85	
1.000	D3 04 3210 2030	Replace fan, induced draft, 6700 CFM	\$ 8,277.88	1.20	\$ 10,236.06	0.97	\$ 9,933.45	
1.000	D3 04 3210 3030	Replace fan, induced draft, 17,700 CFM	\$ 16,683.27	1.20	\$ 20,629.80	0.97	\$ 20,019.92	
1.000	D3 04 3220 2030	Replace roof mounted exhaust fan, 800 CFM exhaust fan	\$ 1,575.88	1.20	\$ 1,948.66	0.97	\$ 1,891.05	
1.000	D3 04 3220 2040	Replace roof mounted exhaust fan, 2000 CFM exhaust fan	\$ 2,660.82	1.20	\$ 3,290.26	0.97	\$ 3,192.99	
1.000	D3 04 3220 2050	Replace roof mounted exhaust fan, 8500 CFM exhaust fan	\$ 4,149.56	1.20	\$ 5,131.17	0.97	\$ 4,979.48	
1.000	D3 04 3220 2060	Replace roof mounted exhaust fan, 20,300 CFM exhaust fan	\$ 11,704.85	1.20	\$ 14,473.71	0.97	\$ 14,045.82	
1.000	D3 04 3430 0010	Replace radiator, baseboard 10' section	\$ 949.99	1.20	\$ 1,174.72	0.97	\$ 1,139.99	
1.000	D3 04 3440 0010	Replace finned radiator wall, 10' section	\$ 1,434.55	1.20	\$ 1,773.90	0.97	\$ 1,721.46	
1.000	D3 04 3520 1020	Replace gate valve, partial, 3/8" - 1/2" valves	\$ 303.77	1.20	\$ 375.63	0.97	\$ 364.53	
1.000	D3 04 3520 2020	Replace gate valve, partial, 2" - 3" valves	\$ 905.22	1.20	\$ 1,119.36	0.97	\$ 1,086.27	
1.000	D3 04 3520 3030	Replace drain valve, 3/4" valves	\$ 66.28	1.20	\$ 81.95	0.97	\$ 79.53	
1.000	D3 05 3150 0030	Replace heater wall mounted/recessed heater, with fan	\$ 499.44	1.20	\$ 617.58	0.97	\$ 599.32	
1.000	D3 05 3245 1030	Replace heat pump, 1.5 ton, air to air split	\$ 3,761.70	1.20	\$ 4,651.56	0.97	\$ 4,514.05	
1.000	D3 05 3245 2030	Replace heat pump, 5 ton, air to air split	\$ 9,324.57	1.20	\$ 11,530.35	0.97	\$ 11,189.48	
1.000	D3 05 3245 3030	Replace heat pump, 10 ton, air to air split	\$ 16,391.04	1.20	\$ 20,268.45	0.97	\$ 19,669.25	
1.000	D3 05 3245 4030	Replace heat pump, 25 ton, air to air split	\$ 39,954.83	1.20	\$ 49,406.40	0.97	\$ 47,945.80	
1.000	D3 05 3245 5030	Replace heat pump, 50 ton, air to air split	\$ 87,055.84	1.20	\$ 107,649.45	0.97	\$ 104,467.01	
1.000	D3 05 3245 6030	Replace heat pump, thru-wall unit, 1.5 ton	\$ 4,925.28	1.20	\$ 6,090.39	0.97	\$ 5,910.34	
1.000	D3 05 3245 7030	Replace heat pump, thru-wall unit, 5 ton	\$ 9,218.30	1.20	\$ 11,398.95	0.97	\$ 11,061.96	
1.000	D3 05 3272 1030	Replace air conditioner, DX, 5 ton	\$ 8,315.07	1.20	\$ 10,282.05	0.97	\$ 9,978.08	
1.000	D3 05 3272 2030	Replace air conditioner, DX, 20 ton	\$ 23,563.79	1.20	\$ 29,137.95	0.97	\$ 28,276.54	
1.000	D3 05 3272 3030	Replace air conditioner, DX, 50 ton	\$ 65,537.61	1.20	\$ 81,040.95	0.97	\$ 78,645.14	
1.000	D3 05 3274 1015	Replace computer room A/C, incl. remote air cooled cond, 5 ton	\$ 26,645.41	1.20	\$ 32,948.55	0.97	\$ 31,974.49	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 - EAST HALL											
Based on National Averages											
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN											
Escalation	6%										
De-Escalation to July 2009	1.03										NON-GREEN
De-Escalation Factor to be Applied	0.97										
Green Factor	1.20	Assumed Value									

Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Incl. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor
1.000	D3 05 3274 1025	Replace computer room A/C, incl. remote air cooled cond, 10 ton	20	Q6	Ea.	97.90	\$ 42,925.00	\$ 49,450.00	1.095	\$ 54,147.75	0.97
1.000	D3 05 3274 1035	Replace computer room A/C, incl. remote air cooled cond, 15 ton	20	Q6	Ea.	123.04	\$ 48,125.00	\$ 55,775.00	1.095	\$ 61,073.63	0.97
1.000	D3 05 3274 1045	Replace computer room A/C, incl. remote air cooled cond, 20 ton	20	Q6	Ea.	123.11	\$ 56,925.00	\$ 65,775.00	1.095	\$ 72,023.63	0.97
1.000	D3 05 3276 1015	Replace computer room A/C, chilled water, 5 ton	20	Q6	Ea.	41.07	\$ 15,980.00	\$ 18,375.00	1.095	\$ 20,120.63	0.97
1.000	D3 05 3276 1025	Replace computer room A/C, chilled water, 10 ton	20	Q6	Ea.	76.00	\$ 18,325.00	\$ 21,350.00	1.095	\$ 23,378.25	0.97
1.000	D3 05 3276 1035	Replace computer room A/C, chilled water, 15 ton	20	Q6	Ea.	94.76	\$ 20,225.00	\$ 23,675.00	1.095	\$ 25,924.13	0.97
1.000	D3 05 3276 1045	Replace computer room A/C, chilled water, 20 ton	20	Q6	Ea.	70.16	\$ 19,525.00	\$ 22,675.00	1.095	\$ 24,829.13	0.97
1.000	D3 05 3410 0030	Replace baseboard heater units	20	1 Elec	Ea.	2.53	\$ 227.00	\$ 275.00	1.095	\$ 301.13	0.97
1.000	D4 01 3310 1030	Replace sprinkler head	20	1 Plum	Ea.	0.98	\$ 71.00	\$ 87.00	1.095	\$ 95.27	0.97
							\$ 4,191,180.57	\$ 4,849,282.61			
1.000	D3 01 3170 0130	Replace 1000' type L 3/8" copper, fuel oil storage	25	1 Plum	M.L.F.	185.72	\$ 14,500.00	\$ 17,800.00	1.095	\$ 19,491.00	0.97
1.000	D3 01 3170 0140	Replace 1000' type L 1/2" copper, fuel oil storage	25	1 Plum	M.L.F.	192.61	\$ 15,150.00	\$ 18,700.00	1.095	\$ 20,476.50	0.97
1.000	D3 01 3170 0150	Replace 1000' type L 5/8" copper, fuel oil storage	25	1 Plum	M.L.F.	197.48	\$ 17,050.00	\$ 20,700.00	1.095	\$ 22,666.50	0.97
1.000	D3 01 3170 0160	Replace 1000' type L 3/4" copper, fuel oil storage	25	1 Plum	M.L.F.	205.29	\$ 17,500.00	\$ 21,300.00	1.095	\$ 23,323.50	0.97
1.000	D3 01 3170 0170	Replace 1000' type L 1" copper, fuel oil storage	25	1 Plum	M.L.F.	229.41	\$ 21,325.00	\$ 25,950.00	1.095	\$ 28,415.25	0.97
1.000	D3 04 3450 1020	Replace coil, hot water boost, 12" x 24" duct coil, 1-row	25	Q5	Ea.	1.97	\$ 474.50	\$ 557.00	1.095	\$ 609.92	0.97
1.000	D3 04 3450 1030	Replace coil, hot water boost, 24" x 24" duct coil, 1-row	25	Q5	Ea.	5.15	\$ 744.50	\$ 879.00	1.095	\$ 962.51	0.97
1.000	D3 04 3450 1040	Replace coil, hot water boost, 24" x 36" duct coil, 1-row	25	Q5	Ea.	7.74	\$ 1,084.00	\$ 1,287.00	1.095	\$ 1,409.27	0.97
1.000	D3 04 3450 1050	Replace coil, hot water boost, 36" x 36" duct coil, 1-row	25	Q5	Ea.	11.60	\$ 1,474.00	\$ 1,730.00	1.095	\$ 1,894.35	0.97
1.000	D3 04 3510 0010	Install new gasket, 4" pipe size, steel/iron	25	1 Plum	Ea.	2.60	\$ 178.00	\$ 221.00	1.095	\$ 242.00	0.97
							\$ 89,480.00	\$ 109,124.00			
1.000	D3 01 3110 0010	Replace 275 gallon fuel oil storage tank	30	Q5	Ea.	6.24	\$ 775.00	\$ 921.00	1.095	\$ 1,008.50	0.97
1.000	D3 01 3160 0020	Replace oil filter housing	30	1 Stpl	Ea.	0.52	\$ 54.50	\$ 66.00	1.095	\$ 72.27	0.97
1.000	D3 01 3210 0010	Install new 2" gasket, 1 per M.L.F. natural gas, steel/iron	30	1 Stpl	Ea.	1.60	\$ 108.50	\$ 135.00	1.095	\$ 147.83	0.97
1.000	D3 01 3210 0020	Install new 3" gasket, 1 per M.L.F. natural gas, steel/iron	30	1 Stpl	Ea.	1.89	\$ 127.50	\$ 158.50	1.095	\$ 173.56	0.97
1.000	D3 01 3210 0030	Install new 4" gasket, 1 per M.L.F. natural gas, steel/iron	30	1 Stpl	Ea.	2.60	\$ 177.50	\$ 221.00	1.095	\$ 242.00	0.97
1.000	D3 01 3210 0040	Install new 6" gasket, 1 per M.L.F. natural gas, steel/iron	30	1 Stpl	Ea.	3.47	\$ 239.00	\$ 297.00	1.095	\$ 325.22	0.97
1.000	D3 02 3180 1060	Replace boiler, gas, 250 MBH	30	Q7	Ea.	65.66	\$ 7,450.00	\$ 8,900.00	1.095	\$ 9,745.50	0.97
1.000	D3 02 3180 2070	Replace boiler, gas, 2000 MBH	30	Q7	Ea.	166.76	\$ 29,925.00	\$ 35,225.00	1.095	\$ 38,571.38	0.97
1.000	D3 02 3180 3070	Replace boiler, gas, 10,000 MBH	30	Q7	Ea.	1,086.40	\$ 211,300.00	\$ 247,900.00	1.095	\$ 271,450.50	0.97

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 05 3274 1025	Replace computer room A/C, incl. remote air cooled cond, 10 ton	\$ 52,546.98	1.20	\$ 64,977.30	0.97	\$ 63,056.38
1.000	D3 05 3274 1035	Replace computer room A/C, incl. remote air cooled cond, 15 ton	\$ 59,268.10	1.20	\$ 73,288.35	0.97	\$ 71,121.73
1.000	D3 05 3274 1045	Replace computer room A/C, incl. remote air cooled cond, 20 ton	\$ 69,894.39	1.20	\$ 86,428.35	0.97	\$ 83,873.27
1.000	D3 05 3276 1015	Replace computer room A/C, chilled water, 5 ton	\$ 19,525.80	1.20	\$ 24,144.75	0.97	\$ 23,430.96
1.000	D3 05 3276 1025	Replace computer room A/C, chilled water, 10 ton	\$ 22,687.12	1.20	\$ 28,053.90	0.97	\$ 27,224.54
1.000	D3 05 3276 1035	Replace computer room A/C, chilled water, 15 ton	\$ 25,157.73	1.20	\$ 31,108.95	0.97	\$ 30,189.28
1.000	D3 05 3276 1045	Replace computer room A/C, chilled water, 20 ton	\$ 24,095.10	1.20	\$ 29,794.95	0.97	\$ 28,914.12
1.000	D3 05 3410 0030	Replace baseboard heater units	\$ 292.22	1.20	\$ 361.35	0.97	\$ 350.67
1.000	D4 01 3310 1030	Replace sprinkler head	\$ 92.45	1.20	\$ 114.32	0.97	\$ 110.94
			\$ 5,152,985.90				\$ 6,183,583.08
			\$ 1,545,895.77	Assume 30% required		Assume 30% required	\$ 1,855,074.93
				PER 20 YEARS		PER 20 YEARS	
1.000	D3 01 3170 0130	Replace 1000" type L 3/8" copper, fuel oil storage	\$ 18,914.79	1.20	\$ 23,389.20	0.97	\$ 22,697.74
1.000	D3 01 3170 0140	Replace 1000" type L 1/2" copper, fuel oil storage	\$ 19,871.15	1.20	\$ 24,571.80	0.97	\$ 23,845.38
1.000	D3 01 3170 0150	Replace 1000" type L 5/8" copper, fuel oil storage	\$ 21,996.41	1.20	\$ 27,199.80	0.97	\$ 26,395.69
1.000	D3 01 3170 0160	Replace 1000" type L 3/4" copper, fuel oil storage	\$ 22,633.99	1.20	\$ 27,988.20	0.97	\$ 27,160.78
1.000	D3 01 3170 0170	Replace 1000" type L 1" copper, fuel oil storage	\$ 27,575.21	1.20	\$ 34,098.30	0.97	\$ 33,090.25
1.000	D3 04 3450 1020	Replace coil, hot water boost, 12" x 24" duct coil, 1-row	\$ 591.88	1.20	\$ 731.90	0.97	\$ 710.26
1.000	D3 04 3450 1030	Replace coil, hot water boost, 24" x 24" duct coil, 1-row	\$ 934.05	1.20	\$ 1,155.01	0.97	\$ 1,120.86
1.000	D3 04 3450 1040	Replace coil, hot water boost, 24" x 36" duct coil, 1-row	\$ 1,367.60	1.20	\$ 1,691.12	0.97	\$ 1,641.12
1.000	D3 04 3450 1050	Replace coil, hot water boost, 36" x 36" duct coil, 1-row	\$ 1,838.35	1.20	\$ 2,273.22	0.97	\$ 2,206.02
1.000	D3 04 3510 0010	Install new gasket, 4" pipe size, steel/iron	\$ 234.84	1.20	\$ 290.39	0.97	\$ 281.81
			\$ 115,958.27				\$ 139,149.93
			\$ 34,787.48	Assume 30% required		Assume 30% required	\$ 41,744.98
				PER 25 YEARS		PER 25 YEARS	
1.000	D3 01 3110 0010	Replace 275 gallon fuel oil storage tank	\$ 978.68	1.20	\$ 1,210.19	0.97	\$ 1,174.42
1.000	D3 01 3160 0020	Replace oil filter housing	\$ 70.13	1.20	\$ 86.72	0.97	\$ 84.16
1.000	D3 01 3210 0010	Install new 2" gasket, 1 per M.L.F. natural gas, steel/iron	\$ 143.45	1.20	\$ 177.39	0.97	\$ 172.15
1.000	D3 01 3210 0020	Install new 3" gasket, 1 per M.L.F. natural gas, steel/iron	\$ 168.43	1.20	\$ 208.27	0.97	\$ 202.11
1.000	D3 01 3210 0030	Install new 4" gasket, 1 per M.L.F. natural gas, steel/iron	\$ 234.84	1.20	\$ 290.39	0.97	\$ 281.81
1.000	D3 01 3210 0040	Install new 6" gasket, 1 per M.L.F. natural gas, steel/iron	\$ 315.60	1.20	\$ 390.26	0.97	\$ 378.72
1.000	D3 02 3180 1060	Replace boiler, gas, 250 MBH	\$ 9,457.39	1.20	\$ 11,694.60	0.97	\$ 11,348.87
1.000	D3 02 3180 2070	Replace boiler, gas, 2000 MBH	\$ 37,431.09	1.20	\$ 46,285.65	0.97	\$ 44,917.31
1.000	D3 02 3180 3070	Replace boiler, gas, 10,000 MBH	\$ 263,425.61	1.20	\$ 325,740.60	0.97	\$ 316,110.73

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 - EAST HALL											
Based on National Averages											
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN											
Escalation	6%										
De-Escalation to July 2009	1.03										NON-GREEN
De-Escalation Factor to be Applied	0.97										
Green Factor	1.20	Assumed Value									

Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Incl. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor
1.000	D3 02 3182 1050	Replace boiler, coal, 4600 MBH	30	5 Stpl	Ea.	366.91	\$ 119,850.00	\$ 138,825.00	1.095	\$ 152,013.38	0.97
1.000	D3 02 3184 1060	Replace boiler, oil, 250 MBH	30	Q7	Ea.	73.39	\$ 8,050.00	\$ 9,650.00	1.095	\$ 10,566.75	0.97
1.000	D3 02 3184 2060	Replace boiler, oil, 2000 MBH	30	Q7	Ea.	205.76	\$ 31,625.00	\$ 37,425.00	1.095	\$ 40,980.38	0.97
1.000	D3 02 3184 3060	Replace boiler, oil, 10,000 MBH	30	Q7	Ea.	894.01	\$ 193,800.00	\$ 226,100.00	1.095	\$ 247,579.50	0.97
1.000	D3 02 3186 1050	Replace boiler, gas/oil, 2000 MBH	30	Q7	Ea.	172.76	\$ 41,725.00	\$ 48,625.00	1.095	\$ 53,244.38	0.97
1.000	D3 02 3186 2050	Replace boiler, gas/oil, 20,000 MBH	30	Q7	Ea.	4,684.20	\$ 515,000.00	\$ 619,000.00	1.095	\$ 677,805.00	0.97
1.000	D3 04 3310 0030	Replace steam converter	30	Q5	Ea.	6.24	\$ 3,220.00	\$ 3,701.00	1.095	\$ 4,052.60	0.97
1.000	D3 04 3340 0030	Replace condensate meter 500 lb./hr.	30	1 Stpl	Ea.	1.11	\$ 2,649.00	\$ 3,030.00	1.095	\$ 3,317.85	0.97
1.000	D3 04 3340 0130	Replace condensate meter 1500 lb./hr.	30	1 Stpl	Ea.	2.23	\$ 2,948.00	\$ 3,359.50	1.095	\$ 3,678.65	0.97
							\$ 1,169,024.00	\$ 1,383,539.00			

1.000	D3 04 3252 0020	Replace metal pipe flue, architectural fireplace	50	2 Sswk	L.F.	0.31	\$ 25.10	\$ 30.22	1.095	\$ 33.09	0.97
1.000	D3 04 3410 0010	Replace radiator valve 1/2" angle union	50	1 Stpl	Ea.	0.65	\$ 80.45	\$ 96.45	1.095	\$ 105.61	0.97
1.000	D3 04 3410 0020	Replace radiator valve 3/4" angle union	50	1 Stpl	Ea.	0.78	\$ 91.70	\$ 110.50	1.095	\$ 121.00	0.97
1.000	D3 04 3410 0030	Replace radiator valve 1" angle union	50	1 Stpl	Ea.	0.82	\$ 101.10	\$ 121.00	1.095	\$ 132.50	0.97
1.000	D3 04 3410 0040	Replace radiator valve 1-1/4" angle union	50	1 Stpl	Ea.	1.04	\$ 129.50	\$ 154.00	1.095	\$ 168.63	0.97
1.000	D3 04 3420 0010	Replace C.I. radiator 4 tube 25"H 10' section	50	Q5	Section	3.25	\$ 482.50	\$ 573.50	1.095	\$ 627.98	0.97
1.000	D3 04 3540 0020	Replace expansion tank, 24 gal capacity	50	Q5	Ea.	2.23	\$ 1,268.00	\$ 1,453.50	1.095	\$ 1,591.58	0.97
1.000	D3 04 3540 0120	Replace expansion tank, 60 gal capacity	50	Q5	Ea.	3.90	\$ 1,850.00	\$ 2,119.00	1.095	\$ 2,320.31	0.97
1.000	D3 04 3540 0220	Replace expansion tank, 175 gal capacity	50	Q5	Ea.	7.79	\$ 4,900.00	\$ 5,638.00	1.095	\$ 6,173.61	0.97
1.000	D3 04 3540 0320	Replace expansion tank, 400 gal capacity	50	Q5	Ea.	11.16	\$ 10,165.00	\$ 11,669.00	1.095	\$ 12,777.56	0.97
							\$ 19,093.35	\$ 21,965.17			

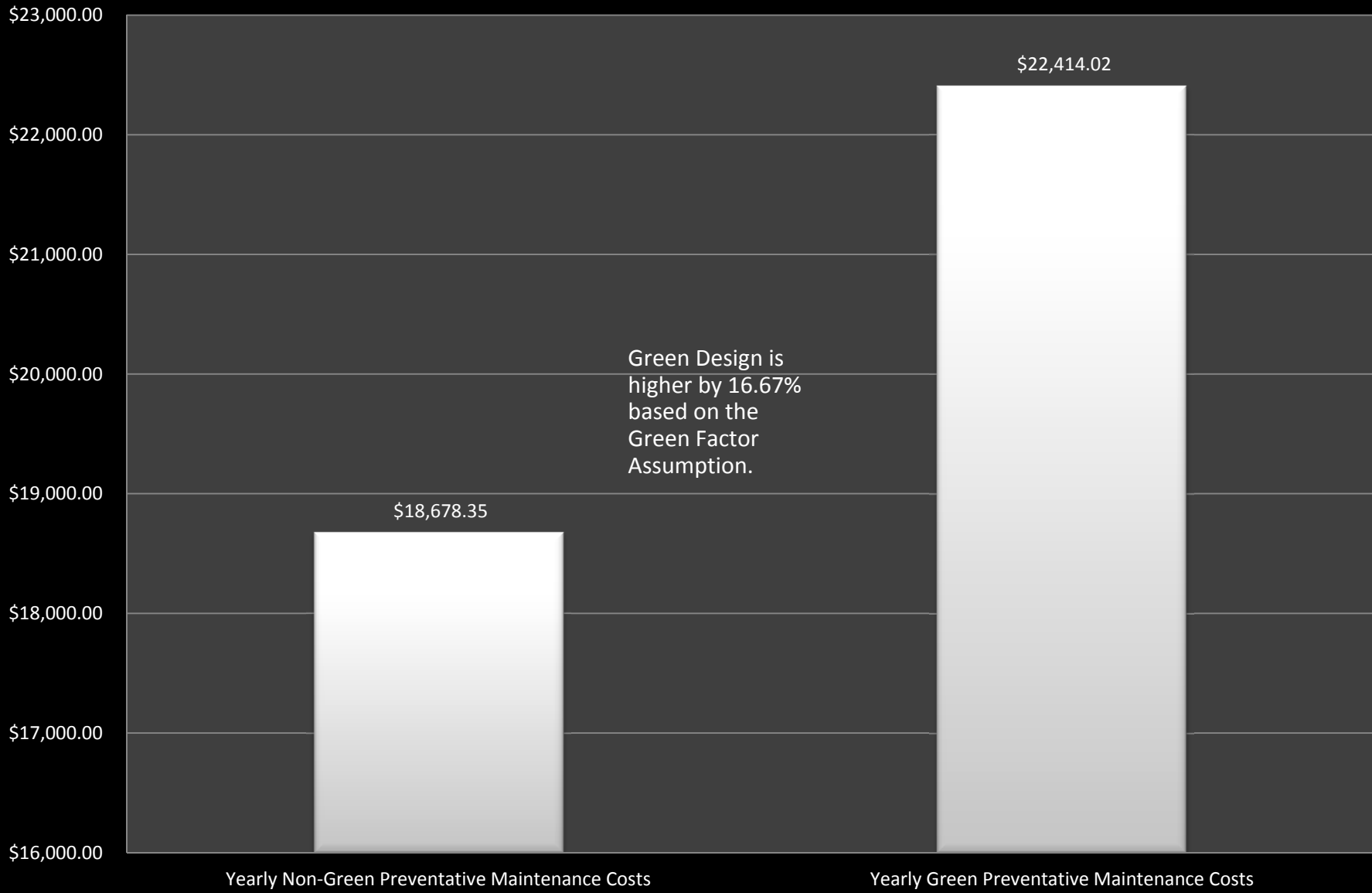
HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹								
CostWorks 2010 - EAST HALL								
Based on National Averages								
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN								
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.20	Assumed Value						
						GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments	
1.000	D3 02 3182 1050	Replace boiler, coal, 4600 MBH	\$ 147,519.40	1.20	\$ 182,416.05	0.97	\$ 177,023.28	
1.000	D3 02 3184 1060	Replace boiler, oil, 250 MBH	\$ 10,254.37	1.20	\$ 12,680.10	0.97	\$ 12,305.24	
1.000	D3 02 3184 2060	Replace boiler, oil, 2000 MBH	\$ 39,768.87	1.20	\$ 49,176.45	0.97	\$ 47,722.65	
1.000	D3 02 3184 3060	Replace boiler, oil, 10,000 MBH	\$ 240,260.30	1.20	\$ 297,095.40	0.97	\$ 288,312.36	
1.000	D3 02 3186 1050	Replace boiler, gas/oil, 2000 MBH	\$ 51,670.31	1.20	\$ 63,893.25	0.97	\$ 62,004.37	
1.000	D3 02 3186 2050	Replace boiler, gas/oil, 20,000 MBH	\$ 657,767.04	1.20	\$ 813,366.00	0.97	\$ 789,320.45	
1.000	D3 04 3310 0030	Replace steam converter	\$ 3,932.79	1.20	\$ 4,863.11	0.97	\$ 4,719.35	
1.000	D3 04 3340 0030	Replace condensate meter 500 lb./hr.	\$ 3,219.76	1.20	\$ 3,981.42	0.97	\$ 3,863.72	
1.000	D3 04 3340 0130	Replace condensate meter 1500 lb./hr.	\$ 3,569.90	1.20	\$ 4,414.38	0.97	\$ 4,283.88	
			\$ 1,470,187.97				\$ 1,764,225.57	
			\$ 735,093.99	Assume 50% required		Assume 50% required	\$ 882,112.78	
				PER 30 YEARS		PER 30 YEARS		
1.000	D3 04 3252 0020	Replace metal pipe flue, architectural fireplace	\$ 32.11	1.20	\$ 39.71	0.97	\$ 38.54	
1.000	D3 04 3410 0010	Replace radiator valve 1/2" angle union	\$ 102.49	1.20	\$ 126.74	0.97	\$ 122.99	
1.000	D3 04 3410 0020	Replace radiator valve 3/4" angle union	\$ 117.42	1.20	\$ 145.20	0.97	\$ 140.90	
1.000	D3 04 3410 0030	Replace radiator valve 1" angle union	\$ 128.58	1.20	\$ 158.99	0.97	\$ 154.29	
1.000	D3 04 3410 0040	Replace radiator valve 1-1/4" angle union	\$ 163.64	1.20	\$ 202.36	0.97	\$ 196.37	
1.000	D3 04 3420 0010	Replace C.I. radiator 4 tube 25"H 10' section	\$ 609.42	1.20	\$ 753.58	0.97	\$ 731.30	
1.000	D3 04 3540 0020	Replace expansion tank, 24 gal capacity	\$ 1,544.53	1.20	\$ 1,909.90	0.97	\$ 1,853.44	
1.000	D3 04 3540 0120	Replace expansion tank, 60 gal capacity	\$ 2,251.71	1.20	\$ 2,784.37	0.97	\$ 2,702.05	
1.000	D3 04 3540 0220	Replace expansion tank, 175 gal capacity	\$ 5,991.10	1.20	\$ 7,408.33	0.97	\$ 7,189.32	
1.000	D3 04 3540 0320	Replace expansion tank, 400 gal capacity	\$ 12,399.81	1.20	\$ 15,333.07	0.97	\$ 14,879.77	
			\$ 23,340.82				\$ 28,008.98	
			\$ 11,670.41	Assume 50% required		Assume 50% required	\$ 14,004.49	
				PER 50 YEARS		PER 50 YEARS		
NOTES:								
REPORT RECOMMENDATIONS								
SHALL INDICATE THAT THE ITEMS MENTIONED ABOVE								
HAVE NOT BEEN QUANTIFIED								
THEREFORE IT IS FOR ANALYSIS ONLY AND DOES NOT								
DEPICT CURRENT OR APPLICABLE CONDITIONS								
FOOTNOTES:								
1								
RS Means CostWorks 2010 Operations and Maintenance								

Appendix C-M3 Summary of Green versus Non-Green FMRR Costs

Summary of Green versus Non-Green Major Repair and Replacement Costs based on Frequency (HVAC & FP)			
Type of Construction	Description	TOTAL COST	COMMENTS
Non-Green	Up to 10 Years	\$ 748,879.83	
Non-Green	10 th yr on till 25 th Year	\$ 2,831,875.84	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
Non-Green	25 th yr on till 50 th Year	\$ 746,764.39	
Green	Up to 10 Years	\$ 898,655.79	
Green	10 th yr on till 25 th Year	\$ 3,398,251.01	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
Green	25 th yr on till 50 th Year	\$ 896,117.27	
SUMMARY OF FINDINGS			
Green v. Non-Green	16.67%	Green Major Repair and Replacement is 16.67% higher in cost than that of a traditional building	

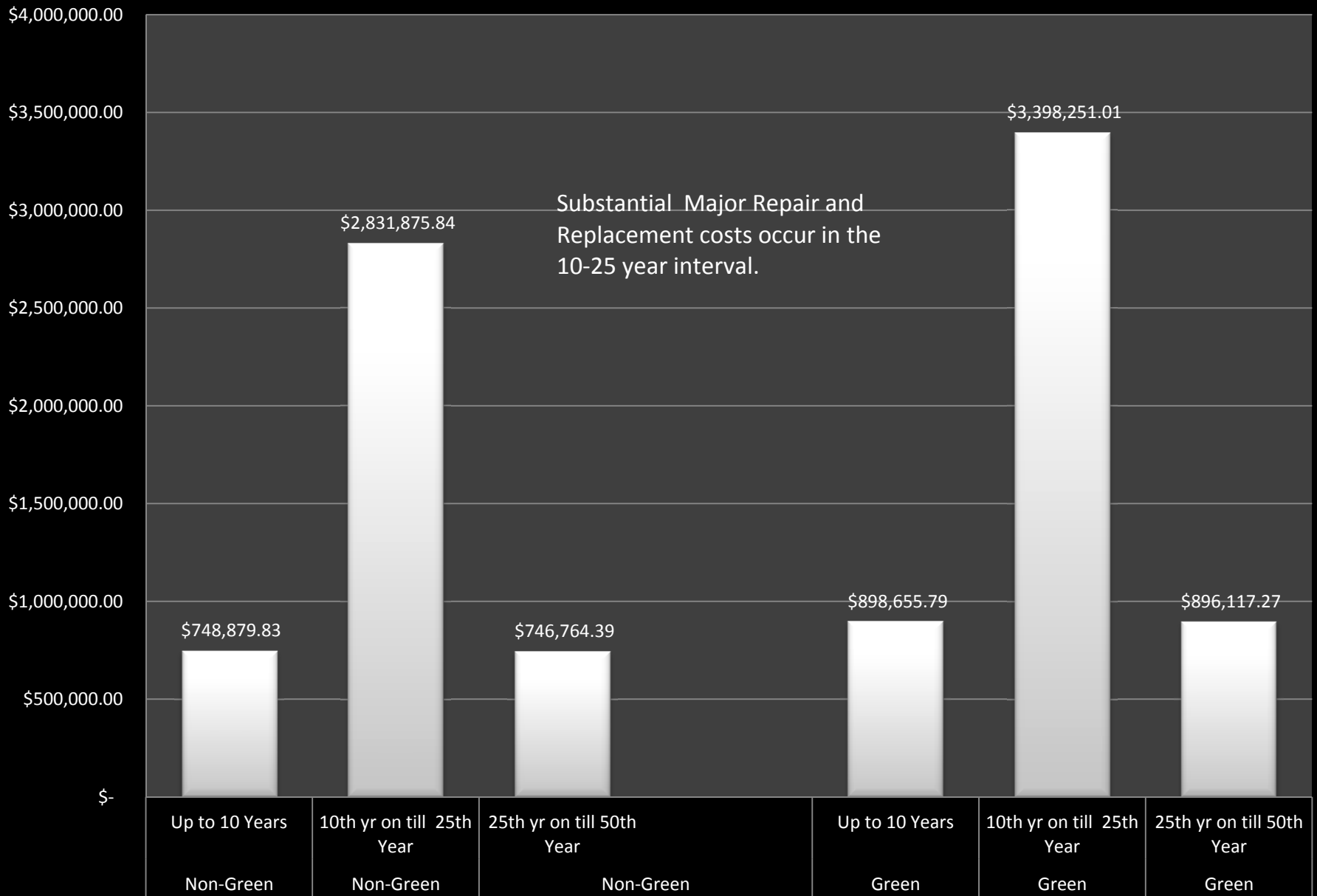
Appendix C-M4 Graph: Green versus Non-Green Yearly Preventative Maintenance Costs

HVAC & FP: Green v. Non-Green Yearly Preventative Maintenance Costs (July 2009)



Appendix C-M5 Graph: Frequency and Magnitude of Maintenance Repair and Replacement Costs

Frequency and Magnitude of Major Repair and Replacement Costs



Appendix C-M6 RS Means Component Lists

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM System D3025 110 1950 PM Components Boiler, electric, to 1500 gallon	Labor Hours	W M Q S A				
		W	M	Q	S	A
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Check hot water pressure gauges.	0.073			X	X	X
3 Check operation and condition of pressure relief valve.	0.030			X	X	X
4 Check for proper operation of primary controls for resistance-type or electrode-type heating elements; check and adjust thermostat.	0.133			X	X	X
5 Check electrical wiring to heating elements, blower, motors, overcurrent protective devices, grounding system and other electrical components as required.	0.238			X	X	X
6 Check over temperature and over-pressure limit controls for proper operation.	0.143			X	X	X
7 Check furnace operation through complete cycle or up to 10 minutes.	0.217			X	X	X
8 Clean area around boiler.	0.066			X	X	X
9 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				957	957	957
Total labor-hours/year	3.628			1,914	957	.957

CostWorks 2010 - EAST HALL

PM System D3025 130 1950 PM Components Boiler, hot water; oil, gas or combination fired, up to 120 MBH	Labor Hours	W M Q S A				
		W	M	Q	S	A
1 Check combustion chamber for air or gas leaks.	0.077					X
2 Inspect and clean oil burner gun and ignition assembly, where applicable.	0.658					X
3 Inspect fuel system for leaks and change fuel filter element, where applicable.	0.098					X
4 Check fuel lines and connections for damage.	0.023		X	X	X	X
5 Check for proper operational response of burner to thermostat controls.	0.133			X	X	X
6 Check and lubricate burner and blower motors.	0.079			X	X	X
7 Check main flame failure protection and main flame detection scanner on boiler equipped with spark ignition (oil burner).	0.124		X	X	X	X
8 Check electrical wiring to burner controls and blower.	0.079					X
9 Clean firebox (sweep and vacuum).	0.577					X
10 Check operation of mercury control switches (i.e., steam pressure, hot water temperature limit, atomizing or combustion air proving, etc.).	0.143		X	X	X	X
11 Check operation and condition of safety pressure relief valve.	0.030		X	X	X	X
12 Check operation of boiler low water cut off devices.	0.056		X	X	X	X
13 Check hot water pressure gauges.	0.073		X	X	X	X
14 Inspect and clean water column sight glass (or replace).	0.127		X	X	X	X
15 Clean fire side of water jacket boiler.	0.433					X
16 Check condition of flue pipe, damper and exhaust stack.	0.147			X	X	X
17 Check boiler operation through complete cycle, up to 30 minutes.	0.650					X
18 Check fuel level with gauge pole, add as required.	0.046		X	X	X	X
19 Clean area around boiler.	0.066		X	X	X	X
20 Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period			710	1,969	1,069	3,641
Total labor-hours/year	12.528		5,680	2,138	1,069	3,641

CostWorks 2010 - EAST HALL

PM System D3025 130 2950 PM Components Boiler, hot water; oil, gas or combination fired, 120 to 500 MBH	Labor Hours	W M Q S A				
		W	M	Q	S	A
1 Check combustion chamber for air or gas leaks.	0.077					X
2 Inspect and clean oil burner gun and ignition assembly where applicable.	0.835					X
3 Inspect fuel system for leaks and change fuel filter element, where applicable.	0.125					X
4 Check fuel lines and connections for damage.	0.023		X	X	X	X
5 Check for proper operational response of burner to thermostat controls.	0.169			X	X	X
6 Check and lubricate burner and blower motors.	0.099			X	X	X
7 Check main flame failure protection and main flame detection scanner on boiler equipped with spark ignition (oil burner).	0.155		X	X	X	X
8 Check electrical wiring to burner controls and blower.	0.100					X
9 Clean firebox (sweep and vacuum).	0.793					X
10 Check operation of mercury control switches (i.e., steam pressure, hot water temperature limit, atomizing or combustion air proving, etc.).	0.185		X	X	X	X
11 Check operation and condition of safety pressure relief valve.	0.038		X	X	X	X
12 Check operation of boiler low water cut off devices.	0.070		X	X	X	X
13 Check hot water pressure gauges.	0.073		X	X	X	X
14 Inspect and clean water column sight glass (or replace).	0.160		X	X	X	X
15 Clean fire side of water jacket.	0.433					X
16 Check condition of flue pipe, damper and exhaust stack.	0.183			X	X	X
17 Check boiler operation through complete cycle, up to 30 minutes.	0.806					X
18 Check fuel level with gauge pole, add as required.	0.046		X	X	X	X
19 Clean area around boiler.	0.137		X	X	X	X
20 Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period			909	1,360	1,360	4,529
Total labor-hours/year	15.881		7,272	2,720	1,360	4,529

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	Cost Centers					A
		W	M	Q	S		
PM System D3025 130 3950							
Boiler, hot water; oil, gas or combination fired, 500 to 1000 MBH							
1 Check combustion chamber for air or gas leaks.	0.086						X
2 Inspect and clean oil burner gun and ignition assembly where applicable.	0.910						X
3 Inspect fuel system for leaks and change fuel filter element, where applicable.	0.140						X
4 Check fuel lines and connections for damage.	0.026		X	X	X		X
5 Check for proper operational response of burner to thermostat controls.	0.185			X	X		X
6 Check and lubricate burner and blower motors.	0.109			X	X		X
7 Check main flame failure protection and main flame detection scanner on boiler equipped with spark ignition (oil burner).	0.169		X	X	X		X
8 Check electrical wiring to burner controls and blower.	0.111						X
9 Clean firebox (sweep and vacuum).	0.875						X
10 Check operation of mercury control switches (i.e., steam pressure, hot water temperature limit, atomizing or combustion air proving, etc.).	0.203	X		X	X		X
11 Check operation and condition of safety pressure relief valve.	0.042		X	X	X		X
12 Check operation of boiler low water cut off devices.	0.077		X	X	X		X
13 Check hot water pressure gauges.	0.081		X	X	X		X
14 Inspect and clean water column sight glass (or replace).	0.176		X	X	X		X
15 Clean fire side of water jacket	0.433						X
16 Check condition of flue pipe, damper and exhaust stack.	0.202			X	X		X
17 Check boiler operation through complete cycle, up to 30 minutes.	0.887						X
18 Check fuel level with gauge pole, add as required.	0.049		X	X	X		X
19 Clean area around boiler.	0.151		X	X	X		X
20 Fill out maintenance checklist and report deficiencies.	0.022		X	X	X		X
Total labor-hours/period			995	1,492	1,492		4,934
Total labor-hours/year	17,378		7,958	2,984	1,492		4,934

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	Cost Centers					A
		W	M	Q	S		
PM System D3025 130 4950							
Boiler, hot water; oil, gas or combination fired, over 1000 MBH							
1 Check combustion chamber for air or gas leaks.	0.117						X
2 Inspect and clean oil burner gun and ignition assembly where applicable.	0.987						X
3 Inspect fuel system for leaks and change fuel filter element, where applicable.	0.147						X
4 Check fuel lines and connections for damage.	0.035		X	X	X		X
5 Check for proper operational response of burner to thermostat controls.	0.199			X	X		X
6 Check and lubricate burner and blower motors.	0.120			X	X		X
7 Check main flame failure protection and main flame detection scanner on boiler equipped with spark ignition (oil burner).	0.186		X	X	X		X
8 Check electrical wiring to burner controls and blower.	0.120						X
9 Clean firebox (sweep and vacuum).	0.819						X
10 Check operation of mercury control switches (i.e., steam pressure, hot water temperature limit, atomizing or combustion air proving, etc.).	0.215	X		X	X		X
11 Check operation and condition of safety pressure relief valve.	0.046		X	X	X		X
12 Check operation of boiler low water cut off devices.	0.085		X	X	X		X
13 Check hot water pressure gauges.	0.109		X	X	X		X
14 Inspect and clean water column sight glass (or replace).	0.191		X	X	X		X
15 Clean fire side of water jacket	0.433						X
16 Check condition of flue pipe, damper and exhaust stack.	0.221			X	X		X
17 Check boiler operation through complete cycle, up to 30 minutes.	0.887						X
18 Check fuel level with gauge pole, add as required.	0.098		X	X	X		X
19 Clean area around boiler.	0.182		X	X	X		X
20 Fill out maintenance checklist and report deficiencies.	0.022		X	X	X		X
Total labor-hours/period			1,169	1,709	1,709		5,219
Total labor-hours/year	19,698		9,352	3,418	1,709		5,219

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3025 140 1950						
Boiler, steam; oil, gas or combination fired, up to 120 MBH						
1 Inspect fuel system for leaks or damage.	0.098		X	X	X	X
2 Change fuel filter element and clean strainers; repair leaks, where applicable.	0.581					X
3 Check main flame failure protection, positive fuel shutoff and main flame detection scanner on boiler equipped with spark ignition (oil burner).	0.124		X	X	X	X
4 Check for proper operational response of burner to thermostat controls.	0.133			X	X	X
5 Inspect all gas, steam and water lines, valves, connections for leaks or damage; repair as necessary.	0.195			X	X	X
6 Check feedwater system and feedwater makeup control and pump.	0.056		X	X	X	X
7 Check and lubricate burner and blower motors as required.	0.083		X	X	X	X
8 Check operation and condition of safety pressure relief valve.	0.030		X	X	X	X
9 Check combustion controls, combustion blower and damper modulation control.	0.133					X
10 Check all indicator lamps and water/steam pressure gauges.	0.073		X	X	X	X
11 Check electrical panels and wiring to burner, blowers and other components.	0.079		X	X	X	X
12 Clean blower air-intake dampers, if required.	0.055			X	X	X
13 Check condition of flue pipe, damper and exhaust stack.	0.147		X	X	X	X
14 Check boiler operation through complete cycle, up to 30 minutes.	0.650			X	X	X
15 Check water column sight glass and water level system; clean or replace sight glass, if required.	0.127		X	X	X	X
16 Clean firebox (sweep and vacuum).	0.577					X
17 Check fuel level with gauge pole for oil burning boilers.	0.046		X	X	X	X
18 Inspect and clean oil burner gun and ignition assembly where applicable.	0.650					X
19 Clean area around boiler.	0.066		X	X	X	X
20 Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period			789	1,984	1,984	3,925
Total labor-hours/year	16,189		6,312	3,968	1,984	3,925

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3025 140 2950						
Boiler, steam; oil, gas or combination fired, 120 to 500 MBH						
1 Inspect fuel system for leaks or damage.	0.098		X	X	X	X
2 Change fuel filter element and clean strainers; repair leaks, where applicable.	0.835					X
3 Check main flame failure protection, positive fuel shutoff and main flame detection scanner on boiler equipped with spark ignition (oil burner).	0.125		X	X	X	X
4 Check for proper operational response of burner to thermostat controls.	0.169			X	X	X
5 Inspect all gas, steam and water lines, valves, connections for leaks or damage; repair as necessary.	0.195			X	X	X
6 Check feedwater system and feedwater makeup control and pump.	0.069		X	X	X	X
7 Check and lubricate burner, blowers and motors as required.	0.099		X	X	X	X
8 Check operation and condition of safety pressure relief valve.	0.039		X	X	X	X
9 Check combustion controls, combustion blower and damper modulation control.	0.169					X
10 Check all indicator lamps and water/steam pressure gauges.	0.073		X	X	X	X
11 Check electrical panels and wiring to burner, blowers and other components.	0.104			X	X	X
12 Clean blower air-intake dampers, if required.	0.069			X	X	X
13 Check condition of flue pipe, damper and exhaust stack.	0.147		X	X	X	X
14 Check boiler operation through complete cycle, up to 30 minutes.	0.806			X	X	X
15 Check water column sight glass and water level system; clean or replace sight glass, if required.	0.127		X	X	X	X
16 Clean firebox (sweep and vacuum).	0.793					X
17 Check fuel level with gauge pole for oil burning boilers.	0.046		X	X	X	X
18 Inspect and clean oil burner gun and ignition assembly where applicable.	0.819					X
19 Clean area around boiler.	0.137		X	X	X	X
20 Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period			883	2,325	2,325	4,941
Total labor-hours/year	18,980		7,064	4,650	2,325	4,941

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3025 140 3950							
Boiler, steam; oil, gas or combination fired, 500 to 1000 MBH							
1	Inspect fuel system for leaks or damage.	0.098		X	X	X	X
2	Change fuel filter element and clean strainers; repair leaks, where applicable.	0.910					X
3	Check main flame failure protection, positive fuel shutoff and main flame detection scanner on boiler equipped with spark ignition (oil burner).	0.140		X	X	X	X
4	Check for proper operational response of burner to thermostat controls.	0.185			X	X	X
5	Inspect all gas, steam and water lines, valves, connections for leaks or damage; repair as necessary.	0.195			X	X	X
6	Check feedwater system and feedwater makeup control and pump.	0.075		X	X	X	X
7	Check and lubricate burner, blowers and motors as required.	0.109			X	X	X
8	Check operation and condition of safety pressure relief valve.	0.052		X	X	X	X
9	Check combustion controls, combustion blower and damper modulation control.	0.185					X
10	Check all indicator lamps and water/steam pressure gauges.	0.091		X	X	X	X
11	Check electrical panels and wiring to burner, blowers and other components.	0.117			X	X	X
12	Clean blower air-intake dampers, if required.	0.069			X	X	X
13	Check condition of flue pipe, damper and exhaust stack.	0.147		X	X	X	X
14	Check boiler operation through complete cycle, up to 30 minutes.	0.884			X	X	X
15	Check water column sight glass and water level system; clean or replace sight glass, if required.	0.127		X	X	X	X
16	Clean firebox (sweep and vacuum).	1.053					X
17	Check fuel level with gauge pole for oil burning boilers.	0.046		X	X	X	X
18	Inspect and clean oil burner gun and ignition assembly where applicable.	0.923					X
19	Clean area around boiler.	0.151		X	X	X	X
20	Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period				349	2,508	2,508	5,579
Total labor-hours/year		20,695		7,592	5,016	2,508	5,579

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3025 140 4950							
Boiler, steam; oil, gas or combination fired, over 1000 MBH							
1	Inspect fuel system for leaks or damage.	0.098		X	X	X	X
2	Change fuel filter element and clean strainers; repair leaks, where applicable.	1.027					X
3	Check main flame failure protection, positive fuel shutoff and main flame detection scanner on boiler equipped with spark ignition (oil burner).	0.147		X	X	X	X
4	Check for proper operational response of burner to thermostat controls.	0.199			X	X	X
5	Inspect all gas, steam and water lines, valves, connections for leaks or damage; repair as necessary.	0.195			X	X	X
6	Check feedwater system and feedwater makeup control and pump.	0.091		X	X	X	X
7	Check and lubricate burner, blowers and motors as required.	0.120			X	X	X
8	Check operation and condition of safety pressure relief valve.	0.069		X	X	X	X
9	Check combustion controls, combustion blower and damper modulation control.	0.199					X
10	Check all indicator lamps and water/steam pressure gauges.	0.109		X	X	X	X
11	Check electrical panels and wiring to burner, blowers and other components.	0.140			X	X	X
12	Clean blower air-intake dampers, if required.	0.069			X	X	X
13	Check condition of flue pipe, damper and exhaust stack.	0.147		X	X	X	X
14	Check boiler operation through complete cycle, up to 30 minutes.	0.884			X	X	X
15	Check water column sight glass and water level system; clean or replace sight glass, if required.	0.127		X	X	X	X
16	Clean firebox (sweep and vacuum).	1.144					X
17	Check fuel level with gauge pole for oil burning boilers.	0.046		X	X	X	X
18	Inspect and clean oil burner gun and ignition assembly where applicable.	1.196					X
19	Clean area around boiler.	0.182		X	X	X	X
20	Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period				1,038	2,645	2,645	6,211
Total labor-hours/year		22,450		6,304	5,290	2,645	6,211

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3025 210 1950							
Deaerator tank							
1	Check tank and associated piping for leaks.	0.013				X	X
2	Bottom - blow deaerator tank.	0.022				X	X
3	Perform sulfite test on deaerator water sample.	0.013				X	X
4	Check low and high float levels for proper operation and respective water level alarms.	0.337				X	X
5	Clean steam and feedwater strainers.	0.143				X	X
6	Check steam pressure regulating valve operation.	0.007				X	X
7	Check all indicator lights.	0.066				X	X
8	Clean unit and surrounding area.	0.022				X	X
9	Fill out maintenance checklist and report deficiencies.	0.130				X	X
Total labor-hours/period						.753	.753
Total labor-hours/year		1,506				.753	.753

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3025 310 1950						
Pump, boiler fuel oil						
1 Check with operating or area personnel for deficiencies.	0.035				X	X
2 Check for leaks on discharge piping and seals, etc.	0.077				X	X
3 Check pump and motor operation for vibration, noise, overheating, etc.	0.022				X	X
4 Check alignment and clearances of shaft and coupler.	0.290				X	X
5 Tighten or replace loose, missing, or damaged nuts, bolts, and screws.	0.005				X	X
6 Lubricate pump and motor as required.	0.099				X	X
7 Clean pump, motor and surrounding area.	0.066				X	X
8 Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period					.616	.616
Total labor-hours/year	1.232				.616	.616

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3025 310 2950						
Pump, condensate return, over 1 H.P.						
1 Check for proper operation of pump.	0.022				X	X
2 Check for leaks on suction and discharge piping, seals, packing glands, etc.; make minor adjustments as required.	0.077				X	X
3 Check pump and motor operation for vibration, noise, overheating, etc.	0.022				X	X
4 Check alignment pump and motor; adjust as necessary.	0.290				X	X
5 Lubricate pump and motor.	0.099				X	X
6 Clean exterior of pump, motor and surrounding area.	0.030				X	X
7 Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period					.562	.562
Total labor-hours/year	1.124				.562	.562

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3025 310 3950						
Pump, steam condensate return, duplex						
1 Check with operating or area personnel for deficiencies.	0.035				X	X
2 Check for proper operation.	0.022				X	X
3 Check for leaks on suction and discharge piping, seals, packing glands, etc.; make minor adjustments as required.	0.153				X	X
4 Check pumps and motors operation for excessive vibration, noise and overheating.	0.044				X	X
5 Check pump controller for proper operation.	0.130				X	X
6 Lubricate pumps and motors.	0.099				X	X
7 Clean condensate return unit and surrounding area.	0.066				X	X
8 Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period					.571	.571
Total labor-hours/year	1.142				.571	.571

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 110 1950						
Water cooling tower, forced draft, up to 50 tons						
1 Check with operating or area personnel for deficiencies.	0.035				X	X
2 Check operation of unit for water leaks, noise or vibration.	0.077				X	X
3 Clean and inspect hot water basin.	0.156				X	X
4 Remove access panel.	0.048				X	X
5 Check electrical wiring and connections; make appropriate adjustments.	0.120				X	X
6 Lubricate all motor and fan bearings.	0.047				X	X
7 Check fan blades or blowers for imbalance and lip clearance.	0.055				X	X
8 Check belt for wear, tension and alignment; adjust as required.	0.029				X	X
9 Drain and flush cold water sump and clean strainer.	0.382				X	X
10 Clean inside of water tower using water hose; scrape, brush and wipe as required; heavy deposits of scale should be removed with scale removing compound.	0.598				X	X
11 Refill with water, ck. make-up water asm. for leakage, adj. float if nec.	0.211				X	X
12 Replace access panel.	0.039				X	X
13 Remove, clean and reinstall conductivity and ph electrodes in chemical water treatment system.	0.390				X	X
14 Inspect and clean around cooling tower.	0.066				X	X
15 Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period					2.275	2.275
Total labor-hours/year	4.550				2.275	2.275

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 110 2950						
Water cooling tower, forced draft, 51 tons through 500 tons						
1 Check with operating or area personnel for deficiencies.	0.074				X	X
2 Check operation of unit for water leaks, noise or vibration.	0.163				X	X
3 Clean and inspect hot water basin.	0.332				X	X
4 Remove access panel.	0.103				X	X
5 Check electrical wiring and connections; make appropriate adjustments.	0.255				X	X
6 Lubricate all motor and fan bearings.	0.100				X	X
7 Check fan blades or blowers for imbalance and tip clearance.	0.247				X	X
8 Check belt for wear, tension and alignment; adjust as required.	0.096				X	X
9 Drain and flush cold water sump and clean strainer.	0.819				X	X
10 Clean inside of water tower using water hose; scrape, brush and wipe as required; heavy deposits of scale should be removed with scale removing compound.	1.271				X	X
11 Refill with water, chk. make-up water asseb. for leakage, adj. float if nec.	0.447				X	X
12 Replace access panel.	0.078				X	X
13 Remove, clean and reinstall conductivity and ph electrodes in chemical water treatment system.	0.832				X	X
14 Inspect and clean around cooling tower.	0.117				X	X
15 Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period					4.956	4.956
Total labor-hours/year	9.912				4.956	4.956

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 110 3950						
Water cooling tower, forced draft, 500 tons through 1000 tons						
1 Check with operating or area personnel for deficiencies.	0.109				X	X
2 Check operation of unit for water leaks, noise or vibration.	0.239				X	X
3 Clean and inspect hot water basin.	0.488				X	X
4 Remove access panel.	0.151				X	X
5 Check electrical wiring and connections; make appropriate adjustments.	0.374				X	X
6 Lubricate all motor and fan bearings.	0.147				X	X
7 Check fan blades or blowers for imbalance and tip clearance.	0.302				X	X
8 Check belt for wear, tension and alignment; adjust as required.	0.220				X	X
9 Drain and flush cold water sump and clean strainer.	1.464				X	X
10 Clean inside of water tower using water hose; scrape, brush and wipe as required; heavy deposits of scale should be removed with scale removing compound.	2.259				X	X
11 Refill with water, check make-up water assembly for leakage, adjust float if necessary.	1.578				X	X
12 Replace access panel.	0.117				X	X
13 Remove, clean and reinstall conductivity and ph electrodes in chemical water treatment system.	1.222				X	X
14 Inspect and clean around cooling tower.	0.172				X	X
15 Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period					8.864	8.864
Total labor-hours/year	17.728				8.864	8.864

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 130 1950						
Chiller, reciprocating, air cooled, up to 25 tons						
1 Check unit for proper operation, excessive noise or vibration.	0.033		X	X	X	X
2 Run system diagnostics test.	0.325		X	X	X	X
3 Check oil level in sight glass of lead compressor only, add oil as necessary.	0.042		X	X	X	X
4 Check superheat and subcooling temperatures.	0.325					X
5 Check liquid line sight glass, oil and refrigerant pressures.	0.036		X	X	X	X
6 Check contactors, sensors and mechanical safety limits.	0.094					X
7 Check electrical wiring and connections; tighten loose connections.	0.120					X
8 Clean intake side of condenser coils, fans and intake screens.	1.282					X
9 Inspect fan(s) or blower(s) for bent blades or imbalance.	0.086					X
10 Lubricate shaft bearings and motor bearings as required.	0.281					X
11 Inspect plumbing and valves for leaks, adjust as necessary.	0.077		X	X	X	X
12 Check evaporator and condenser for corrosion.	0.026		X	X	X	X
13 Clean chiller and surrounding area.	0.066		X	X	X	X
14 Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period			627	627	627	2.815
Total labor-hours/year	9.712		5.016	1.254	627	2.815

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3035 130 2950							
Chiller, reciprocating, air cooled, over 25 tons							
1	Check unit for proper operation, excessive noise or vibration.	0.033		X	X	X	X
2	Run system diagnostics test.	0.455		X	X	X	X
3	Check oil level in sight glass of lead compressor only, add oil as necessary.	0.042		X	X	X	X
4	Check superheat and subcooling temperatures.	0.325					X
5	Check liquid line sight glass, oil and refrigerant pressures.	0.036		X	X	X	X
6	Check contactors, sensors and mechanical safety limits.	0.094					X
7	Check electrical wiring and connections; tighten loose connections.	0.120					X
8	Clean intake side of condenser coils, fans and intake screens.	1.282					X
9	Inspect fan(s) or blower(s) for bent blades or imbalance.	0.237					X
10	Lubricate shaft bearings and motor bearings as required.	0.341					X
11	Inspect plumbing and valves for leaks, adjust as necessary.	0.117		X	X	X	X
12	Check evaporator and condenser for corrosion.	0.052		X	X	X	X
13	Clean chiller and surrounding area.	0.117		X	X	X	X
14	Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period				874	874	874	3,273
Total labor-hours/year		12.887		6.992	1.748	.874	3.273

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3035 135 1950							
Chiller, reciprocating, water cooled, up to 50 tons							
1	Check unit for proper operation, excessive noise or vibration.	0.033		X	X	X	X
2	Run system diagnostics test.	0.325		X	X	X	X
3	Check oil level in sight glass of lead compressor only, add oil as necessary.	0.042		X	X	X	X
4	Check superheat and subcooling temperatures.	0.325					X
5	Check liquid line sight glass, oil and refrigerant pressures.	0.036		X	X	X	X
6	Check contactors, sensors and mechanical limits, adjust as necessary.	0.094					X
7	Inspect plumbing and valves for leaks, tighten connections as necessary.	0.077		X	X	X	X
8	Check condenser and evaporator for corrosion.	0.026		X	X	X	X
9	Clean chiller and surrounding area.	0.066		X	X	X	X
10	Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period				627	627	627	1,048
Total labor-hours/year		7.943		5.016	1.254	.627	1.048

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3035 135 2950							
Chiller, reciprocating, water cooled, over 50 tons							
1	Check unit for proper operation, excessive noise or vibration.	0.033		X	X	X	X
2	Run system diagnostics test.	0.455		X	X	X	X
3	Check oil level in sight glass of lead compressor only, add oil as necessary.	0.042		X	X	X	X
4	Check superheat and subcooling temperatures.	0.325					X
5	Check liquid line sight glass, oil and refrigerant pressures.	0.036		X	X	X	X
6	Check contactors, sensors and mechanical limits, adjust as necessary.	0.094					X
7	Inspect plumbing and valves for leaks, tighten connections as necessary.	0.117		X	X	X	X
8	Check condenser and evaporator for corrosion.	0.052		X	X	X	X
9	Clean chiller and surrounding area.	0.117		X	X	X	X
10	Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period				874	874	874	1,293
Total labor-hours/year		10.907		6.992	1.748	.874	1.293

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 140 1950						
Chiller, centrifugal water cooled, up to 100 tons						
1 Check unit for proper operation.	0.035	X	X	X	X	X
2 Check oil level; add oil as necessary.	0.022	X	X	X	X	X
3 Check oil temperature.	0.038	X	X	X	X	X
4 Check dehydrator or purge system; remove water if observed in sight glass.	0.046	X	X	X	X	X
5 Run system control tests.	0.325		X	X	X	X
6 Check refrigerant charge/level, add as necessary.	0.272		X	X	X	X
7 Check compressor for excessive noise/vibration.	0.025		X	X	X	X
8 Check sensor and mechanical safety limits; replace as necessary.	0.094				X	X
9 Clean dehydrator float valve.	0.195					X
10 Perform spectrochemical analysis of compressor oil; replace oil as necessary.	0.039					X
11 Replace oil filters and add oil as necessary.	0.081					X
12 Inspect cooler and condenser tubes for leaks; clean screens as necessary.	5.200					X
13 Inspect utility vessel vent piping and safety relief valve; replace as necessary.	0.195					X
14 Inspect/clean the economizer (vane) gas line damper valve and actuator arm.	0.650					X
15 Run an insulation test on the centrifugal motor.	1.300					X
16 Clean area around equipment.	0.066	X	X	X	X	X
17 Document all maintenance and cleaning procedures.	0.022	X	X	X	X	X
Total labor-hours/period		229	851	851	945	8,605
Total labor-hours/year	26,762	8,702	6,808	1,702	,945	8,605

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 140 2950						
Chiller, centrifugal water cooled, over 100 tons						
1 Check unit for proper operation.	0.035	X	X	X	X	X
2 Check oil level; add oil as necessary.	0.022	X	X	X	X	X
3 Check oil temperature.	0.038	X	X	X	X	X
4 Check dehydrator or purge system; remove water if observed in sight glass.	0.046	X	X	X	X	X
5 Run system control tests.	0.455		X	X	X	X
6 Check refrigerant charge/level, add as necessary.	0.381		X	X	X	X
7 Check compressor for excessive noise/vibration.	0.039		X	X	X	X
8 Check sensor and mechanical safety limits; replace as necessary.	0.133				X	X
9 Clean dehydrator float valve.	0.351					X
10 Perform spectrochemical analysis of compressor oil; replace oil as necessary.	0.039					X
11 Replace oil filters and add oil as necessary.	0.161					X
12 Inspect cooler and condenser tubes for leaks; clean screens as necessary.	5.200					X
13 Inspect utility vessel vent piping and safety relief valve; replace as necessary.	0.247					X
14 Inspect/clean the economizer (vane), gas line damper valve and actuator arm.	0.650					X
15 Run an insulation test on the centrifugal motor.	1.950					X
16 Clean area around equipment.	0.117	X	X	X	X	X
17 Document all maintenance and cleaning procedures.	0.022	X	X	X	X	X
Total labor-hours/period		280	1,155	1,155	1,288	9,886
Total labor-hours/year	33,364	10,640	9,240	2,310	1,288	9,886

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 150 1950						
Chiller, absorption unit, up to 500 tons						
1 Check with operating personnel for deficiencies; check operating log sheets for indications of increased temperature trends.	0.035			X	X	X
2 Check unit for proper operation, excessive noise or vibration.	0.026			X	X	X
3 Check and clean strainers in all lines as required.	1.300					X
4 Check pulley alignment and belts for condition, proper tension and misalignment on external purge pump system, if applicable; adjust for proper tension and or alignment.	0.043			X	X	X
5 Check purge pump vacuum oil level, as required; add/change oil as necessary.	0.650			X	X	X
6 Lubricate pump shaft bearings and motor bearings.	0.281			X	X	X
7 Check and service system controls, wirings and connections; tighten loose connections.	0.120					X
8 Inspect cooling and system water piping circuits for leakage.	0.077			X	X	X
9 Clean area around equipment.	0.066			X	X	X
10 Fill out maintenance checklist.	0.022			X	X	X
Total labor-hours/period				1,200	1,200	2,620
Total labor-hours/year	6,220			2,400	1,200	2,620

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 150 2950						
Chiller, absorption unit, 500 to 5000 tons						
1 Check with operating personnel for deficiencies; check operating log sheets for indications of increased temperature trends.	0.035			X	X	X
2 Check unit for proper operation, excessive noise or vibration.	0.026			X	X	X
3 Check and clean strainers in all lines as required.	2.340					X
4 Check pulley alignment and belts for condition, proper tension and misalignment on external purge pump system, if applicable; adjust for proper tension and or alignment.	0.086			X	X	X
5 Check purge pump vacuum of level, as required; add/change oil as necessary.	0.975			X	X	X
6 Lubricate pump shaft bearings and motor bearings.	0.320			X	X	X
7 Check and service system controls, wirings and connections; tighten loose connections.	0.139					X
8 Inspect cooling and system water piping circuits for leakage.	0.153			X	X	X
9 Clean area around equipment.	0.117			X	X	X
10 Fill out maintenance checklist.	0.022			X	X	X
Total labor-hours/period				1.734	1.734	4.213
Total labor-hours/year	9.415			3.468	1.734	4.213

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 160 1950						
Chiller, screw, water cooled, up to 100 tons						
1 Check unit for proper operation, excessive noise or vibration.	0.033		X	X	X	X
2 Run system diagnostics test.	0.325		X	X	X	X
3 Check oil level and oil temperature; add oil as necessary.	0.022		X	X	X	X
4 Check refrigerant pressures; add as necessary.	0.272		X	X	X	X
5 Replace oil filters and oil, if applicable.	0.081				X	X
6 Check contactors, sensors and mechanical safety limits.	0.094				X	X
7 Perform spectrochemical analysis of compressor oil.	0.039				X	X
8 Check electrical wiring and connections; tighten loose connections.	0.120				X	X
9 Inspect cooler and condenser tubes for leaks.	5.200					X
10 Check evaporator and condenser for corrosion.	0.026					X
11 Clean chiller and surrounding area.	0.066		X	X	X	X
12 Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period			740	746	1.074	6.300
Total labor-hours/year	14.774		5.920	1.480	1.074	6.300

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 160 2950						
Chiller, screw, water cooled, over 100 tons						
1 Check unit for proper operation, excessive noise or vibration.	0.033		X	X	X	X
2 Run system diagnostics test.	0.325		X	X	X	X
3 Check oil level and oil temperature; add oil as necessary.	0.022		X	X	X	X
4 Check refrigerant pressures; add as necessary.	0.381		X	X	X	X
5 Replace oil filters and oil, if applicable.	0.081				X	X
6 Check contactors, sensors and mechanical safety limits.	0.094				X	X
7 Perform spectrochemical analysis of compressor oil.	0.039				X	X
8 Check electrical wiring and connections; tighten loose connections.	0.120				X	X
9 Inspect cooler and condenser tubes for leaks.	5.200					X
10 Check evaporator and condenser for corrosion.	0.052					X
11 Clean chiller and surrounding area.	0.117		X	X	X	X
12 Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period			900	900	1.234	6.486
Total labor-hours/year	16.720		7.200	1.800	1.234	6.486

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 170 1950						
Evaporative cooler						
1 Check with operating or area personnel for deficiencies.	0.035					X
2 Check unit for proper operation, noise and vibration.	0.016					X
3 Clean evaporation louver panels.	0.083					X
4 Lubricate fan, bearings and motor.	0.052					X
5 Check belt(s) for excessive wear and deterioration.	0.095					X
6 Visually inspect wiring for damage or loose connections; tighten loose connections.	0.120					X
7 Clean sump.	0.039					X
8 Clean and adjust float.	0.257					X
9 Check interior surfaces and check components for loose paint/lime deposits.	0.016					X
10 Check/clean, adjust nozzles (6).	0.039					X
11 Remove/clean and reinstall evaporative pads.	0.352					X
12 Start unit and check for proper operation.	0.055					X
13 Remove debris from surrounding area.	0.066					X
14 Fill out maintenance checklist.	0.022					X
Total labor-hours/period						1.247
Total labor-hours/year	1.247					1.247

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 180 1950						
Evaporative cooler, rotating drum						
1 Check with operating or area personnel for deficiencies.	0.035					X
2 Check unit for proper operation, noise and vibration.	0.016					X
3 Clean evaporation louver panels.	0.083					X
4 Lubricate rotary and fan, bearings and motor.	0.078					X
5 Check belt(s) for excessive wear and deterioration.	0.095					X
6 Visually inspect wiring for damage or loose connections; tighten loose connections.	0.120					X
7 Clean sump and pump intake.	0.039					X
8 Clean and adjust float.	0.257					X
9 Check interior surfaces and check components for loose paint/lime deposits.	0.055					X
10 Check/clean, adjust nozzles.	0.039					X
11 Remove/clean and reinstall evaporative pads.	0.352					X
12 Start unit and check for proper operation.	0.055					X
13 Remove debris from surrounding area.	0.066					X
14 Fill out maintenance checklist.	0.022					X
Total labor-hours/period						1.312
Total labor-hours/year	1.312					1.312

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 210 1950						
Condenser, air cooled, 3 tons to 25 tons						
1 Check with operating or area personnel for deficiencies.	0.027			X	X	X
2 Check unit for proper operation, excessive noise or vibration.	0.025			X	X	X
3 Pressure wash coils and fans with coil cleaning solution.	0.470					X
4 Check electrical wiring and connections; tighten loose connections.	0.092					X
5 Lubricate shaft bearings and motor bearings.	0.036			X	X	X
6 Inspect fan(s) or blower(s) for bent blades or imbalance; adjust as necessary.	0.024			X	X	X
7 Check belt(s) for condition, proper tension, and misalignment; adjust for proper tension and/or alignment, if applicable.	0.060			X	X	X
8 Inspect piping and valves for leaks; tighten connections as necessary.	0.059			X	X	X
9 Clean area around equipment.	0.051			X	X	X
10 Fill out maintenance checklist and report deficiencies.	0.017			X	X	X
Total labor-hours/period				299	299	.861
Total labor-hours/year	1.758			598	299	.861

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 210 2950						
Condenser, air cooled, 26 tons through 100 tons						
1 Check with operating or area personnel for deficiencies.	0.027			X	X	X
2 Check unit for proper operation, excessive noise or vibration.	0.025			X	X	X
3 Pressure wash coils and fans with coil cleaning solution.	0.570					X
4 Check electrical wiring and connections; tighten loose connections.	0.092					X
5 Lubricate shaft bearings and motor bearings.	0.042			X	X	X
6 Inspect fan(s) or blower(s) for bent blades or imbalance; adjust as necessary.	0.030			X	X	X
7 Check belt(s) for condition, proper tension, and misalignment; adjust for proper tension and/or alignment, if applicable.	0.080			X	X	X
8 Inspect piping and valves for leaks; tighten connections as necessary.	0.059			X	X	X
9 Clean area around equipment.	0.051			X	X	X
10 Fill out maintenance checklist and report deficiencies.	0.017			X	X	X
Total labor-hours/period				.331	.331	.993
Total labor-hours/year	1.966			.662	.331	.993

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 210 3950						
Condenser, air cooled, over 100 tons						
1 Check with operating or area personnel for deficiencies.	0.027			X	X	X
2 Check unit for proper operation, excessive noise or vibration.	0.031			X	X	X
3 Pressure wash coils and fans with coil cleaning solution.	0.670					X
4 Check electrical wiring and connections; tighten loose connections.	0.092					X
5 Lubricate shaft bearings and motor bearings.	0.042			X	X	X
6 Inspect fan(s) or blower(s) for bent blades or imbalance; adjust as necessary.	0.030			X	X	X
7 Check belt(s) for condition, proper tension, and misalignment; adjust for proper tension and/or alignment, if applicable.	0.100			X	X	X
8 Inspect piping and valves for leaks; tighten connections as necessary.	0.059			X	X	X
9 Clean area around equipment.	0.051			X	X	X
10 Fill out maintenance checklist and report deficiencies.	0.017			X	X	X
Total labor-hours/period				.357	.357	1.119
Total labor-hours/year	2.190			.714	.357	1.119

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 220 1950						
Condensing unit, air cooled, 3 tons to 25 tons						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Check unit for proper operation, excessive noise or vibration.	0.033			X	X	X
3 Pressure wash coils and fans with coil cleaning solution.	0.611					X
4 Check electrical wiring and connections; tighten loose connections.	0.120					X
5 Lubricate shaft bearings and motor bearings.	0.047			X	X	X
6 Inspect fan(s) or blower(s) for bent blades or imbalance; adjust as necessary.	0.031			X	X	X
7 Check belt(s) for condition, proper tension, and misalignment; adjust for proper tension and/or alignment, if applicable.	0.078			X	X	X
8 Inspect piping and valves for leaks; tighten connections as necessary.	0.077			X	X	X
9 Check refrigerant pressure; add refrigerant, if necessary.	0.272					X
10 Clean area around equipment.	0.066			X	X	X
11 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				.389	.389	1.392
Total labor-hours/year	2.559			.778	.389	1.392

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 220 2950						
Condensing unit, air cooled, 26 tons through 100 tons						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Check unit for proper operation, excessive noise or vibration.	0.033			X	X	X
3 Pressure wash coils and fans with coil cleaning solution.	0.741					X
4 Check electrical wiring and connections; tighten loose connections.	0.120					X
5 Lubricate shaft bearings and motor bearings.	0.055		X		X	X
6 Inspect fan(s) or blower(s) for bent blades or imbalance; adjust as necessary.	0.039		X		X	X
7 Check belt(s) for condition, proper tension, and misalignment; adjust for proper tension and/or alignment, if applicable.	0.104			X	X	X
8 Inspect piping and valves for leaks; tighten connections as necessary.	0.077			X	X	X
9 Check refrigerant pressure; add refrigerant, if necessary.	0.390					X
10 Clean area around equipment.	0.066			X	X	X
11 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period					.431	.431
Total labor-hours/year	2.975			.862	.431	1.682

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 220 3950						
Condensing unit, air cooled, over 100 tons						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Pressure wash coils and fans with coil cleaning solution.	0.871					X
3 Clean intake side of condenser coils, fans and intake screens.	0.091			X	X	X
4 Check electrical wiring and connections; tighten loose connections.	0.120					X
5 Lubricate shaft bearings and motor bearings.	0.055		X		X	X
6 Inspect fan(s) or blower(s) for bent blades or imbalance; adjust as necessary.	0.039		X		X	X
7 Check belt(s) for condition, proper tension, and misalignment; adjust for proper tension and/or alignment, if applicable.	0.130			X	X	X
8 Inspect piping and valves for leaks; tighten connections as necessary.	0.077			X	X	X
9 Check refrigerant pressure; add refrigerant, if necessary.	0.455					X
10 Clean area around equipment.	0.066			X	X	X
11 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				.515	.515	1.961
Total labor-hours/year	3.506			1.030	.515	1.961

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 240 1950						
Condensing unit, water cooled, 3 tons to 24 tons						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Check unit for proper operation, excessive noise or vibration.	0.033			X	X	X
3 Check electrical wiring and connections; tighten loose connections.	0.120					X
4 Inspect piping and valves for leaks; tighten connections as necessary.	0.077			X	X	X
5 Check refrigerant pressure; add refrigerant, if necessary.	0.272			X	X	X
6 Clean area around equipment.	0.066			X	X	X
7 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				.233	.233	.625
Total labor-hours/year	1.324			.466	.233	.625

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 240 2950						
Condensing unit, water cooled, 25 tons through 100 tons						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Check unit for proper operation, excessive noise or vibration.	0.033			X	X	X
3 Run system diagnostics test.	0.216			X	X	X
4 Check electrical wiring and connections; tighten loose connections.	0.120			X	X	X
5 Check oil level in sight glass of lead compressor only; add oil as necessary.	0.029			X	X	X
6 Check contactors, sensors and mechanical limits, adjust as necessary.	0.156					X
7 Check condenser for corrosion.	0.026					X
8 Inspect piping and valves for leaks; tighten connections as necessary.	0.077			X	X	X
9 Check refrigerant pressure; add refrigerant, if necessary.	0.272					X
10 Clean area around equipment.	0.066			X	X	X
11 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				.598	.598	1.052
Total labor-hours/year	2.846			1.196	.598	1.052

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3035 240 3950						
Condensing unit, water cooled, over 100 tons						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Check unit for proper operation, excessive noise or vibration.	0.033			X	X	X
3 Run system diagnostics test.	0.216			X	X	X
4 Check electrical wiring and connections; tighten loose connections.	0.120			X	X	X
5 Check oil level in sight glass of lead compressor only; add oil as necessary.	0.029			X	X	X
6 Check contactors, sensors and mechanical limits, adjust as necessary.	0.156					X
7 Check condenser for corrosion.	0.026					X
8 Inspect piping and valves for leaks; tighten connections as necessary.	0.077			X	X	X
9 Check refrigerant pressure; add refrigerant, if necessary.	0.272					X
10 Clean area around equipment.	0.066			X	X	X
11 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				.598	.598	1.052
Total labor-hours/year	2.846			1.196	.598	1.052

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3035 260 1950							
Remove/replace access panel/cover.							
2 Check unit for proper operation, excessive noise or vibration.	0.030			X	X	X	
3 Run systems diagnostics test, if applicable.	0.060			X	X	X	
4 Check oil level in compressor, if possible, and add oil as required.	0.030			X	X	X	
5 Check refrigerant pressures; add refrigerant as necessary.	0.200			X	X	X	
6 Check contactors, sensors and mechanical limits, adjust as necessary.	0.100			X	X	X	
7 Inspect refrigerant piping and insulation.	0.050			X	X	X	
8 Clean compressor and surrounding area.	0.050			X	X	X	
9 Fill out maintenance checklist and report deficiencies.	0.020			X	X	X	
Total labor-hours/period				.610	.610	.610	
Total labor-hours/year	2.440			1.220	.610	.610	

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3035 260 2950							
Compressor, DX refrigeration, 25 tons to 100 tons							
2 Run system diagnostics test, if applicable.	0.098			X	X	X	
3 Check oil level in compressor; add oil as necessary.	0.033			X	X	X	
4 Check refrigerant pressures; add refrigerant as necessary.	0.272			X	X	X	
5 Check contactors, sensors and mechanical limits, adjust as necessary.	0.216			X	X	X	
6 Inspect refrigerant piping and insulation.	0.077			X	X	X	
7 Clean compressor and surrounding area.	0.066			X	X	X	
8 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X	
Total labor-hours/period				.784	.784	.784	
Total labor-hours/year	3.136			1.568	.784	.784	

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3035 290 1950							
Fluid cooler, 2 fans (no compressor)							
1 Check with operating or area personnel for deficiencies.	0.035						X
2 Check unit for proper operation, excessive noise or vibration.	0.159						X
3 Clean intake side of condenser coils, fans and intake screens.	0.473						X
4 Check electrical wiring and connections; tighten loose connections.	0.120						X
5 Inspect fan(s) for bent blades or unbalance; adjust as necessary.	0.040						X
6 Check belts for condition, proper tension and misalignment; adjust for proper tension and/or alignment, if required.	0.029						X
7 Lubricate shaft bearings and motor bearings.	0.047						X
8 Inspect piping and valves for leaks; tighten connections as necessary.	0.077						X
9 Lubricate and check operation of dampers, if applicable.	0.055						X
10 Clean area around fluid cooler.	0.066						X
11 Fill out maintenance checklist and report deficiencies.	0.022						X
Total labor-hours/period							1.123
Total labor-hours/year	1.123						1.123

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3045 110 1950							
Air handling unit, 3 tons through 24 tons							
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X	
2 Check controls and unit for proper operation.	0.033			X	X	X	
3 Check for unusual noise or vibration.	0.033			X	X	X	
4 Check tension, condition and alignment of belts, adjust as necessary.	0.029			X	X	X	
5 Clean coils, evaporator drain pan, blower, motor and drain piping, as required.	0.380						X
6 Lubricate shaft and motor bearings.	0.047			X	X	X	
7 Replace air filters.	0.078			X	X	X	
8 Inspect exterior piping and valves for leaks; tighten connections as required.	0.077			X	X	X	
9 Clean area around equipment.	0.066			X	X	X	
10 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X	
Total labor-hours/period				.420	.420	.800	
Total labor-hours/year	2.060			.840	.420	.800	

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3045 110 2950						
Air handling unit, 25 tons through 50 tons						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Check controls and unit for proper operation.	0.033			X	X	X
3 Check for unusual noise or vibration.	0.033			X	X	X
4 Clean coils, evaporator drain pan, blower, motor and condensate drain piping, as required.	0.380					X
5 Lubricate shaft and motor bearings.	0.047			X	X	X
6 Check belts for wear, proper tension, and alignment; adjust as necessary.	0.029			X	X	X
7 Inspect exterior piping and valves for leaks; tighten connections as required.	0.077			X	X	X
8 Check operation and clean dampers, louvers and shutters; lubricate at pivot points and linkages.	0.078					X
9 Replace air filters.	0.078			X	X	X
10 Clean area around equipment.	0.066			X	X	X
11 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				420	420	878
Total labor-hours/year	2.138			840	420	878

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3045 110 3950						
Air handling unit, over 50 tons						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Check controls and unit for proper operation.	0.033			X	X	X
3 Check for unusual noise or vibration.	0.033			X	X	X
4 Clean coils, evaporator drain pan, blower, motor and drain piping, as required.	0.510					X
5 Lubricate shaft and motor bearings.	0.047			X	X	X
6 Check belts for wear, proper tension, and alignment; adjust as necessary.	0.055			X	X	X
7 Inspect exterior piping and valves for leaks; tighten connections as required.	0.077			X	X	X
8 Check operation and clean dampers, louvers and shutters; lubricate at pivot points and linkages.	0.078					X
9 Clean centrifugal fan.	0.065					X
10 Replace air filters.	0.286			X	X	X
11 Clean area around equipment.	0.066			X	X	X
12 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				654	654	1,307
Total labor-hours/year	3.269			1,308	654	1,307

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3045 112 1950						
Air handling unit, computer room						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Run microprocessor check, if available, or check controls and unit for proper operation.	0.216			X	X	X
3 Check for unusual noise or vibration.	0.033			X	X	X
4 Clean coils, evaporator drain pan, blower, motor and drain piping, as required.	0.380					X
5 Lubricate shaft and motor bearings.	0.047			X	X	X
6 Check belts for wear, proper tension, and alignment; adjust as necessary.	0.029			X	X	X
7 Check humidity lamp, replace if necessary.	0.156			X	X	X
8 Inspect exterior piping and valves for leaks; tighten connections as required.	0.077			X	X	X
9 Replace air filters.	0.078			X	X	X
10 Clean area around equipment.	0.066			X	X	X
11 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				759	759	1,139
Total labor-hours/year	3.416			1,518	759	1,139

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3045 120 1950						
Fan coil unit						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Check coil unit while operating.	0.120			X	X	X
3 Remove access panel and vacuum inside of unit and coils.	0.468			X	X	X
4 Check coils and piping for leaks, damage and corrosion; repair as necessary.	0.077			X	X	X
5 Lubricate blower shaft and fan motor bearings.	0.047			X	X	X
6 Clean coil, drip pan, and drain line with solvent.	0.473			X	X	X
7 Replace filters as required.	0.009			X	X	X
8 Replace access panel.	0.023			X	X	X
9 Check operation after repairs.	0.120			X	X	X
10 Clean area.	0.066			X	X	X
11 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				209	1,460	1,460
Total labor-hours/year	3.338			418	1,460	1,460

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3045 150 1950						
Filters, Electrostatic						
1 Review manufacturers instructions	0.091			X	X	X
2 Check indicators for defective tubes or broken ionizing wires.	0.130			X	X	X
3 De-energize power supply tag and lockout disconnect switch.	0.130			X	X	X
4 Ground bus trips, top and bottom.	0.065			X	X	X
5 Secure filter and fan unit.	0.065			X	X	X
6 Wash each manifold until clean, approximately 4 minutes with hot water, 7 minutes with cold water	0.390			X	X	X
7 Clean or replace dry filters as necessary	0.260			X	X	X
8 Inspect for broken or hum suppressors and wipe insulators with soft dry cloth.	0.260			X	X	X
9 Disassemble unit as required, check it thoroughly, clean and clean and adjust.	0.650			X	X	X
10 Restore to service and check for shorts.	0.130			X	X	X
11 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				2,193	2,193	2,193
Total labor-hours/year	8.772			4,386	2,193	2,193

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3045 160 1950						
VAV Boxes						
1 Open/close VAV control box access.	0.060				X	X
2 Check that pneumatic tubing/electrical connections are in place and tight.	0.040				X	X
3 Tighten arm on motor output shaft.	0.040				X	X
4 Cycle actuator while watching for proper operation. Verify that blades fully open and close.	0.200				X	X
5 Lubricate actuator linkage and damper blade pivot points.	0.040				X	X
6 Fill out maintenance checklist and report deficiencies.	0.070				X	X
	0.017				X	X
Total labor-hours/period					.467	.467
Total labor-hours/year	0.934				.467	.467

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3045 170 1950						
Fire dampers						
1 Remove/replace access door.	0.800					X
2 Clean out debris/dirt blown against damper.	0.200					X
3 Remove fusible link and check that blades operate freely.	0.070					X
4 Lubricate pivot points.	0.050					X
5 Replace fusible link.	0.020					X
6 Fill out maintenance checklist and report deficiencies.	0.017					X
Total labor-hours/period						1.157
Total labor-hours/year	1.157					1.157

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3045 210 1950						
Fan, axial, up to 5,000 CFM						
1 Start and stop fan with local switch.	0.012				X	X
2 Check fan for noise and vibration.	0.091				X	X
3 Check electrical wiring and connections; tighten loose connections.	0.029				X	X
4 Check motor and fan shaft bearings for noise, vibration, overheating; lubricate as required.	0.325				X	X
5 Clean area around fan.	0.143				X	X
6 Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period					.622	.622
Total labor-hours/year	1.244				.622	.622

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3045 210 2950						
Fan, axial, 5,000 to 10,000 CFM						
1 Start and stop fan with local switch.	0.012				X	X
2 Check motor and fan shaft bearings for noise, vibration, overheating; lubricate bearings.	0.325				X	X
3 Check belts for wear, tension, and alignment, if applicable; adjust as required.	0.057				X	X
4 Check fan pitch operator, lubricate, if applicable.	0.029				X	X
5 Check electrical wiring and connections; tighten loose connections.	0.057				X	X
6 Clean fan and surrounding fan.	0.143				X	X
7 Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period					.645	.645
Total labor-hours/year	1.290				.645	.645

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3045 210 3950						
Fan, axial, 36" to 48" dia (over 10,000 CFM)						
1 Start and stop fan with local switch.	0.012				X	X
2 Check motor and fan shaft bearings for noise, vibration, overheating; lubricate bearings.	0.325				X	X
3 Check belts for wear, tension, and alignment, if applicable; adjust as required.	0.086				X	X
4 Check fan pitch operator, lubricate, if applicable.	0.029				X	X
5 Check electrical wiring and connections; tighten loose connections.	0.078				X	X
6 Clean fan and surrounding area.	0.143				X	X
7 Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period					695	695
Total labor-hours/year	1.390				695	695

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3045 220 1950						
Fan, centrifugal, up to 5,000 CFM						
1 Start and stop fan with local switch.	0.012				X	X
2 Check motor and fan shaft bearings for noise, vibration, overheating; lubricate bearings.	0.325				X	X
3 Check belts for wear, tension, and alignment, if applicable; adjust as required.	0.057				X	X
4 Check blower intake dampers, lubricate, if applicable.	0.029				X	X
5 Check electrical wiring and connections; tighten loose connections.	0.029				X	X
6 Clean fan and surrounding area.	0.066				X	X
7 Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period					540	540
Total labor-hours/year	1.080				540	540

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3045 220 2950						
Fan, centrifugal, 5,000 to 10,000 CFM						
1 Start and stop fan with local switch.	0.012				X	X
2 Check motor and fan shaft bearings for noise, vibration, overheating; lubricate bearings.	0.325				X	X
3 Check belts for wear, tension, and alignment, if applicable; adjust as required.	0.057				X	X
4 Check blower intake dampers, lubricate, if applicable.	0.029				X	X
5 Check electrical wiring and connections; tighten loose connections.	0.057				X	X
6 Clean fan and surrounding area.	0.066				X	X
7 Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period					568	568
Total labor-hours/year	1.136				568	568

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3045 220 3950						
Fan, centrifugal, over 10,000 CFM						
1 Start and stop fan with local switch.	0.007				X	X
2 Check motor and fan shaft bearings for noise, vibration, overheating; lubricate bearings.	0.325				X	X
3 Check belts for wear, tension, and alignment, if applicable; adjust as required.	0.086				X	X
4 Check blower intake dampers, lubricate, if applicable.	0.029				X	X
5 Check electrical wiring and connections; tighten loose connections.	0.057				X	X
6 Clean fan and surrounding area.	0.066				X	X
7 Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period					592	592
Total labor-hours/year	1.184				592	592

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3045 250 1950						
Hood and blower						
1 Check with operating or area personnel for any deficiencies.	0.044			X	X	X
2 Check unit for proper operation, including switches, controls and thermostat; calibrate thermostat and repair components as required.	0.109			X	X	X
3 Check operation of spray nozzles for spray coverage and drainage, if applicable.	0.022					X
4 Inspect soap and spray solution feeder lines.	0.007			X	X	X
5 Check components for automatic cleaning system and automatic fire protection system - solenoid valve, line strainer, shut-off valve, detergent tank, etc.	0.055			X	X	X
6 Clean spray nozzles.	1.104					X
7 Tighten or replace loose, missing or damaged nuts, bolts or screws.	0.005			X	X	X
8 Check operation of exhaust blower on roof; lubricate bearings; adjust tension of fan belts and clean fan blades as required.	0.056			X	X	X
9 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				298	298	1.424
Total labor-hours/year	2.318			596	298	1.424

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3045 410 1950							
Centrifugal pump over 1 H.P.							
1	Check for proper operation of pump.	0.022				X	X
2	Check for leaks on suction and discharge piping, seals, packing glands, etc.; make minor adjustments as required.	0.077				X	X
3	Check pump and motor operation for excessive vibration, noise and overheating.	0.022				X	X
4	Check alignment of pump and motor; adjust as necessary.	0.260				X	X
5	Lubricate pump and motor.	0.099				X	X
6	Clean exterior of pump, motor and surrounding area.	0.096				X	X
7	Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period						.598	.598
Total labor-hours/year		1.196				.598	.598

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3045 410 2950							
Centrifugal pump w/reduction gear, over 1 H.P.							
1	Check with operating or area personnel for deficiencies.	0.035				X	X
2	Clean pump exterior and check for corrosion on pump exterior and base plate.	0.030				X	X
3	Check for leaks on suction and discharge piping, seals, packing glands, etc.	0.077				X	X
4	Check pump, gear and motor operation for vibration, noise, overheating, etc.	0.022				X	X
5	Check alignment and clearances of shaft reduction gear and coupler.	0.260				X	X
6	Tighten or replace loose, missing, or damaged nuts, bolts and screws.	0.005				X	X
7	Lubricate pump and motor as required.	0.099				X	X
8	When available, check suction or discharge, pressure gauge readings and flow rate.	0.022				X	X
9	Clean area around pump.	0.066				X	X
10	Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period						.638	.638
Total labor-hours/year		1.276				.638	.638

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3045 420 1950							
Pump w/oil reservoir, over 1 H.P.							
1	Check for proper operation of pump.	0.022				X	X
2	Check for leaks on suction and discharge piping, seals, packing glands, etc.; make minor adjustments as required.	0.077				X	X
3	Check pump and motor operation for excessive vibration, noise and overheating.	0.022				X	X
4	Check alignment of pump and motor; adjust as necessary.	0.260				X	X
5	Lubricate motor; check oil level in pump reservoir.	0.099				X	X
6	Clean exterior of pump and surrounding area.	0.096				X	X
7	Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period						.598	.598
Total labor-hours/year		1.196				.598	.598

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3045 600 1950							
Heat exchanger, steam							
1	Check with operating or area personnel for deficiencies.	0.035				X	X
2	Check temperature gauges for proper operating temperatures.	0.091				X	X
3	Check steam modulating valve and steam condensate trap for proper operation.	0.101				X	X
4	Inspect heat exchanger and adjacent piping for torn or deteriorated insulation.	0.147				X	X
5	Clean heat exchanger and surrounding area.	0.066				X	X
6	Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period						.462	.462
Total labor-hours/year		0.924				.462	.462

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3055 110 1950							
Unit heater, gas radiant							
1	Check with operating or area personnel for deficiencies.	0.035					X
2	Inspect, clean and adjust control valves and thermo sensing bulbs on gas burners.	0.254					X
3	Inspect fuel system for leaks.	0.016					X
4	Check for proper operation of burner controls, check and adjust thermostat.	0.133					X
5	Check fan and motor for vibration and noise, lubricate bearings.	0.056					X
6	Check electrical wiring to blower motor.	0.079					X
7	Check condition of flue pipe, damper and stack.	0.147					X
8	Check unit heater operation through complete cycle or up to ten minutes.	0.133					X
9	Clean area around unit heater.	0.133					X
10	Fill out maintenance checklist and report deficiencies.	0.022					X
Total labor-hours/period							1.008
Total labor-hours/year		1.008					1.008

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3055 110 2950							
Unit heater, gas infrared							
1	Check with operating or area personnel for deficiencies.	0.035					X
2	Inspect fuel system for leaks around unit.	0.016					X
3	Replace primary air intake filter.	0.048					X
4	Blow out burner.	0.130					X
5	Clean spark electrode and reset gap, replace if necessary.	0.254					X
6	Clean pilot and thermo-sensor bulb, replace if necessary.	0.133					X
7	Check alignment of thermo-sensor bulb.	0.133					X
8	Check wiring and connections, tighten any loose connections.	0.079					X
9	Check and clean pilot sight glass.	0.091					X
10	Vacuum pump filter): A) check motor bearings for overheating, adjust or repair as required. B) lubricate motor bearings. C) check motor mounting, adjust as required. D) check fan blade clearance, adjust as required. E) check wiring, connections, switches, etc.; tighten any loose connections.	0.022					X
11	Operate unit to ensure that it is in proper working condition.	0.225					X
12	Clean equipment and surrounding area.	0.066					X
13	Fill out maintenance checklist and report deficiencies.	0.022					X
Total labor-hours/period							1.504
Total labor-hours/year		1.504					1.504

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3055 110 3950							
Unit heater, steam							
1	Check with operating or area personnel for deficiencies.	0.035					X
2	Inspect, clean and adjust control valves and thermostat.	0.254					X
3	Inspect coils, connections, trap and steam piping for leaks; repair as necessary.	0.195					X
4	Check fan and motor for vibration and noise; lubricate bearings.	0.056					X
5	Check electrical wiring to motor.	0.079					X
6	Check unit heater operation through complete cycle or up to ten minutes.	0.133					X
7	Clean equipment and surrounding area.	0.066					X
8	Fill out maintenance checklist and report deficiencies.	0.022					X
Total labor-hours/period							.840
Total labor-hours/year		0.840					.840

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3055 122 1950							
Forced air heater, oil or gas fired, up to 120 MBH							
1	Check with operating or area personnel for deficiencies.	0.035			X	X	X
2	Inspect, clean and adjust electrodes and nozzles on oil burners or oil burner motor bearings as applicable.	0.254					X
3	Inspect fuel system for leaks.	0.016			X	X	X
4	Change fuel filter element on oil burner, where applicable.	0.133			X	X	X
5	Check for proper operation of burner primary controls, check and adjust thermostat.	0.009			X	X	X
6	Replace air filters in air handler.	0.042			X	X	X
7	Check blower and motor for vibration and noise, lubricate bearings.	0.029			X	X	X
8	Check belts for wear and proper tension, tighten if required.	0.079					X
9	Check electrical wiring to burner controls and blower.	0.577					X
10	Inspect and clean firebox.	0.294					X
11	Clean blower and air plenum.	0.147			X	X	X
12	Check condition of flue pipe, damper and stack.	0.650			X	X	X
13	Check furnace operation through complete cycle or up to 10 minutes.	0.066			X	X	X
14	Clean area around furnace.	0.022			X	X	X
15	Fill out maintenance checklist and report deficiencies.						
Total labor-hours/period					1.149	1.149	2.353
Total labor-hours/year		5.800			2.298	1.149	2.353

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3055 122 2950						
Forced air heater, oil or gas fired, over 120 MBH						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Inspect, clean and adjust electrodes and nozzles on oil burners or controls valves and thermo-sensing bulbs on gas burners; lubricate oil burner motor bearings as applicable.	0.358					X
3 Inspect fuel system for leaks.	0.156			X	X	X
4 Change fuel filter element on oil burner, where applicable.	0.120					X
5 Check for proper operation of burner primary controls, check and adjust thermostat.	0.133			X	X	X
6 Replace air filters in air handler.	0.182			X	X	X
7 Check blower and motor for vibration and noise, lubricate bearings.	0.047			X	X	X
8 Check belts for wear and proper tension, tighten if required.	0.057			X	X	X
9 Check electrical wiring to burner controls and blower.	0.079					X
10 Inspect and clean firebox.	0.577					X
11 Clean blower and air plenum.	0.294					X
12 Check condition of flue pipe, damper and stack.	0.147			X	X	X
13 Check furnace operation through complete cycle or up to 10 minutes.	0.650			X	X	X
14 Clean area around furnace.	0.066			X	X	X
15 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period	7.408			1,495	1,495	2,923
Total labor-hours/year				2,990	1,495	2,923

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3055 210 1950						
Package unit, air cooled, 3 tons through 24 tons						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Check tension, condition, and alignment of belts; adjust as necessary.	0.029			X	X	X
3 Lubricate shaft and motor bearings.	0.047			X	X	X
4 Replace air filters.	0.055			X	X	X
5 Clean electrical wiring and connections; tighten loose connections.	0.120					X
6 Clean coils, evaporator drain pan, blowers, fans, motors and drain piping as required.	0.385					X
7 Perform operational check of unit; make adjustments on controls and other components as required.	0.077			X	X	X
8 During operation of unit, check refrigerant pressure; add refrigerant as necessary.	0.135			X	X	X
9 Check compressor oil level; add oil as required.	0.033					X
10 Clean area around unit.	0.066			X	X	X
11 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				466	466	1,004
Total labor-hours/year	2.402			932	466	1,004

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3055 210 2950						
Package unit, air cooled, 25 tons through 50 tons						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Check tension, condition, and alignment of belts; adjust as necessary.	0.029			X	X	X
3 Lubricate shaft and motor bearings.	0.047			X	X	X
4 Replace air filters.	0.078			X	X	X
5 Clean electrical wiring and connections; tighten loose connections.	0.120					X
6 Clean coils, evaporator drain pan, blowers, fans, motors and drain piping as required.	0.385					X
7 Perform operational check of unit; make adjustments on controls and other components as required.	0.130		X		X	X
8 During operation of unit, check refrigerant pressure; add refrigerant as necessary.	0.272			X	X	X
9 Check compressor oil level; add oil as required.	0.033					X
10 Clean area around unit.	0.066			X	X	X
11 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				.679	.679	1.217
Total labor-hours/year	3.254			1.358	.679	1.217

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3055 110 3950						
Unit heater, steam						
1 Check with operating or area personnel for deficiencies.	0.035					X
2 Inspect, clean and adjust control valves and thermostat.	0.254					X
3 Inspect coils, connections, trap and steam piping for leaks; repair as necessary.	0.195					X
4 Check fan and motor for vibration and noise; lubricate bearings.	0.056					X
5 Check electrical wiring to motor.	0.079					X
6 Check unit heater operation through complete cycle or up to ten minutes.	0.133					X
7 Clean equipment and surrounding area.	0.066					X
8 Fill out maintenance checklist and report deficiencies.	0.022					X
Total labor-hours/period						.840
Total labor-hours/year	0.840					.840

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3055 122 1950						
Forced air heater, oil or gas fired, up to 120 MBH						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Inspect, clean and adjust electrodes and nozzles on oil burners or oil burner motor bearings as applicable.	0.254					X
3 Inspect fuel system for leaks.	0.016			X	X	X
4 Change fuel filter element on oil burner, where applicable.						
5 Check for proper operation of burner primary controls, check and adjust thermostat.	0.133			X	X	X
6 Replace air filters in air handler.	0.009			X	X	X
7 Check blower and motor for vibration and noise, lubricate bearings.	0.042			X	X	X
8 Check belts for wear and proper tension, tighten if required.	0.029			X	X	X
9 Check electrical wiring to burner controls and blower.	0.079					X
10 Inspect and clean firebox.	0.577					X
11 Clean blower and air plenum.	0.294					X
12 Check condition of flue pipe, damper and stack.	0.147			X	X	X
13 Check furnace operation through complete cycle or up to 10 minutes.	0.650			X	X	X
14 Clean area around furnace.	0.066			X	X	X
15 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				1.149	1.149	2.353
Total labor-hours/year	5.800			2.298	1.149	2.353

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	PM System D3055 122 2950					
		W	M	Q	S	A	
Forced air heater, oil or gas fired, over 120 MBH							
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X	
2 Inspect, clean and adjust electrodes and nozzles on oil burners or controls valves and thermo-sensing bulbs on gas burners; lubricate oil burner motor bearings as applicable.	0.358					X	
3 Inspect fuel system for leaks.	0.156			X	X	X	
4 Change fuel filter element on oil burner, where applicable.	0.120					X	
5 Check for proper operation of burner primary controls, check and adjust thermostats.	0.133			X	X	X	
6 Replace air filters in air handler.	0.182			X	X	X	
7 Check blower and motor for vibration and noise, lubricate bearings.	0.047			X	X	X	
8 Check belts for wear and proper tension, tighten if required.	0.057			X	X	X	
9 Check electrical wiring to burner controls and blower.	0.079					X	
10 Inspect and clean firebox.	0.577					X	
11 Clean blower and air plenum.	0.294					X	
12 Check condition of flue pipe, damper and stack.	0.147			X	X	X	
13 Check furnace operation through complete cycle or up to 10 minutes.	0.650			X	X	X	
14 Clean area around furnace.	0.066			X	X	X	
15 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X	
Total labor-hours/period				1,495	1,495	2,923	
Total labor-hours/year	7,408			2,990	1,495	2,923	

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	PM System D3055 210 1950					
		W	M	Q	S	A	
Package unit, air cooled, 3 tons through 24 tons							
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X	
2 Check tension, condition, and alignment of belts; adjust as necessary.	0.029			X	X	X	
3 Lubricate shaft and motor bearings.	0.047			X	X	X	
4 Replace air filters.	0.055			X	X	X	
5 Clean electrical wiring and connections; tighten loose connections.	0.120					X	
6 Clean coils, evaporator drain pan, blowers, fans, motors and drain piping as required.	0.385					X	
7 Perform operational check of unit; make adjustments on controls and other components as required.	0.077			X	X	X	
8 During operation of unit, check refrigerant pressure; add refrigerant as necessary.	0.135			X	X	X	
9 Check compressor oil level; add oil as required.	0.033					X	
10 Clean area around unit.	0.066			X	X	X	
11 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X	
Total labor-hours/period				.466	.466	1.004	
Total labor-hours/year	2,402			.932	.466	1,004	

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	PM System D3055 220 1950					
		W	M	Q	S	A	
Package unit, water cooled, 3 tons through 24 tons							
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X	
2 Check tension, condition, and alignment of belts; adjust as necessary.	0.029			X	X	X	
3 Lubricate shaft and motor bearings.	0.047			X	X	X	
4 Replace air filters.	0.055			X	X	X	
5 Clean electrical wiring and connections; tighten loose connections.	0.120					X	
6 Clean coils, evaporator drain pan, blowers, fans, motors and drain piping as required.	0.385					X	
7 Perform operational check of unit; make adjustments on controls and other components as required.	0.077			X	X	X	
8 During operation of unit, check refrigerant pressure; add refrigerant as necessary.	0.135			X	X	X	
9 Check compressor oil level; add oil as required.	0.033					X	
10 Clean area around unit.	0.066			X	X	X	
11 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X	
Total labor-hours/period				.466	.466	1.004	
Total labor-hours/year	2,402			.932	.466	1,004	

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	PM System D3055 220 2950					
		W	M	Q	S	A	
Package unit, water cooled, 25 tons through 50 tons							
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X	
2 Check tension, condition, and alignment of belts; adjust as necessary.	0.029			X	X	X	
3 Lubricate shaft and motor bearings.	0.047			X	X	X	
4 Replace air filters.	0.078			X	X	X	
5 Clean electrical wiring and connections; tighten loose connections.	0.120					X	
6 Clean coils, evaporator drain pan, blowers, fans, motors and drain piping as required.	0.385					X	
7 Perform operational check of unit; make adjustments on controls and other components as required.	0.130			X	X	X	
8 During operation of unit, check refrigerant pressure; add refrigerant as necessary.	0.272			X	X	X	
9 Check compressor oil level; add oil as required.	0.033					X	
10 Clean area around unit.	0.066			X	X	X	
11 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X	
Total labor-hours/period				.679	.679	1,217	
Total labor-hours/year	3,254			1,358	.679	1,217	

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3055 230 1950						
Package unit, computer room						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Run microprocessor check, if available, or check controls and unit for proper operation.	0.216			X	X	X
3 Check for unusual noise or vibration.	0.033			X	X	X
4 Clean coils, evaporator drain pan, humidifier pan, blower, motor and drain piping as required.	0.380				X	X
5 Replace air filters.	0.078			X	X	X
6 Lubricate shaft and motor bearings.	0.047			X	X	X
7 Check belts for wear, proper tension, and alignment; adjust as necessary.	0.029			X	X	X
8 Check humidity lamp, replace if necessary.	0.156			X	X	X
9 During operation of unit, check refrigerant pressures; add refrigerant as necessary.	0.270				X	X
10 Inspect exterior piping and valves for leaks; tighten connections as required.	0.077			X	X	X
11 Clean area around unit.	0.066			X	X	X
12 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				759	1,409	1,409
Total labor-hours/year	4,336			1,518	1,409	1,409

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3055 240 1950						
Package unit, with duct gas heater						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Check tension, condition and alignment of belts; adjust as necessary.	0.029			X	X	X
3 Lubricate shaft and motor bearings.	0.047			X	X	X
4 Replace air filters.	0.078			X	X	X
5 Check electrical wiring and connections; tighten loose connections.	0.120				X	X
6 Clean coils, evaporator drain pan, blowers, fans, motors and drain piping as required.	0.385				X	X
7 Perform operational check of unit; make adjustments on controls and other components as required.	0.077			X	X	X
8 During operation of unit, check refrigerant pressures; add refrigerant as necessary.	0.272			X	X	X
9 Check compressor oil level; add oil as required.	0.033					X
10 Inspect, clean and adjust control valves and thermo-sensing bulbs on gas burners.	0.254					X
11 Inspect fuel system for leaks.	0.016			X	X	X
12 Check for proper operation of burner primary controls. Check and adjust thermostat.	0.133					X
13 Check electrical wiring to burner controls.	0.079					X
14 Inspect and clean firebox.	0.577					X
15 Check condition of flue pipe, damper and stack.	0.147			X	X	X
16 Check heater operation through complete cycle or up to 10 minutes.	0.225					X
17 Clean area around entire unit.	0.066			X	X	X
18 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				789	789	2,595
Total labor-hours/year	4,962			1,578	789	2,595

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3055 250 1950						
Air conditioning split system, DX, air cooled, up to 10 tons						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Clean intake side of condenser coils, fans and intake screens.	0.055			X	X	X
3 Lubricate shaft and motor bearings.	0.047			X	X	X
4 Pressure wash condenser coils with coil clean solution, as required.	0.611					X
5 Replace air filters.	0.078			X	X	X
6 Clean electrical wiring and connections; tighten loose connections.	0.120					X
7 Clean evaporator coils, drain pan, blowers, fans, motors and drain piping as required.	0.380					X
8 Perform operational check of unit; make adjustments on controls and other components as required.	0.033			X	X	X
9 During operation of unit, check refrigerant pressure; add refrigerant as necessary.	0.272			X	X	X
10 Clean area around equipment.	0.066			X	X	X
11 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				608	608	1,719
Total labor-hours/year	3,543			1,216	608	1,719

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3055 250 2950							
Air conditioning split system, DX, air cooled, over 10 tons							
1	Check with operating or area personnel for deficiencies.	0.035			X	X	X
2	Check tension, condition, and alignment of belts; adjust as necessary.	0.029			X	X	X
3	Lubricate shaft and motor bearings.	0.047			X	X	X
4	Pressure wash condenser coils with coil clean solution, as required.	0.611					X
5	Replace air filters.	0.078			X	X	X
6	Clean electrical wiring and connections; tighten loose connections.	0.120					X
7	Clean evaporator coils, drain pan, blowers, fans, motors and drain piping as required.	0.380					X
8	Perform operational check of unit; make adjustments on controls and other components as required.	0.033			X	X	X
9	During operation of unit, check refrigerant pressure; add refrigerant as necessary.	0.272			X	X	X
10	Check compressor oil level; add oil as required.	0.033			X	X	X
11	Clean area around equipment.	0.066			X	X	X
12	Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period					.615	.615	1.726
Total labor-hours/year		3.571			1.230	.615	1.726

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3055 310 1950							
Heat pump, air cooled, up to 5 tons							
1	Check with operating or area personnel for deficiencies.	0.035			X	X	X
2	Check unit for proper operation, excessive noise or vibration.	0.033			X	X	X
3	Clean intake side of condenser coils, fans and intake screens.	0.055			X	X	X
4	Check electrical wiring and connections; tighten loose connections.	0.120					X
5	Inspect fan(s) for bent blades or unbalance; adjust and clean as necessary.	0.027					X
6	Check belts for condition, proper tension and misalignment; adjust as required.	0.029			X	X	X
7	Lubricate shaft bearings and motor bearings.	0.047			X	X	X
8	Inspect piping and valves for leaks; tighten connections as necessary.	0.077			X	X	X
9	Replace air filters.	0.078			X	X	X
10	Check refrigerant pressure; add refrigerant as necessary.	0.135			X	X	X
11	Clean evaporative drain pan, and drain piping as required.	0.385					X
12	Cycle the reverse cycle valve to insure proper operation.	0.091			X	X	X
13	Clean area around equipment.	0.066			X	X	X
14	Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period					.668	.668	1.200
Total labor-hours/year		3.204			1.336	.668	1.200

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3055 310 2950							
Heat pump, air cooled, over 5 tons							
1	Check with operating or area personnel for deficiencies.	0.035			X	X	X
2	Check unit for proper operation, excessive noise or vibration.	0.033			X	X	X
3	Clean intake side of condenser coils, fans and intake screens.	0.055			X	X	X
4	Check electrical wiring and connections; tighten loose connections.	0.120					X
5	Inspect fan(s) for bent blades or unbalance; adjust and clean as necessary.	0.055					X
6	Check belts for condition, proper tension and misalignment; adjust as required.	0.057			X	X	X
7	Lubricate shaft bearings and motor bearings.	0.047			X	X	X
8	Inspect piping and valves for leaks; tighten connections as necessary.	0.077			X	X	X
9	Replace air filters.	0.156			X	X	X
10	Check refrigerant pressure; add refrigerant as necessary.	0.135			X	X	X
11	Lubricate and check operation of dampers, if applicable.	0.029					X
12	Check compressor oil level and add oil, if required.	0.033			X	X	X
13	Cycle the reverse cycle valve to insure proper operation.	0.091			X	X	X
14	Clean evaporative drain pan, and drain piping as required.	0.385					X
15	Clean area around equipment.	0.066			X	X	X
16	Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period					.730	.730	1.396
Total labor-hours/year		3.586			1.460	.730	1.396

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3055 320 1950							
Heat pump, water cooled, up to 5 tons							
1	Check with operating or area personnel for deficiencies.	0.035			X	X	X
2	Check unit for proper operation, excessive noise or vibration.	0.033			X	X	X
3	Clean intake side of evaporator coil, fans and intake screens.	0.055			X	X	X
4	Check electrical wiring and connections; tighten loose connections.	0.120					X
5	Inspect fan(s) for bent blades or unbalance; adjust and clean as necessary.	0.027					X
6	Check belts for condition, proper tension and misalignment; adjust as required.	0.029			X	X	X
7	Lubricate shaft bearings and motor bearings.	0.047			X	X	X
8	Inspect piping and valves for leaks; tighten connections as necessary.	0.077			X	X	X
9	Replace air filters.	0.078			X	X	X
10	Check refrigerant pressure; add refrigerant as necessary.	0.135			X	X	X
11	Lubricate and check operation of dampers, if applicable.	0.029					X
12	Clean evaporator drain pan and drain line with solvent.	0.385					X
13	Cycle reverse cycle valve to insure proper operation.	0.091			X	X	X
14	Backwash condenser coil to remove sediment.	0.325					X
15	Clean area around equipment.	0.066			X	X	X
16	Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period					.668	.668	1.554
Total labor-hours/year		3.558			1.336	.668	1.554

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3055 320 2950						
Heat pump, water cooled, over 5 tons						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Check unit for proper operation, excessive noise or vibration.	0.033			X	X	X
3 Clean intake side of condenser coils, fans and intake screens.	0.055			X	X	X
4 Check electrical wiring and connections; tighten loose connections.	0.120					X
5 Inspect fan(s) for bent blades or unbalance; adjust and clean as necessary.	0.027					X
6 Check belts for condition, proper tension and misalignment; adjust as required.	0.029			X	X	X
7 Lubricate shaft bearings and motor bearings.	0.047			X	X	X
8 Inspect piping and valves for leaks; tighten connections as necessary.	0.077			X	X	X
9 Replace air filters.	0.078			X	X	X
10 Check refrigerant pressure; add refrigerant as necessary.	0.135			X	X	X
11 Lubricate and check operation of dampers, if applicable.	0.029					X
12 Clean evaporator drain pan and drain line with solvent.	0.385					X
13 Cycle reverse cycle valve to insure proper operation.	0.091			X	X	X
14 Clean area around equipment.	0.066			X	X	X
15 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				.668	.668	1.229
Total labor-hours/year	3.233			1.336	.668	1.229

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3065 100 1950						
Controls, central system, electro/pneumatic						
1 With panel disconnected from power source, clean patrol panel compartment with a vacuum.	0.468					X
2 Inspect wiring/components for loose connections; tighten, as required.	0.120					X
3 Check set point of controls temperature, humidity or pressure.	0.033					X
4 Check unit over its range of control.	0.033					X
5 Check for correct pressure differential on all two position controllers.	0.195					X
6 Check source of the signal and its amplification on electronic controls.	0.468					X
7 Check air systems for leaks; repair as necessary.	0.156					X
8 Check relays, pilot valves and pressure regulators for proper operation; repair or replace as necessary.	0.325					X
9 Replace air filters in sensors, controllers, and thermostats as necessary.	0.029					X
10 Clean area around equipment.	0.066					X
11 Fill out maintenance checklist and report deficiencies.	0.022					X
Total labor-hours/period						1.915
Total labor-hours/year	1.915					1.915

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3055 310 1950						
Heat pump, air cooled, up to 5 tons						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Check unit for proper operation, excessive noise or vibration.	0.033			X	X	X
3 Clean intake side of condenser coils, fans and intake screens.	0.055			X	X	X
4 Check electrical wiring and connections; tighten loose connections.	0.120					X
5 Inspect fan(s) for bent blades or unbalance; adjust and clean as necessary.	0.027					X
6 Check belts for condition, proper tension and misalignment; adjust as required.	0.029			X	X	X
7 Lubricate shaft bearings and motor bearings.	0.047			X	X	X
8 Inspect piping and valves for leaks; tighten connections as necessary.	0.077			X	X	X
9 Replace air filters.	0.078			X	X	X
10 Check refrigerant pressure; add refrigerant as necessary.	0.135			X	X	X
11 Clean evaporative drain pan, and drain piping as required.	0.385					X
12 Cycle the reverse cycle valve to insure proper operation.	0.091			X	X	X
13 Clean area around equipment.	0.066			X	X	X
14 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				.668	.668	1.200
Total labor-hours/year	3.204			1.336	.668	1.200

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3055 310 2950						
Heat pump, air cooled, over 5 tons						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Check unit for proper operation, excessive noise or vibration.	0.033			X	X	X
3 Clean intake side of condenser coils, fans and intake screens.	0.055			X	X	X
4 Check electrical wiring and connections; tighten loose connections.	0.120					X
5 Inspect fan(s) for bent blades or unbalance; adjust and clean as necessary.	0.055					X
6 Check belts for condition, proper tension and misalignment; adjust as required.	0.057			X	X	X
7 Lubricate shaft bearings and motor bearings.	0.047			X	X	X
8 Inspect piping and valves for leaks; tighten connections as necessary.	0.077					X
9 Replace air filters.	0.156			X	X	X
10 Check refrigerant pressure; add refrigerant as necessary.	0.135			X	X	X
11 Lubricate and check operation of dampers, if applicable.	0.029					X
12 Check compressor oil level and add oil, if required.	0.033			X	X	X
13 Cycle the reverse cycle valve to insure proper operation.	0.091			X	X	X
14 Clean evaporative drain pan, and drain piping as required.	0.385					X
15 Clean area around equipment.	0.066			X	X	X
16 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				.730	.730	1.396
Total labor-hours/year	3.586			1.460	.730	1.396

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3055 320 1950						
Heat pump, water cooled, up to 5 tons						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Check unit for proper operation, excessive noise or vibration.	0.033			X	X	X
3 Clean intake side of evaporator coil, fans and intake screens.	0.055			X	X	X
4 Check electrical wiring and connections; tighten loose connections.	0.120					X
5 Inspect fan(s) for bent blades or unbalance; adjust and clean as necessary.	0.027					X
6 Check belts for condition, proper tension and misalignment; adjust as required.	0.029			X	X	X
7 Lubricate shaft bearings and motor bearings.	0.047			X	X	X
8 Inspect piping and valves for leaks; tighten connections as necessary.	0.077			X	X	X
9 Replace air filters.	0.078			X	X	X
10 Check refrigerant pressure; add refrigerant as necessary.	0.135			X	X	X
11 Lubricate and check operation of dampers, if applicable.	0.029					X
12 Clean evaporator drain pan and drain line with solvent.	0.385					X
13 Cycle reverse cycle valve to insure proper operation.	0.091			X	X	X
14 Backwash condenser coil to remove sediment.	0.325					X
15 Clean area around equipment.	0.066			X	X	X
16 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				.668	.668	1.554
Total labor-hours/year	3.558			1.336	.668	1.554

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3055 320 2950						
Heat pump, water cooled, over 5 tons						
1 Check with operating or area personnel for deficiencies.	0.035			X	X	X
2 Check unit for proper operation, excessive noise or vibration.	0.033			X	X	X
3 Clean intake side of condenser coils, fans and intake screens.	0.055			X	X	X
4 Check electrical wiring and connections; tighten loose connections.	0.120					X
5 Inspect fan(s) for bent blades or unbalance; adjust and clean as necessary.	0.027					X
6 Check belts for condition, proper tension and misalignment; adjust as required.	0.029			X	X	X
7 Lubricate shaft bearings and motor bearings.	0.047			X	X	X
8 Inspect piping and valves for leaks; tighten connections as necessary.	0.077			X	X	X
9 Replace air filters.	0.078			X	X	X
10 Check refrigerant pressure; add refrigerant as necessary.	0.135			X	X	X
11 Lubricate and check operation of dampers, if applicable.	0.029					X
12 Clean evaporator drain pan and drain line with solvent.	0.385					X
13 Cycle reverse cycle valve to insure proper operation.	0.091			X	X	X
14 Clean area around equipment.	0.066			X	X	X
15 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				.668	.668	1.229
Total labor-hours/year	3.233			1.336	.668	1.229

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3065 100 1950						
Controls, central system, electro/pneumatic						
1 With panel disconnected from power source, clean patrol panel compartment with a vacuum.	0.468					X
2 Inspect wiring/components for loose connections; tighten, as required.	0.120					X
3 Check set point of controls temperature, humidity or pressure.	0.033					X
4 Check unit over its range of control.	0.033					X
5 Check for correct pressure differential on all two position controllers.	0.195					X
6 Check source of the signal and its amplification on electronic controls.	0.468					X
7 Check air systems for leaks; repair as necessary.	0.156					X
8 Check relays, pilot valves and pressure regulators for proper operation; repair or replace as necessary.	0.325					X
9 Replace air filters in sensors, controllers, and thermostats as necessary.	0.029					X
10 Clean area around equipment.	0.066					X
11 Fill out maintenance checklist and report deficiencies.	0.022					X
Total labor-hours/period						1.915
Total labor-hours/year	1.915					1.915

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3095 110 1950						
Air compressor, gas engine						
1 Check with operating or area personnel for any obvious deficiencies.	0.035		X	X	X	X
2 Check compressor oil level; add oil as required.	0.022		X	X	X	X
3 Replace compressor oil.	0.221				X	X
4 Clean air intake filter on air compressor(s); replace if necessary.	0.177				X	X
5 Clean cylinder cooling fins and air cooler on compressor(s).	0.156				X	X
6 Check tension, condition, and alignment of v-belts; adjust as necessary.	0.030				X	X
7 Clean oil and water traps.	0.178				X	X
8 Drain moisture from air storage tank and check discharge for indication of interior corrosion.	0.046				X	X
9 Perform operation check of compressor; check the operation of low pressure cut-in and high pressure cut-out switches.	0.221		X	X	X	X
10 Check operation of safety pressure relief valve.	0.030				X	X
11 Check and tighten compressor foundation anchor bolts.	0.022				X	X
12 Check radiator coolant; add if required.	0.012		X	X	X	X
13 Check battery water; add if required.	0.241		X	X	X	X
14 Check wiring, connections, switches, etc.; tighten loose connections.	0.120				X	X
15 Check engine oil level; add if required.	0.014		X	X	X	X
16 Change engine oil.	0.224				X	X
17 Change engine oil filter.	0.059				X	X
18 Check spark plug and reset cap.	0.035				X	X
19 Check condition of engine air filter; replace if necessary.	0.039				X	X
20 Test run engine for proper operation.	0.413		X	X	X	X
21 Wipe dust and dirt from engine and compressor.	0.109		X	X	X	X
22 Check muffler/exhaust system for corrosion.	0.020				X	X
23 Clean area around equipment.	0.066		X	X	X	X
24 Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period			1.155	1.155	2.512	2.512
Total labor-hours/year	16.574		9.240	2.310	2.512	2.512

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D3095 114 1950						
Air compressor, centrifugal, to 40 H.P.						
1 Check compressor oil level; add oil as necessary.	0.022			X	X	X
2 Perform operational check of compressor system and adjust as required.	0.221			X	X	X
3 Check motor for excessive vibration, noise and overheating; lubricate.	0.039			X	X	X
4 Check operation of pressure relief valve.	0.030			X	X	X
5 Clean cooling fans and air cooler.	0.023			X	X	X
6 Check tension, condition, and alignment of V-belts; adjust as necessary.	0.030			X	X	X
7 Drain moisture from air storage tank and check low pressure cut-in; while draining, check discharge for indication of interior corrosion.	0.046			X	X	X
8 Replace air intake filter, as needed.	0.177			X	X	X
9 Clean oil and water trap.	0.177			X	X	X
10 Clean compressor and surrounding area.	0.066			X	X	X
11 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				.853	.853	.853
Total labor-hours/year	3.412			1.706	.853	.853

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A	
PM System D3095 114 2950								
Air compressor, centrifugal, over 40 H.P.								
1	Check with operating or area personnel for any obvious deficiencies.	0.035		X	X	X	X	
2	Perform control system check.	0.325				X	X	
3	Lubricate main driver coupling if necessary.	0.047				X	X	
4	Lubricate prelube pump motor and pump coupling, if necessary.	0.047				X	X	
5	Perform operation check of air compressor, adjust as required.	0.221		X	X	X	X	
6	Check main driver coupling alignment; realign if necessary.	0.325				X	X	
7	Check compressor and motor operation for excessive vibration, noise and overheating; lubricate motor.	0.039		X	X	X	X	
8	Check compressor scrolls, piping, and impeller housing for all leaks or cracks.	0.325		X	X	X	X	
9	Check intercoolers and aftercoolers for high cooling water temperatures or cooling water leakage.	0.195		X	X	X	X	
10	Check oil level in compressor oil reservoir; add oil as necessary.	0.022		X	X	X	X	
11	Replace compressor oil and oil filters.	0.282					X	
12	Record of pressure and oil temperature.	0.013		X	X	X	X	
13	Check compressor for oil leaks.	0.026		X	X	X	X	
14	Visually inspect oil mist arrester, clean housing, lines, and replace element if saturated, if applicable.	0.177				X	X	
15	Check operation of pressure relief valve.	0.030		X	X	X	X	
16	Visually inspect discharge check valve.	0.009				X	X	
17	Check oil and water trap.	0.022		X	X	X	X	
18	Check indicating lamps or gauges for proper operation if appropriate; replace burned out lamps or repair/replace gauges.	0.020					X	
19	Visually check all air intake filter elements; replace if necessary.	0.022		X	X	X	X	
20	Replace all air intake filter elements.	0.177				X	X	
21	Lubricate motor.	0.047				X	X	
22	Clean compressor, motor and surrounding area.	0.066		X	X	X	X	
23	Fill out maintenance check and report deficiencies.	0.022		X	X	X	X	
Total labor-hours/period		14.889			1.038	1.038	2.015	2.494
Total labor-hours/year					8.304	2.076	2.015	2.494

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3095 118 1950							
Air compressor, reciprocating, less than 5 H.P.							
1	Replace compressor oil.	0.341			X	X	X
2	Perform operation check of compressor system and adjust as required.	0.221			X	X	X
3	Check motor operation for excessive vibration, noise and overheating.	0.042			X	X	X
4	Lubricate motor.	0.047			X	X	X
5	Check operation of pressure relief valve.	0.030			X	X	X
6	Check tension, condition, and alignment of V-belts; adjust as necessary.	0.030			X	X	X
7	Drain moisture from air storage tank and check low pressure cut-in; while draining, check discharge for indication of interior corrosion.	0.046		X	X	X	X
8	Clean air intake filter on compressor.	0.177			X	X	X
9	Clean oil and water trap.	0.177			X	X	X
10	Clean exterior of compressor, motor and surrounding area.	0.066			X	X	X
11	Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period					1.199	1.199	1.199
Total labor-hours/year		4.796			2.398	1.199	1.199

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3095 118 2950							
Air compressor, reciprocating, 5 to 40 H.P.							
1	Replace compressor oil.	0.341			X	X	X
2	Perform operation check of compressor system and adjust as required.	0.221			X	X	X
3	Check motor operation for excessive vibration, noise and overheating; lubricate motor.	0.042			X	X	X
4	Check operation of pressure relief valve.	0.043			X	X	X
5	Clean cooling fans and air cooler on compressor.	0.023			X	X	X
6	Check tension, condition, and alignment of V-belts; adjust as necessary.	0.030			X	X	X
7	Drain moisture from air storage tank and check low pressure cut-in; while draining, check discharge for indication of interior corrosion.	0.059		X	X	X	X
8	Clean air intake filter on compressor.	0.177			X	X	X
9	Clean oil and water trap.	0.190			X	X	X
10	Clean compressor and surrounding area.	0.066			X	X	X
11	Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period					1.214	1.214	1.214
Total labor-hours/year		4.856			2.428	1.214	1.214

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3095 118 3950							
Air compressor, reciprocating, over 40 H.P.							
1	Check with operating or area personnel for deficiencies.	0.035			X	X	X
2	Perform operation check of compressor system and adjust as required.	0.221			X	X	X
3	Replace compressor oil.	0.341			X	X	X
4	Check motor(s) operation for excessive vibration, noise and overheating; lubricate motor(s).	0.042			X	X	X
5	Clean cylinder cooling fins and air cooler on compressor.	0.023			X	X	X
6	Check tension, condition, and alignment of V-belts; adjust as necessary.	0.056			X	X	X
7	Check operation of pressure relief valve.	0.030			X	X	X
8	Check low pressure cut in and high pressure cut out switches.	0.120			X	X	X
9	Drain moisture from air storage tank and check low pressure cut-in; while draining, check discharge for indication of interior corrosion.	0.072			X	X	X
10	Clean air intake filter on air compressor(s); replace if necessary.	0.177			X	X	X
11	Clean oil and water trap.	0.204			X	X	X
12	Check indicating lamps or gauges for proper operation if appropriate; replace burned out lamps or repair/replace gauges.	0.020			X	X	X
13	Clean area around equipment.	0.066			X	X	X
14	Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period					1,429	1,429	1,429
Total labor-hours/year		5.716			2,858	1,429	1,429

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3095 210 1950							
Steam Humidification System							
1	Operate humidistat through its throttling range to verify activation and deactivation.	0.117				X	X
2	Inspect steam trap for proper operation.	0.117				X	X
3	Turn off steam supply.	0.065				X	X
4	Secure electrical service before servicing humidification unit.	0.065				X	X
5	Clean strainer.	0.195				X	X
6	Clean and/or replace water/steam nozzels as necessary.	0.455				X	X
7	Inspect pneumatic controller for air leaks.	0.039				X	X
8	Inspect steam lines for leaks and corrosion and repair leaks.	0.195				X	X
9	Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period						1,270	1,270
Total labor-hours/year		2.540				1,270	1,270

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3095 210 2950							
Evaporative Pan with Heating Coil Humidification System							
1	Operate humidistat through its throttling range to verify activation and deactivation.	0.117				X	X
2	Inspect steam trap for proper operation.	0.117				X	X
3	Turn off water and steam supply.	0.065				X	X
4	Secure electrical service before servicing humidification unit.	0.065				X	X
5	Drain and flush water pans, clean drains, etc.	0.260				X	X
6	Check condition of heating element/steam coils and clean.	0.065				X	X
7	Inspect pneumatic controller for air leaks.	0.039				X	X
8	Inspect steam lines for leaks and corrosion and repair leaks.	0.195				X	X
9	Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period						.945	.945
Total labor-hours/year		1.890				.945	.945

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D3095 220 1950							
Dehumidifier, desiccant wheel							
1	Check with operating or area personnel for deficiencies.	0.035		X	X	X	X
2	Check filters for any blockage or fouling, remove and clean as required.	0.036		X	X	X	X
3	Check wheel seals for tears or punctures.	0.055		X	X	X	X
4	Check the control valve, thermo sensor bulb and burner, if it has heaters; or check for scaling or leaking on steam heating coils, as applicable.	0.094				X	X
5	Check that the outlet air temperature is within the proper heat range.	0.105		X	X	X	X
6	Clean the desiccant wheel and check for softening of wheel faces.	0.031				X	X
7	Check desiccant wheel and motor for vibration and noise, adjust as required.	0.109				X	X
8	Check gear reducer oil level, add as required.	0.035				X	X
9	Check wheel belt(s) for wear, proper tension and alignment; adjust as required.	0.029				X	X
10	Check blower and motor for excessive vibration and noise; adjust as required.	0.109				X	X
11	Check blower belt(s) for wear, proper tension and alignment; adjust as required.	0.029				X	X
12	Lubricate wheel, blower and motor bearings.	0.047				X	X
13	Check electrical wiring and connections; make appropriate adjustments.	0.120				X	X
14	Check reactivation ductwork for condensation and air leaks.	0.013				X	X
15	Clean the equipment and the surrounding area.	0.066		X	X	X	X
16	Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period				.319	.319	.935	.935
Total labor-hours/year		5.060		2,552	.638	.935	.935

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D4015 100 1950						
Backflow prevention device, up to 4"						
NOTE: Test frequency may vary depending on local regulations and application						
1 Test and calibrate check valve operation of backflow prevention device with test set.	0.191					X
2 Bleed air from backflow preventer.	0.047					X
3 Inspect for leaks under pressure.	0.007					X
4 Clean backflow preventer and surrounding area.	0.066					X
5 Fill out maintenance checklist and report deficiencies.	0.022					X
Total labor-hours/period						.333
Total labor-hours/year	0.333					.333

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D4015 100 2950						
Backflow prevention device, over 4"						
NOTE: Test frequency may vary depending on local regulations and application						
1 Test and calibrate check valve operation of backflow prevention device with test set.	0.334					X
2 Bleed air from backflow preventer.	0.065					X
3 Inspect for leaks under pressure.	0.007					X
4 Clean backflow preventer and surrounding area.	0.066					X
5 Fill out maintenance checklist and report deficiencies.	0.022					X
Total labor-hours/period						.494
Total labor-hours/year	0.494					.494

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D4015 150 1950						
Extinguishing system, wet pipe						
1 Notify proper authorities prior to testing any alarm systems.	0.130		X	X	X	X
2 Open and close post indicator valve (PIV) to check operation; make minor adjustments such as lubricating valve stem, cleaning and/or replacing target windows as required.	0.176					X
3 Open and close OS&Y (outside stem and yoke) out-of valve to check operation; make minor repairs such as lubricating stems and tightening packing glands as required.	0.176					X
4 Perform operational test of water flow detectors; make minor adjustments and restore system to proper operating condition.	0.148					X
5 Check to ensure that alarm drain is open; clean drain line if necessary.	0.081		X	X	X	X
6 Open water motor alarm test valve and ensure that outside alarm operates; lubricate alarm, make adjustments as required.	0.176		X	X	X	X
7 Conduct main drain test by opening 2" test valve; maintain a continuous record of drain tests; make minor adjustments if applicable; restore system to proper operating condition.	0.333			X	X	X
8 Check general condition of sprinklers and sprinkler system; make minor adjustments as required.	0.228					X
9 Check equipment gaskets, piping, packing glands, and valves for leaks; tighten flange bolts and loose connections to stop all leaks.	0.013					X
10 Check condition of fire department connections; replace missing or broken covers as required.	0.103					X
11 Trip test wet pipe system using test valve furthest from wet pipe valve (control valve); make minor adjustments as necessary and restore system to proper operating condition.	1.733					X
12 Inspect OS&Y and PIV out-of valves for open position.	0.066		X	X	X	X
13 Clean area around system components.	0.433			X	X	X
14 Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period			.475	1.241	1.241	3.818
Total labor-hours/year	11.341		3.800	2.482	1.241	3.818

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D4015 180 1950						
Extinguishing system, deluge/preaction						
1 Notify proper authorities prior to testing any alarm systems.	0.130		X	X	X	X
2 Open and close post indicator valve (PIV) to check operation; make minor repairs such as lubricating valve stem, cleaning and/or replacing target windows as required.	0.176					X
3 Open and close outside steam and yoke (OS&Y) out-of valve to check operation; make minor repairs such as lubricating stems, tightening packing glands as required.	0.176					X
4 Perform operational test of supervisory initiating devices and water flow detectors; make minor adjustments and restore system to proper operating condition.	0.148					X
5 Check to ensure that alarm drain is open; clean drain if necessary.	0.081		X	X	X	X
6 Open water motor alarm test valve and ensure that outside alarm operates; lubricate alarm and adjust as required.	0.176		X	X	X	X
7 Visually check water pressure to ensure adequate operating pressure is available; make adjustments as required.	0.004		X	X	X	X
8 Conduct main drain test by opening 2" test valve and observing drop in water pressure on gauge; pressure drop should not exceed 20 PSI; maintain a continuous record of drain tests; make minor adjustments; restore system to proper operating condition.	0.333			X	X	X
9 Check general condition of sprinklers and sprinkler system; make minor adjustments as required.	0.228					X
10 Check equipment gaskets, piping, packing glands, and valves for leaks; tighten flange bolts and loose connections to stop all leaks.	0.013					X
11 Check condition of fire department connections; replace missing or broken covers as required.	0.103					X
12 Check and inspect pneumatic system for physical damage and proper operation; make minor adjustments as required.	0.320					X
13 Trip test deluge system (control valve closed); make minor adjustments as necessary and restore system to fully operational condition.	1.956					X
14 Inspect OS&Y and PIV out-of valves for open position.	0.066		X	X	X	X

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D4015 210 1950						
Fire pump, electric motor driven						
1 Check control panel and wiring for loose connections; tighten connections as required.	0.109			X	X	X
2 Ensure all valves relating to water system are in correct position.	0.008	X	X	X	X	X
3 Open and close OS&Y(outside steam and yoke) out-of valve to check operation; make minor repairs such as lubricating stems and tightening packing glands as required.	0.176			X	X	X
4 Centrifugal pump: A) perform 10 minute pump test run; check for proper operation and adjust if required.	0.217	X	X	X	X	X
B) check for leaks on suction and discharge piping, seals, packing glands, etc.	0.077	X	X	X	X	X
C) check for excessive vibration, noise, overheating, etc.	0.022	X	X	X	X	X
D) check alignment, clearances, and rotation of shaft and coupler (includes removing and reinstalling safety cover).	0.160	X	X	X	X	X
E) tighten or replace loose, missing or damaged nuts, bolts, or screws.	0.005	X	X	X	X	X
F) lubricate pump and motor as required.	0.099			X	X	X
G) check suction or discharge pressure gauge readings and flow rate.	0.078	X	X	X	X	X
H) check packing glands and tighten or repack as required; note that slight dripping is required for proper lubrication of shaft.	0.113			X	X	X
5 Inspect and clean strainers after each use and flow test.	0.260	X	X	X	X	X
6 Clean equipment and surrounding area.	0.066	X	X	X	X	X
7 Fill out maintenance checklist and report deficiencies.	0.022	X	X	X	X	X
Total labor-hours/period		.915	.915	1.412	1.412	1.412
Total labor-hours/year	47.738	34.770	7.320	2.824	1.412	1.412

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D4015 250 1950						
Fire pump, engine driven						
1 Ensure all valves relating to water system are in correct position.	0.008	X	X	X	X	X
2 Open and close OS&Y (outside steam and yoke) out-of valve to check operation; make minor repairs such as lubricating stems and tightening packing glands as required.	0.176			X	X	X
3 Controller panel: A) check controller panel for proper operation in accordance with standard procedures for the type of panel installed; replace burned out bulbs and fuses; make other repairs as necessary.	0.039			X	X	X
B) check wiring for loose connections and fraying; tighten or replace as required.	0.109			X	X	X
4 Diesel engine: A) check oil level in crankcase with dipstick; add oil as necessary.	0.014	X	X	X	X	X
B) drain and replace engine oil.	0.511					X
C) replace engine oil filter.	0.059					X
D) check radiator coolant level; add water if low.	0.012	X	X	X	X	X
E) drain and replace radiator coolant.	0.511					X
F) check battery water level; add water if low.	0.012			X	X	X
G) check battery terminals for corrosion; clean if necessary.	0.124			X	X	X
H) check bolts for tension and wear; adjust or replace if required.	0.012			X	X	X
I) check fuel level in tank; refill as required.	0.046			X	X	X
J) check electrical wiring, connections, switches, etc.; adjust or tighten as necessary.	0.120			X	X	X
K) perform 10 minute pump check for proper operation and adjust as required.	0.217	X	X	X	X	X
5 Centrifugal pump: A) check for leaks on suction and discharge piping, seals, packing glands, etc.	0.077	X	X	X	X	X
B) check pump operation; vibration, noise, overheating, etc.	0.022	X	X	X	X	X
C) check alignment, clearances, and rotation of shaft and coupler (includes removing and reinstalling safety cover).	0.160	X	X	X	X	X
D) tighten or replace loose, missing or damaged nuts, bolts, or	0.005	X	X	X	X	X

**Mechanical Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM System D4015 310 1950	PM Components	Labor Hours	W	M	Q	S	A
Extinguishing system, dry pipe							
1	Notify proper authorities prior to testing any alarm systems.	0.130		X	X	X	X
2	Open and close post indicator valve to check operation; make minor repairs such as lubricating valve stem, cleaning and/or replacing target windows as required.	0.176					X
3	Open and close OS&Y (outside stem and yoke) cut-off valve to check operation; make minor repairs such as lubricating stems and tightening packing glands as required.	0.176					X
4	Perform operational test of water flow detectors; make minor adjustments and restore system to proper operating condition.	0.148					X
5	Check to ensure that alarm drain is open; clean drain line if necessary.	0.081		X	X	X	X
6	Open water motor alarm test valve and ensure that outside alarm operates; lubricate alarm, make adjustments as required.	0.176		X	X	X	X
7	Visually check water pressure to ensure that adequate operating pressure is available; make adjustments as required.	0.003		X	X	X	X
8	Conduct main drain test by opening 2" test valve; maintain a continuous record of drain tests; make minor adjustments if applicable; restore system to proper operating condition.	0.333			X	X	X
9	Check general condition of sprinklers and sprinkler system; make minor adjustments as required.	0.228					X
10	Check equipment gaskets, piping, packing glands, and valves for leaks; tighten flange bolts and loose connections to stop all leaks.	0.013					X
11	Check condition of fire department connections; replace missing or broken covers as required.	0.103					X
12	Visually check system air pressure; pump up system and make minor adjustments as required.	0.135		X	X	X	X
13	Trip test dry pipe system using test valve furthest from dry pipe valve (control valve partially open); make minor adjustments as necessary and restore system to fully operational condition.	1.733					X
14	Check operation of quick opening device.	0.022					X
15	Inspect OS&Y and PIV out-of valves for open position.	0.066		X	X	X	X

CostWorks 2010 - EAST HALL

PM System D4095 100 1950	PM Components	Labor Hours	W	M	Q	S	A
Extinguishing system, CO2							
1	Check that nozzles, heads and hand hose lines are clear from obstructions, have not been damaged and in proper position.	0.098		X	X	X	X
2	Check to ensure that all operating controls are properly set.	0.066		X	X	X	X
3	Clean nozzles as required.	0.098		X	X	X	X
4	Visually inspect the control panel for obstructions or physical damage; clean dirt and dust from interior and exterior; make sure that all cards are plugged in tightly; tighten loose connections and make other minor adjustments as necessary.	0.222		X	X	X	X
5	Check battery voltages where installed; recharge or replace as required.	0.012		X	X	X	X
6	Weigh CO2 cylinders; replace any that show a weight loss greater than 10%.	0.650				X	X
7	Blow out entire system to make sure that the system is not plugged or restricted.	0.325					X
8	Run out hose reels and check hoses.	0.217					X
9	Conduct operational test of actuating devices, both automatic, manual and alarm system; prior to conducting tests, close valves, disable CO2 dumping control and manually override computer shutdown feature if applicable, all in accordance with the manufacturers specifications.	0.433					X
10	Check the operation and timing of the time delay control and check operation of the abort station.	0.108					X
11	Restore system to proper operating condition and notify personnel upon completion of tests.	0.079					X
12	Clean up around system.	0.066		X	X	X	X
13	Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period				.584	.584	1.234	2.396
Total labor-hours/year		9.470		4.672	1.168	1.234	2.396

CostWorks 2010 - EAST HALL

PM System D4095 200 1950	PM Components	Labor Hours	W	M	Q	S	A
Extinguishing system, foam bottle							
1	Check that all nozzles, heads and hand held lines are clear from obstructions, have not been damaged and are in proper position.	0.195		X	X	X	X
2	Check to ensure that all operating controls are properly set.	0.022		X	X	X	X
3	Observe pressure on system to ensure that proper pressure is being maintained.	0.004		X	X	X	X
4	Clean area around system.	0.066		X	X	X	X
5	Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period				.309	.309	.309	.309
Total labor-hours/year		3.708		2.472	.618	.309	.309

CostWorks 2010 - EAST HALL

PM System D4095 210 1950	PM Components	Labor Hours	W	M	Q	S	A
Extinguishing system, foam, electric pump, deluge system							
1	Check foam concentrate level in tank; add concentrate as required to maintain proper level.	0.043		X	X	X	X
2	Ensure all valves relating to foam/water system are in correct position.	0.008		X	X	X	X
3	Visually check proportioning devices, pumps, and foam nozzles; correct any observed deficiencies.	0.386		X	X	X	X
4	Check water supply pressure; adjust as necessary.	0.029		X	X	X	X
5	Open and close OS&Y (outside stem and yoke) cut-off valve to check operation; make minor repairs such as lubricating stems and tightening packing glands as required.	0.059			X	X	X
6	Centrifugal pump: A) perform 10 minute pump test run, check for proper operation and adjust as required. B) test start pump without foam discharger. C) check for leaks on suction and discharge piping, seals, packing glands, etc. D) check for excessive vibration, noise, overheating, etc. E) check alignment, clearances, and rotation of shaft and coupler (includes removing and reinstalling safety cover). F) tighten or replace loose, missing or damaged nuts, bolts, or screws. G) lubricate pump and motor as required. H) check suction or discharge pressure gauge readings and flow rate. I) check packing glands and tighten or repack as required; note that slight dripping is required for proper lubrication of shaft.	0.217			X	X	X
		0.022		X	X	X	X
		0.077		X	X	X	X
		0.022		X	X	X	X
		0.160		X	X	X	X
		0.005		X	X	X	X
		0.099		X	X	X	X
		0.078		X	X	X	X
		0.113		X	X	X	X
7	Inspect and clean strainers after each use and flow test.	0.260		X	X	X	X
8	Clean equipment and surrounding area.	0.433		X	X	X	X
9	Fill out maintenance checklist.	0.022		X	X	X	X
Total labor-hours/period				1.203	2.033	2.033	2.033
Total labor-hours/year		17.756		9.624	4.066	2.033	2.033

Appendix C-M7 RS Means Crew Lists

Crews

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour		
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P
Crew ASBE (FMR)									
1 Asbestos/Insulation Workers	\$45.55	\$364.40	\$58.95	\$471.60	\$73.05	\$584.40	\$45.55	\$58.95	\$73.05
8 L.H., Daily Totals		\$364.40		\$471.60		\$584.40	\$45.55	\$58.95	\$73.05

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour		
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P
Crew B35 (FMR)									
1 Laborer Foreman (out)	\$35.10	\$280.80	\$46.76	\$374.12	\$57.63	\$461.07	\$40.92	\$52.50	\$65.18
1 Skilled Worker	\$42.60	\$340.80	\$55.70	\$445.60	\$68.90	\$551.20			
1 Welder (plumber)	\$52.05	\$416.40	\$64.50	\$516.00	\$80.65	\$645.20			
1 Laborer	\$33.10	\$264.80	\$44.10	\$352.80	\$54.35	\$434.80			
1 Equip. Oper. (crane)	\$44.40	\$355.20	\$55.80	\$446.40	\$69.55	\$556.40			
1 Equip. Oper. Oiler	\$38.30	\$306.40	\$48.15	\$385.20	\$60.00	\$480.00			
1 Welder, electric, 300 amp		\$58.55		\$58.55		\$64.40			
1 Hyd. Excavator, .75 C.Y.		\$677.80		\$677.80		\$745.60	\$15.34	\$15.34	\$16.88
48 L.H., Daily Totals		\$2,700.75		\$3,256.47		\$3,938.67	\$56.27	\$67.84	\$82.06

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour		
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P
Crew BRIC (FMR)									
2 Bricklayers	\$41.75	\$668.00	\$54.20	\$667.20	\$67.15	\$1,074.40	\$41.75	\$54.20	\$67.15
16 L.H., Daily Totals		\$668.00		\$667.20		\$1,074.40	\$41.75	\$54.20	\$67.15

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour		
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P
Crew ELEC (FMR)									
1 Electricians	\$49.00	\$392.00	\$60.10	\$480.80	\$75.30	\$602.40	\$49.00	\$60.10	\$75.30
8 L.H., Daily Totals		\$392.00		\$480.80		\$602.40	\$49.00	\$60.10	\$75.30

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour		
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P
Crew L2 (FMR)									
1 Carpenter	\$41.55	\$332.40	\$55.35	\$442.80	\$68.25	\$546.00	\$36.58	\$48.58	\$59.93
1 Carpenter Helper	\$31.60	\$252.80	\$41.80	\$334.40	\$51.60	\$412.80			
16 L.H., Daily Totals		\$585.20		\$777.20		\$958.80	\$36.58	\$48.58	\$59.93

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour		
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P
Crew PLUM (FMR)									
1 Plumbers	\$52.05	\$416.40	\$64.50	\$516.00	\$80.65	\$645.20	\$52.05	\$64.50	\$80.65
8 L.H., Daily Totals		\$416.40		\$516.00		\$645.20	\$52.05	\$64.50	\$80.65

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour		
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P
Crew Q1 (FMR)									
1 Plumber	\$52.05	\$416.40	\$64.50	\$516.00	\$80.65	\$645.20	\$46.85	\$58.05	\$72.58
1 Plumber Apprentice	\$41.64	\$333.12	\$51.60	\$412.80	\$64.52	\$516.16			
16 L.H., Daily Totals		\$749.52		\$928.80		\$1,161.36	\$46.85	\$58.05	\$72.58

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour		
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P
1 Plumber Foreman (inside)	\$52.55	\$420.40	\$65.12	\$520.96	\$81.42	\$651.40	\$49.57	\$61.43	\$76.81
1 Plumber	\$52.05	\$416.40	\$64.50	\$516.00	\$80.65	\$645.20			
1 Welder (plumber)	\$52.05	\$416.40	\$64.50	\$516.00	\$80.65	\$645.20			
1 Plumber Apprentice	\$41.64	\$333.12	\$51.60	\$412.80	\$64.52	\$516.16			
1 Welder, electric, 300 amp		\$58.55		\$58.55		\$64.40	\$1.83	\$1.83	\$2.01
32 L.H., Daily Totals		\$1,644.87		\$2,024.31		\$2,522.36	\$51.40	\$63.26	\$78.82

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour		
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P
1 Steamfitter	\$51.90	\$415.20	\$64.30	\$514.40	\$80.40	\$643.20	\$46.71	\$57.87	\$72.36
1 Steamfitter Apprentice	\$41.52	\$332.16	\$51.44	\$411.52	\$64.32	\$514.56			
16 L.H., Daily Totals		\$747.36		\$925.92		\$1,157.76	\$46.71	\$57.87	\$72.36

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour			
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P	
Crew Q6 (FMR)										
2	Steamfitters	\$51.90	\$830.40	\$64.30	\$1,028.80	\$80.40	\$1,286.40	\$48.44	\$60.01	\$75.04
1	Steamfitter Apprentice	\$41.52	\$332.16	\$51.44	\$411.52	\$64.32	\$514.56			
24 L.H., Daily Totals			\$1,162.56		\$1,440.32		\$1,800.96	\$48.44	\$60.01	\$75.04

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour			
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P	
Crew Q7 (FMR)										
1	Steamfitter Foreman (inside)	\$52.40	\$419.20	\$64.92	\$519.36	\$81.17	\$649.40	\$49.43	\$61.24	\$76.57
2	Steamfitters	\$51.90	\$830.40	\$64.30	\$1,028.80	\$80.40	\$1,286.40			
1	Steamfitter Apprentice	\$41.52	\$332.16	\$51.44	\$411.52	\$64.32	\$514.56			
32 L.H., Daily Totals			\$1,581.76		\$1,959.68		\$2,450.36	\$49.43	\$61.24	\$76.57

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour			
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P	
Crew Q9 (FMR)										
1	Sheet Metal Worker	\$49.10	\$392.80	\$61.55	\$492.40	\$76.80	\$614.40	\$44.19	\$55.40	\$69.12
1	Sheet Metal Apprentice	\$39.28	\$314.24	\$49.24	\$393.92	\$61.44	\$491.52			
16 L.H., Daily Totals			\$707.04		\$886.32		\$1,105.92	\$44.19	\$55.40	\$69.12

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour			
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P	
Crew Q10 (FMR)										
2	Sheet Metal Workers	\$49.10	\$785.60	\$61.55	\$984.80	\$76.80	\$1,228.80	\$45.83	\$57.45	\$71.68
1	Sheet Metal Apprentice	\$39.28	\$314.24	\$49.24	\$393.92	\$61.44	\$491.52			
24 L.H., Daily Totals			\$1,099.84		\$1,378.72		\$1,720.32	\$45.83	\$57.45	\$71.68

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour			
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P	
Crew Q14 (FMR)										
1	Asbestos Worker	\$45.55	\$364.40	\$58.95	\$471.60	\$73.05	\$584.40	\$41.00	\$53.06	\$65.75
1	Asbestos Apprentice	\$36.44	\$291.52	\$47.16	\$377.28	\$58.44	\$467.52			
16 L.H., Daily Totals			\$655.92		\$848.88		\$1,051.92	\$41.00	\$53.06	\$65.75

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour			
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P	
Crew Q15 (FMR)										
1	Plumber	\$52.05	\$416.40	\$64.50	\$516.00	\$80.65	\$645.20	\$46.85	\$58.05	\$72.58
1	Plumber Apprentice	\$41.64	\$333.12	\$51.60	\$412.80	\$64.52	\$516.16			
1	Welder, electric, 300 amp		\$58.55		\$58.55		\$64.40	\$3.66	\$3.66	\$4.03
16 L.H., Daily Totals			\$808.07		\$987.35		\$1,225.76	\$50.50	\$61.71	\$76.61

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour			
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P	
Crew Q16 (FMR)										
2	Plumbers	\$52.05	\$832.80	\$64.50	\$1,032.00	\$80.65	\$1,290.40	\$48.58	\$60.20	\$75.27
1	Plumber Apprentice	\$41.64	\$333.12	\$51.60	\$412.80	\$64.52	\$516.16			
1	Welder, electric, 300 amp		\$58.55		\$58.55		\$64.40	\$2.44	\$2.44	\$2.68
24 L.H., Daily Totals			\$1,224.47		\$1,503.35		\$1,870.96	\$51.02	\$62.64	\$77.96

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour			
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P	
Crew Q20 (FMR)										
1	Sheet Metal Worker	\$49.10	\$392.80	\$61.55	\$492.40	\$76.80	\$614.40	\$45.15	\$56.34	\$70.36
1	Sheet Metal Apprentice	\$39.28	\$314.24	\$49.24	\$393.82	\$61.44	\$491.52			
50	Electrician	\$49.00	\$196.00	\$60.10	\$240.40	\$75.30	\$301.20			
20 L.H., Daily Totals			\$903.04		\$1,126.72		\$1,407.12	\$45.15	\$56.34	\$70.36

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour		
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P
Crew R3 (FMR)									
1 Electrician Foreman	\$49.50	\$396.00	\$60.71	\$485.71	\$76.07	\$608.55	\$48.28	\$59.49	\$74.46
1 Electrician	\$49.00	\$392.00	\$60.10	\$480.80	\$75.30	\$602.40			
.50 Equip. Oper. (crane)	\$44.40	\$177.60	\$55.80	\$223.20	\$69.55	\$278.20			
.50 S.P. Crane, 4x4, 5 Ton		\$138.10		\$138.10		\$151.90	\$6.91	\$6.91	\$7.60
20 L.H., Daily Totals		\$1,103.70		\$1,327.81		\$1,641.05	\$55.19	\$66.39	\$82.05

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour		
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P
Crew SSWK (FMR)									
2 Structural Steel Workers	\$46.90	\$750.40	\$71.20	\$1,139.20	\$85.75	\$1,372.00	\$46.90	\$71.20	\$85.75
16 L.H., Daily Totals		\$750.40		\$1,139.20		\$1,372.00	\$46.90	\$71.20	\$85.75

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour		
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P
Crew STPI (FMR)									
1 Steamfitters or Pipefitters	\$51.90	\$415.20	\$64.30	\$514.40	\$80.40	\$643.20	\$51.90	\$64.30	\$80.40
8 L.H., Daily Totals		\$415.20		\$514.40		\$643.20	\$51.90	\$64.30	\$80.40

Appendix C-LM1 LCCA 20% GF O&M

LIFE CYCLE COST (Present Worth Method)							
LCC -Mechanical O&M		Green				Non-Green	
		Not East Hall Specific				RS Means CostWorks	
PROJECT LIFE CYCLE (YEARS)	25						
DISCOUNT RATE (% in decimals)	7.00%						
				Est.	PW	Est.	PW
Base Cost					\$ -		\$ -
Interface Cost							
A)					\$ -		\$ -
B)					\$ -		\$ -
C)					\$ -		\$ -
D)					\$ -		\$ -
Other Initial Costs							
A)					\$ -		\$ -
B)					\$ -		\$ -
Total Initial Cost Impact (IC)					\$ -		\$ -
Initial Cost PW Savings							\$ -
		Year	Factor				
	FMRRC Mechanical Items	0.5	0.9667	\$ 328.99	\$ 318.00	\$ 274.16	\$ 265.00
		1	0.9346	\$ 3,976.50	\$ 3,716.00	\$ 3,313.75	\$ 3,096.00
		2	0.8734	\$ 234.51	\$ 204.00	\$ 195.43	\$ 170.00
		3	0.8163	\$ 17.53	\$ 14.00	\$ 14.61	\$ 11.00
		5	0.7130	\$ 60,802.80	\$ 43,351.00	\$ 50,669.00	\$ 36,126.00
		6	0.6663	\$ 9,102.05	\$ 6,065.00	\$ 7,585.04	\$ 5,054.00
		7	0.6227	\$ 34,687.06	\$ 21,601.00	\$ 28,905.89	\$ 18,001.00
		8	0.5820	\$ 163.87	\$ 95.00	\$ 136.56	\$ 79.00
		10	0.5083	\$ 789,342.47	\$ 401,261.00	\$ 657,785.39	\$ 334,384.00
		12	0.4440	\$ 22,101.58	\$ 9,813.00	\$ 18,417.99	\$ 8,177.00
		14	0.3878	\$ 1,200.33	\$ 465.00	\$ 1,000.28	\$ 387.00
		15	0.3624	\$ 1,478,129.18	\$ 535,742.00	\$ 1,231,774.32	\$ 446,451.00
		20	0.2584	\$ 1,855,074.93	\$ 479,386.00	\$ 1,545,895.77	\$ 399,488.00
	25	0.1842	\$ 41,744.98	\$ 7,691.00	\$ 34,787.48	\$ 6,409.00	
Total Replacement/Salvage PW Costs					\$ 1,509,722.00		\$ 1,258,098.00
	Type of Annual Expense	Escl..00 %	PWA				
A	YPM-Mechanical	6.00%	22.178	\$ 22,414.02	\$ 497,098.05	\$ 18,678.35	\$ 414,248.37
A	Operations	6.00%	22.178	\$ 100,000.00	\$ 2,217,799.31	\$ 100,000.00	\$ 2,217,799.31
Total Operation/Maintenance (PW) Costs					\$ 2,714,897.35		\$ 2,632,047.68
Total Present Worth Life Cycle Costs					\$ 4,224,619.35		\$ 3,890,145.68
Life Cycle (PW) Savings							\$ 334,473.67
PW - Present Worth	PWA - Present Worth of Annuity						
Summary-O&M per SF							
					\$ 162,404.00		
					\$ 16.21		
					\$ 16.72		
					\$ 7.75		
					\$ 9.30		
						\$ 23.95	
						\$ 26.01	

Appendix C-LM2 LCCA 15% GF O&M

LIFE CYCLE COST (Present Worth Method)							
LCC -Mechanical 15% Green Factor O&M		Green			Non-Green		
		Not East Hall Specific			RS Means CostWorks		
PROJECT LIFE CYCLE (YEARS)	25						
DISCOUNT RATE (% in decimals)	7.00%						
				Est.	PW	Est.	PW
Base Cost					\$ -		\$ -
Interface Cost							
A)					\$ -		\$ -
B)					\$ -		\$ -
C)					\$ -		\$ -
D)					\$ -		\$ -
Other Initial Costs							
A)					\$ -		\$ -
B)					\$ -		\$ -
Total Initial Cost Impact (IC)					\$ -		\$ -
Initial Cost PW Savings							\$ -
		Year	Factor				
	FMRRC Mechanical Items	0.5	0.9667	\$ 315.28	\$ 304.00	\$ 274.16	\$ 265.00
		1	0.9346	\$ 3,810.82	\$ 3,561.00	\$ 3,313.75	\$ 3,096.00
		2	0.8734	\$ 224.74	\$ 196.00	\$ 195.43	\$ 170.00
		3	0.8163	\$ 16.80	\$ 13.00	\$ 14.61	\$ 11.00
		5	0.7130	\$ 58,269.35	\$ 41,545.00	\$ 50,669.00	\$ 36,126.00
		6	0.6663	\$ 8,722.80	\$ 5,812.00	\$ 7,585.04	\$ 5,054.00
		7	0.6227	\$ 33,241.77	\$ 20,701.00	\$ 28,905.89	\$ 18,001.00
		8	0.5820	\$ 157.04	\$ 91.00	\$ 136.56	\$ 79.00
		10	0.5083	\$ 756,453.20	\$ 384,542.00	\$ 657,785.39	\$ 334,384.00
		12	0.4440	\$ 21,180.69	\$ 9,404.00	\$ 18,417.99	\$ 8,177.00
		14	0.3878	\$ 1,150.32	\$ 446.00	\$ 1,000.28	\$ 387.00
		15	0.3624	\$ 1,416,540.47	\$ 513,419.00	\$ 1,231,774.32	\$ 446,451.00
		20	0.2584	\$ 1,777,780.14	\$ 459,412.00	\$ 1,545,895.77	\$ 399,488.00
		25	0.1842	\$ 40,005.60	\$ 7,370.00	\$ 34,787.48	\$ 6,409.00
Total Replacement/Salvage PW Costs						\$ 1,446,816.00	
	Type of Annual Expense	Escl..00 %	PWA				
A	YPM-Mechanical	6.00%	22.178	\$ 21,480.11	\$ 476,385.63	\$ 18,678.35	\$ 414,248.37
A	Operations	6.00%	22.178	\$ 100,000.00	\$ 2,217,799.31	\$ 100,000.00	\$ 2,217,799.31
Total Operation/Maintenance (PW) Costs					\$ 2,694,184.94		\$ 2,632,047.68
Total Present Worth Life Cycle Costs					\$ 4,141,000.94		\$ 3,890,145.68
Life Cycle (PW) Savings							\$ 250,855.26
PW - Present Worth	PWA - Present Worth of Annuity						
Summary-O&M per SF							
					\$ 162,404.00		
					\$ 16.21		
					\$ 16.59		
					\$ 7.75		
					\$ 8.91		
					\$ 23.95		
					\$ 25.50		

Appendix C-LM3 LCCA 10% GF O&M

LIFE CYCLE COST (Present Worth Method)							
LCC -Mechanical 10% Green Factor O&M		Green				Non-Green	
		Not East Hall Specific				RS Means CostWorks	
PROJECT LIFE CYCLE (YEARS)	25						
DISCOUNT RATE (% in decimals)	7.00%						
				Est.	PW	Est.	PW
Base Cost					\$ -		\$ -
Interface Cost							
A)					\$ -		\$ -
B)					\$ -		\$ -
C)					\$ -		\$ -
D)					\$ -		\$ -
Other Initial Costs							
A)					\$ -		\$ -
B)					\$ -		\$ -
Total Initial Cost Impact (IC)					\$ -		\$ -
Initial Cost PW Savings							\$ -
		Year	Factor				
	FMRRC Mechanical Items	0.5	0.9667	\$ 301.57	\$ 291.00	\$ 274.16	\$ 265.00
		1	0.9346	\$ 3,645.13	\$ 3,406.00	\$ 3,313.75	\$ 3,096.00
		2	0.8734	\$ 214.97	\$ 187.00	\$ 195.43	\$ 170.00
		3	0.8163	\$ 16.07	\$ 13.00	\$ 14.61	\$ 11.00
		5	0.7130	\$ 55,735.90	\$ 39,738.00	\$ 50,669.00	\$ 36,126.00
		6	0.6663	\$ 8,343.55	\$ 5,559.00	\$ 7,585.04	\$ 5,054.00
		7	0.6227	\$ 31,796.47	\$ 19,801.00	\$ 28,905.89	\$ 18,001.00
		8	0.5820	\$ 150.21	\$ 87.00	\$ 136.56	\$ 79.00
		10	0.5083	\$ 723,563.93	\$ 367,823.00	\$ 657,785.39	\$ 334,384.00
		12	0.4440	\$ 20,259.79	\$ 8,995.00	\$ 18,417.99	\$ 8,177.00
		14	0.3878	\$ 1,100.31	\$ 426.00	\$ 1,000.28	\$ 387.00
		15	0.3624	\$ 1,354,951.75	\$ 491,096.00	\$ 1,231,774.32	\$ 446,451.00
		20	0.2584	\$ 1,700,485.35	\$ 439,437.00	\$ 1,545,895.77	\$ 399,488.00
		25	0.1842	\$ 38,266.23	\$ 7,050.00	\$ 34,787.48	\$ 6,409.00
Total Replacement/Salvage PW Costs						\$ 1,383,909.00	
	Type of Annual Expense	Escl..00 %	PWA				
A	YPM-Mechanical	6.00%	22.178	\$ 20,546.19	\$ 455,673.21	\$ 18,678.35	\$ 414,248.37
A	Operations	6.00%	22.178	\$ 100,000.00	\$ 2,217,799.31	\$ 100,000.00	\$ 2,217,799.31
Total Operation/Maintenance (PW) Costs					\$ 2,673,472.52		\$ 2,632,047.68
Total Present Worth Life Cycle Costs					\$ 4,057,381.52		\$ 3,890,145.68
Life Cycle (PW) Savings							\$ 167,235.84
PW - Present Worth	PWA - Present Worth of Annuity						
Summary-O&M per SF							
					\$ 162,404.00		
					\$ 16.21		
					\$ 16.46		
					\$ 7.75		
					\$ 8.52		
					\$ 23.95		
					\$ 24.98		

Appendix C-LM4 LCCA 5% GF O&M

LIFE CYCLE COST (Present Worth Method)							
LCC -Mechanical 5% Green Factor O&M		Green			Non-Green		
		Not East Hall Specific			RS Means CostWorks		
PROJECT LIFE CYCLE (YEARS)	25						
DISCOUNT RATE (% in decimals)	7.00%						
				Est.	PW	Est.	PW
Base Cost					\$ -		\$ -
Interface Cost							
A)					\$ -		\$ -
B)					\$ -		\$ -
C)					\$ -		\$ -
D)					\$ -		\$ -
Other Initial Costs							
A)					\$ -		\$ -
B)					\$ -		\$ -
Total Initial Cost Impact (IC)					\$ -		\$ -
Initial Cost PW Savings							\$ -
		Year	Factor				
	FMRRC Mechanical Items	0.5	0.9667	\$ 287.87	\$ 278.00	\$ 274.16	\$ 265.00
		1	0.9346	\$ 3,479.44	\$ 3,251.00	\$ 3,313.75	\$ 3,096.00
		2	0.8734	\$ 205.20	\$ 179.00	\$ 195.43	\$ 170.00
		3	0.8163	\$ 15.34	\$ 12.00	\$ 14.61	\$ 11.00
		5	0.7130	\$ 53,202.45	\$ 37,932.00	\$ 50,669.00	\$ 36,126.00
		6	0.6663	\$ 7,964.29	\$ 5,306.00	\$ 7,585.04	\$ 5,054.00
		7	0.6227	\$ 30,351.18	\$ 18,901.00	\$ 28,905.89	\$ 18,001.00
		8	0.5820	\$ 143.39	\$ 83.00	\$ 136.56	\$ 79.00
		10	0.5083	\$ 690,674.66	\$ 351,103.00	\$ 657,785.39	\$ 334,384.00
		12	0.4440	\$ 19,338.89	\$ 8,586.00	\$ 18,417.99	\$ 8,177.00
		14	0.3878	\$ 1,050.29	\$ 407.00	\$ 1,000.28	\$ 387.00
		15	0.3624	\$ 1,293,363.04	\$ 468,774.00	\$ 1,231,774.32	\$ 446,451.00
		20	0.2584	\$ 1,623,190.56	\$ 419,463.00	\$ 1,545,895.77	\$ 399,488.00
		25	0.1842	\$ 36,526.86	\$ 6,730.00	\$ 34,787.48	\$ 6,409.00
Total Replacement/Salvage PW Costs						\$ 1,321,005.00	
	Type of Annual Expense	Escl..00 %	PWA				
A	YPM-Mechanical	6.00%	22.178	\$ 19,612.27	\$ 434,960.79	\$ 18,678.35	\$ 414,248.37
A	Operations	6.00%	22.178	\$ 100,000.00	\$ 2,217,799.31	\$ 100,000.00	\$ 2,217,799.31
Total Operation/Maintenance (PW) Costs					\$ 2,652,760.10		\$ 2,632,047.68
Total Present Worth Life Cycle Costs					\$ 3,973,765.10		\$ 3,890,145.68
Life Cycle (PW) Savings							\$ 83,619.42
PW - Present Worth	PWA - Present Worth of Annuity						
Summary-O&M per SF							
					\$ 162,404.00		
					\$ 16.21		
					\$ 16.33		
					\$ 7.75		
					\$ 8.13		
					\$ 23.95		
					\$ 24.47		

Electrical Maintenance Costs

Appendix C-E1 YPM Costs

ELECTRICAL PREVENTATIVE MAINTENANCE ³										
CostWorks 2010 - EAST HALL										
National Average										
Location Adjustment	1.095	Weighted Average (CostWorks 2010)								
Total Building Area	162,404	sf								
Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.20	Assumed Value								
Qty	Assembly Number	Description	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	
1.000	D5 01 5210 1950	Switchboard, annualized	0.71	\$ 7.00	\$ 34.50	\$ -	\$ 41.50	\$ 50.00	\$ 62.00	
1.000	D5 01 5214 1950	Switchboard, with air circuit breaker, annualized	13.30	\$ 28.00	\$ 650.00	\$ -	\$ 678.00	\$ 830.00	\$ 1,025.00	
1.000	D5 01 5217 1950	Switchboard, with air circuit breaker and tie switch, annualized	13.36	\$ 41.50	\$ 655.00	\$ -	\$ 696.50	\$ 850.00	\$ 1,050.00	
1.000	D5 01 5220 1950	Circuit breaker, high voltage air, annualized	0.47	\$ -	\$ 23.00	\$ -	\$ 23.00	\$ 28.50	\$ 35.50	
1.000	D5 01 5222 1950	Circuit breaker, high voltage oil, annualized	0.86	\$ 14.05	\$ 42.00	\$ -	\$ 56.05	\$ 67.00	\$ 82.00	
1.000	D5 01 5230 1950	Switch, selector, high voltage, air, annualized	0.41	\$ 14.05	\$ 20.00	\$ -	\$ 34.05	\$ 40.00	\$ 48.00	
1.000	D5 01 5232 1950	Switch, selector, high voltage, oil, annualized	0.45	\$ 21.00	\$ 22.00	\$ -	\$ 43.00	\$ 50.00	\$ 60.50	
1.000	D5 01 5234 1950	Switch, automatic transfer, annualized	5.32	\$ 14.05	\$ 260.00	\$ -	\$ 274.05	\$ 335.00	\$ 420.00	
1.000	D5 01 5236 1950	Switch, interrupt, high voltage, fused air, annualized	0.36	\$ 14.05	\$ 17.85	\$ -	\$ 31.90	\$ 37.50	\$ 45.00	
1.000	D5 01 5238 1950	Switch, interrupt, high voltage, w/ aux fuses, air, annualized	0.36	\$ 14.05	\$ 17.85	\$ -	\$ 31.90	\$ 37.50	\$ 45.00	
1.000	D5 01 5240 1950	Transformer, dry type 500 KVA and over, annualized	0.77	\$ 14.05	\$ 37.50	\$ -	\$ 51.55	\$ 61.50	\$ 75.50	
1.000	D5 01 5240 2950	Transformer, oil pad mounted, annualized	1.08	\$ 28.00	\$ 53.00	\$ -	\$ 81.00	\$ 96.00	\$ 117.00	
1.000	D5 01 5240 3950	Transformer, oil pad mounted, PCB, annualized	2.66	\$ 41.50	\$ 130.00	\$ -	\$ 171.50	\$ 205.00	\$ 252.00	
1.000	D5 01 5260 1950	Panelboard, 225 A and above, annualized	0.44	\$ 28.00	\$ 21.50	\$ -	\$ 49.50	\$ 57.50	\$ 68.00	
1.000	D5 01 5280 1950	Motor control center, over 400 A, annualized	0.39	\$ 28.00	\$ 19.05	\$ -	\$ 47.05	\$ 54.00	\$ 64.50	
1.000	D5 03 5610 1950	Central clock systems, annualized	1.32	\$ 1.46	\$ 64.50	\$ -	\$ 65.96	\$ 81.00	\$ 101.00	
1.000	D5 03 5710 1950	Fire alarm annunciator system, annualized	11.05	\$ 137.00	\$ 555.00	\$ -	\$ 692.00	\$ 840.00	\$ 1,025.00	
1.000	D5 03 5810 1950	Security, intrusion alarm system, annualized	3.83	\$ 41.50	\$ 188.00	\$ -	\$ 229.50	\$ 276.00	\$ 340.00	
1.000	D5 09 5210 1950	Emergency diesel or gas generator, up to 15 KVA, annualized	13.17	\$ 124.00	\$ 645.00	\$ -	\$ 769.00	\$ 930.00	\$ 1,150.00	
1.000	D5 09 5210 2950	Emergency diesel or gas generator, over 15 KVA, annualized	16.16	\$ 137.00	\$ 790.00	\$ -	\$ 927.00	\$ 1,125.00	\$ 1,400.00	
1.000	D5 09 5210 3950	Emergency diesel generator, turbine, annualized	16.10	\$ 233.00	\$ 790.00	\$ -	\$ 1,023.00	\$ 1,225.00	\$ 1,525.00	
1.000	D5 09 5220 1950	Power stabilizer, annualized	0.63	\$ -	\$ 30.50	\$ -	\$ 30.50	\$ 37.50	\$ 47.00	
1.000	D5 09 5230 1950	Uninterrupted power system, up to 200 KVA, annualized	22.92	\$ 209.00	\$ 1,125.00	\$ -	\$ 1,334.00	\$ 1,600.00	\$ 1,975.00	
1.000	D5 09 5230 2950	Uninterrupted power system, 200 KVA to 800 KVA, annualized	78.09	\$ 281.00	\$ 3,825.00	\$ -	\$ 4,106.00	\$ 5,000.00	\$ 6,225.00	
1.000	D5 09 5240 1950	Battery system and charger, annualized	8.73	\$ 28.00	\$ 430.00	\$ -	\$ 458.00	\$ 555.00	\$ 695.00	
1.000	D5 09 5250 1950	Light, emergency, hardwired system, annualized	0.25	\$ -	\$ 12.25	\$ -	\$ 12.25	\$ 15.05	\$ 18.85	
1.000	D5 09 5250 2950	Light, emergency, dry cell, annualized	0.37	\$ 41.50	\$ 18.15	\$ -	\$ 59.65	\$ 68.00	\$ 80.00	
1.000	D5 09 5250 3950	Light, emergency, wet cell, annualized	0.39	\$ 62.00	\$ 19.10	\$ -	\$ 81.10	\$ 91.50	\$ 107.00	

ELECTRICAL PREVENTATIVE MAINTENANCE ³										
CostWorks 2010 - EAST HALL										
National Average										
Location Adjustment	1.095	Weighted Average (CostWorks 2010)								
Total Building Area	162,404	sf								
Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.20	Assumed Value								
Qty	Assembly Number	Description	Location Factor	Adjusted Total Includ. O&P	De-Escalation Factor to July 2009 Costs	Total Non-Green with all Adjustments	GREEN Factor	Adjusted Total with Green Factor OH&P		
1.000	D5 01 5210 1950	Switchboard, annualized	1.095	\$ 67.89	0.97	\$ 65.88	1.20	\$ 79.06		
1.000	D5 01 5214 1950	Switchboard, with air circuit breaker, annualized	1.095	\$ 1,122.38	0.97	\$ 1,089.19	1.20	\$ 1,307.03		
1.000	D5 01 5217 1950	Switchboard, with air circuit breaker and tie switch, annualized	1.095	\$ 1,149.75	0.97	\$ 1,115.76	1.20	\$ 1,338.91		
1.000	D5 01 5220 1950	Circuit breaker, high voltage air, annualized	1.095	\$ 38.87	0.97	\$ 37.72	1.20	\$ 45.27		
1.000	D5 01 5222 1950	Circuit breaker, high voltage oil, annualized	1.095	\$ 89.79	0.97	\$ 87.14	1.20	\$ 104.56		
1.000	D5 01 5230 1950	Switch, selector, high voltage, air, annualized	1.095	\$ 52.56	0.97	\$ 51.01	1.20	\$ 61.21		
1.000	D5 01 5232 1950	Switch, selector, high voltage, oil, annualized	1.095	\$ 66.25	0.97	\$ 64.29	1.20	\$ 77.15		
1.000	D5 01 5234 1950	Switch, automatic transfer, annualized	1.095	\$ 459.90	0.97	\$ 446.30	1.20	\$ 535.56		
1.000	D5 01 5236 1950	Switch, interrupt, high voltage, fused air, annualized	1.095	\$ 49.28	0.97	\$ 47.82	1.20	\$ 57.38		
1.000	D5 01 5238 1950	Switch, interrupt, high voltage, w/ aux fuses, air, annualized	1.095	\$ 49.28	0.97	\$ 47.82	1.20	\$ 57.38		
1.000	D5 01 5240 1950	Transformer, dry type 500 KVA and over, annualized	1.095	\$ 82.67	0.97	\$ 80.23	1.20	\$ 96.27		
1.000	D5 01 5240 2950	Transformer, oil pad mounted, annualized	1.095	\$ 128.12	0.97	\$ 124.33	1.20	\$ 149.19		
1.000	D5 01 5240 3950	Transformer, oil pad mounted, PCB, annualized	1.095	\$ 275.94	0.97	\$ 267.78	1.20	\$ 321.34		
1.000	D5 01 5260 1950	Panelboard, 225 A and above, annualized	1.095	\$ 74.46	0.97	\$ 72.26	1.20	\$ 86.71		
1.000	D5 01 5280 1950	Motor control center, over 400 A, annualized	1.095	\$ 70.63	0.97	\$ 68.54	1.20	\$ 82.25		
1.000	D5 03 5610 1950	Central clock systems, annualized	1.095	\$ 110.60	0.97	\$ 107.33	1.20	\$ 128.79		
1.000	D5 03 5710 1950	Fire alarm annunciator system, annualized	1.095	\$ 1,122.38	0.97	\$ 1,089.19	1.20	\$ 1,307.03		
1.000	D5 03 5810 1950	Security, intrusion alarm system, annualized	1.095	\$ 372.30	0.97	\$ 361.29	1.20	\$ 433.55		
1.000	D5 09 5210 1950	Emergency diesel or gas generator, up to 15 KVA, annualized	1.095	\$ 1,259.25	0.97	\$ 1,222.02	1.20	\$ 1,466.43		
1.000	D5 09 5210 2950	Emergency diesel or gas generator, over 15 KVA, annualized	1.095	\$ 1,533.00	0.97	\$ 1,487.68	1.20	\$ 1,785.22		
1.000	D5 09 5210 3950	Emergency diesel generator, turbine, annualized	1.095	\$ 1,669.88	0.97	\$ 1,620.51	1.20	\$ 1,944.61		
1.000	D5 09 5220 1950	Power stabilizer, annualized	1.095	\$ 51.47	0.97	\$ 49.94	1.20	\$ 59.93		
1.000	D5 09 5230 1950	Uninterrupted power system, up to 200 KVA, annualized	1.095	\$ 2,162.63	0.97	\$ 2,098.69	1.20	\$ 2,518.43		
1.000	D5 09 5230 2950	Uninterrupted power system, 200 KVA to 800 KVA, annualized	1.095	\$ 6,816.38	0.97	\$ 6,614.86	1.20	\$ 7,937.83		
1.000	D5 09 5240 1950	Battery system and charger, annualized	1.095	\$ 761.03	0.97	\$ 738.53	1.20	\$ 886.23		
1.000	D5 09 5250 1950	Light, emergency, hardwired system, annualized	1.095	\$ 20.64	0.97	\$ 20.03	1.20	\$ 24.04		
1.000	D5 09 5250 2950	Light, emergency, dry cell, annualized	1.095	\$ 87.60	0.97	\$ 85.01	1.20	\$ 102.01		
1.000	D5 09 5250 3950	Light, emergency, wet cell, annualized	1.095	\$ 117.17	0.97	\$ 113.70	1.20	\$ 136.44		
						\$ 19,274.86		\$ 23,129.83		
						Total Yearly Preventative Maintenance Cost		Total Yearly Preventative Maintenance Cost		
						Non-Green		Green		

Qty	Assembly Number	Description	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P
SUMMARY OF FINDINGS									
		Description	Cost	% Difference	Comments				
		Yearly Non-Green Preventative Maintenance Costs	\$19,274.86						
		Yearly Green Preventative Maintenance Costs	\$23,129.83	16.67%	Green Costs are 16.67% higher than Non-Green based on this analysis				
NOTES:									
It is assumed that all above mentioned items shall be required to be maintained									
FOOTNOTES:									
1									
RS Means CostWorks 2010 Operations and Maintenance									

Appendix C-E2 FMRR Costs

ELECTRICAL REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 -East Hall

National Averages

Escalation	6%	
De-Escalation to July 2009	1.03	
De-Escalation Factor to be Applied	0.97	
Green Factor	1.20	Assumed Value

Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Location Adjustment
1.000	D5013 110 0020	Maintenance and inspection primary transformer, liquid filled	0.5	1 Elec	Ea.	0.50	\$ -	\$ 24.50	\$ -	\$ 24.50	\$ 30.00	\$ 37.50	1.095
1.000	D5013 120 0020	Maintenance and inspection primary transformer, dry	0.5	1 Elec	Ea.	0.50	\$ -	\$ 24.50	\$ -	\$ 24.50	\$ 30.00	\$ 37.50	1.095
1.000	D5013 210 0020	Maintenance and inspection switchgear, mainframe	1	1 Elec	Ea.	0.80	\$ -	\$ 39.00	\$ -	\$ 39.00	\$ 48.00	\$ 60.00	1.095
1.000	D5013 220 0020	Maintenance and inspection switchgear, indoor, less than 600 V	3	1 Elec	Ea.	0.50	\$ -	\$ 24.50	\$ -	\$ 24.50	\$ 30.00	\$ 37.50	1.095
1.000	D5013 210 0010	Repair switchgear 1200 A mainframe	5	1 Elec	Ea.	6.70	\$ 1,150.00	\$ 328.50	\$ -	\$ 1,478.50	\$ 1,677.00	\$ 1,953.00	1.095
1.000	D5013 224 0010	Maintenance and repair - (5% of total fuses) switchgear, indoor, 600 V	10	1 Elec	Ea.	0.55	\$ 320.00	\$ 27.00	\$ -	\$ 347.00	\$ 384.05	\$ 441.35	1.095
1.000	D5013 220 0010	Repair switchgear, - (5% of total C.B.), indoor, less than 600 V	10	1 Elec	Ea.	1.54	\$ 179.00	\$ 75.60	\$ -	\$ 254.60	\$ 290.00	\$ 340.00	1.095
1.000	D5013 110 0010	Repair 500 kva transformer, primary, liquid filled	10	1 Elec	Ea.	3.96	\$ 2,225.00	\$ 194.00	\$ -	\$ 2,419.00	\$ 2,685.00	\$ 3,075.50	1.095

ELECTRICAL REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 - East Hall							
National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value					
Qty	Assembly Number	Description	Non-Green Total with L. Adjusted OH&P	De-Escalation Factor	Total Non-Green w/All Adjustments	Green Factor	Total w/Green Factor
1.000	D5013 110 0020	Maintenance and inspection primary transformer, liquid filled	\$ 41.06	0.97	\$ 39.85	1.20	\$ 47.82
1.000	D5013 120 0020	Maintenance and inspection primary transformer, dry	\$ 41.06	0.97	\$ 39.85	1.20	\$ 47.82
					\$ 79.70		\$ 95.64
					\$ 79.70		\$ 95.64
							Assumed 100%
							PER 0.5 YR
1.000	D5013 210 0020	Maintenance and inspection switchgear, mainframe	\$ 65.70	0.97	\$ 63.76	1.20	\$ 76.51
					\$ 63.76		\$ 76.51
					\$ 63.76		\$ 76.51
							Assumed 100%
							PER 1 YR
1.000	D5013 220 0020	Maintenance and inspection switchgear, indoor, less than 600 V	\$ 41.06	0.97	\$ 39.85	1.20	\$ 47.82
					\$ 39.85		\$ 47.82
					\$ 39.85		\$ 47.82
							Assumed 100%
							PER 3 YR
1.000	D5013 210 0010	Repair switchgear 1200 A mainframe	\$ 2,138.54	0.97	\$ 2,075.31	1.20	\$ 2,490.38
					\$ 2,075.31		\$ 2,490.38
					\$ 2,075.31		\$ 2,490.38
							Assumed 100%
							PER 5 YR
1.000	D5013 224 0010	Maintenance and repair - (5% of total fuses) switchgear, indoor, 600 V	\$ 483.28	0.97	\$ 468.99	1.20	\$ 562.79
1.000	D5013 220 0010	Repair switchgear, - (5% of total C.B.), indoor, less than 600 V	\$ 372.30	0.97	\$ 361.29	1.20	\$ 433.55
1.000	D5013 110 0010	Repair 500 kva transformer, primary, liquid filled	\$ 3,367.67	0.97	\$ 3,268.11	1.20	\$ 3,921.74
					\$ 4,098.40		\$ 4,918.08
					\$ 4,098.40		\$ 4,918.08
							Assumed 100%

ELECTRICAL REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 -East Hall

National Averages

Escalation	6%	
De-Escalation to July 2009	1.03	
De-Escalation Factor to be Applied	0.97	
Green Factor	1.20	Assumed Value

Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Location Adjustment
1.000	D5013 120 0010	Repair 15 KV primary transformer, dry	15	1 Elec	Ea.	2.00	\$ 48.50	\$ 98.00	\$ -	\$ 146.50	\$ 174.00	\$ 212.00	1.095
1.000	D5013 210 0030	Replace switchgear 1200 A mainframe	20	3 Elec	Ea.	29.82	\$ 2,075.00	\$ 1,467.00	\$ -	\$ 3,542.00	\$ 4,080.00	\$ 4,851.00	1.095
1.000	D5013 216 0010	Replace fuse	25	1 Elec	Ea.	0.55	\$ 320.00	\$ 27.00	\$ -	\$ 347.00	\$ 384.05	\$ 441.35	1.095
1.000	D5013 110 0030	Replace transformer primary, liquid filled	30	R3	Ea.	63.79	\$ 20,000.00	\$ 3,090.00	\$ 440.50	\$ 23,530.50	\$ 26,215.00	\$ 30,225.00	1.095
1.000	D5013 120 0030	Replace transformer primary, dry	30	R3	Ea.	70.94	\$ 45,600.00	\$ 3,415.00	\$ 490.50	\$ 49,505.50	\$ 54,915.00	\$ 62,625.00	1.095
1.000	D5013 220 0030	Replace switchgear, indoor, less than 600 V	30	1 Elec	Ea.	17.45	\$ 2,200.00	\$ 855.00	\$ -	\$ 3,055.00	\$ 3,480.50	\$ 4,064.00	1.095

ELECTRICAL REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010 -East Hall							
National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value					
Qty	Assembly Number	Description	Non-Green Total with L. Adjusted OH&P	De-Escalation Factor	Total Non-Green w/All Adjustments	Green Factor	Total w/Green Factor
							PER 10 YR
1.000	D5013 120 0010	Repair 15 KV primary transformer, dry	\$ 232.14	0.97	\$ 225.28	1.20	\$ 270.33
					\$ 225.28		\$ 270.33
					\$ 225.28		\$ 270.33 Assumed 100%
							PER 15 YR
1.000	D5013 210 0030	Replace switchgear 1200 A mainframe	\$ 5,311.85	0.97	\$ 5,154.81	1.20	\$ 6,185.77
					\$ 5,154.81		\$ 6,185.77
					\$ 5,154.81		\$ 6,185.77 Assumed 100%
							PER 20 YR
1.000	D5013 216 0010	Replace fuse	\$ 483.28	0.97	\$ 468.99	1.20	\$ 562.79
					\$ 468.99		\$ 562.79
					\$ 468.99		\$ 562.79 Assumed 100%
							PER 25 YR
1.000	D5013 110 0030	Replace transformer primary, liquid filled	\$ 33,096.38	0.97	\$ 32,117.95	1.20	\$ 38,541.54
1.000	D5013 120 0030	Replace transformer primary, dry	\$ 68,574.38	0.97	\$ 66,547.11	1.20	\$ 79,856.53
1.000	D5013 220 0030	Replace switchgear, indoor, less than 600 V	\$ 4,450.08	0.97	\$ 4,318.52	1.20	\$ 5,182.23
					\$ 102,983.58		\$ 123,580.29
					\$ 102,983.58		\$ 123,580.29 Assumed 100%
							PER 30 YR

ELECTRICAL REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

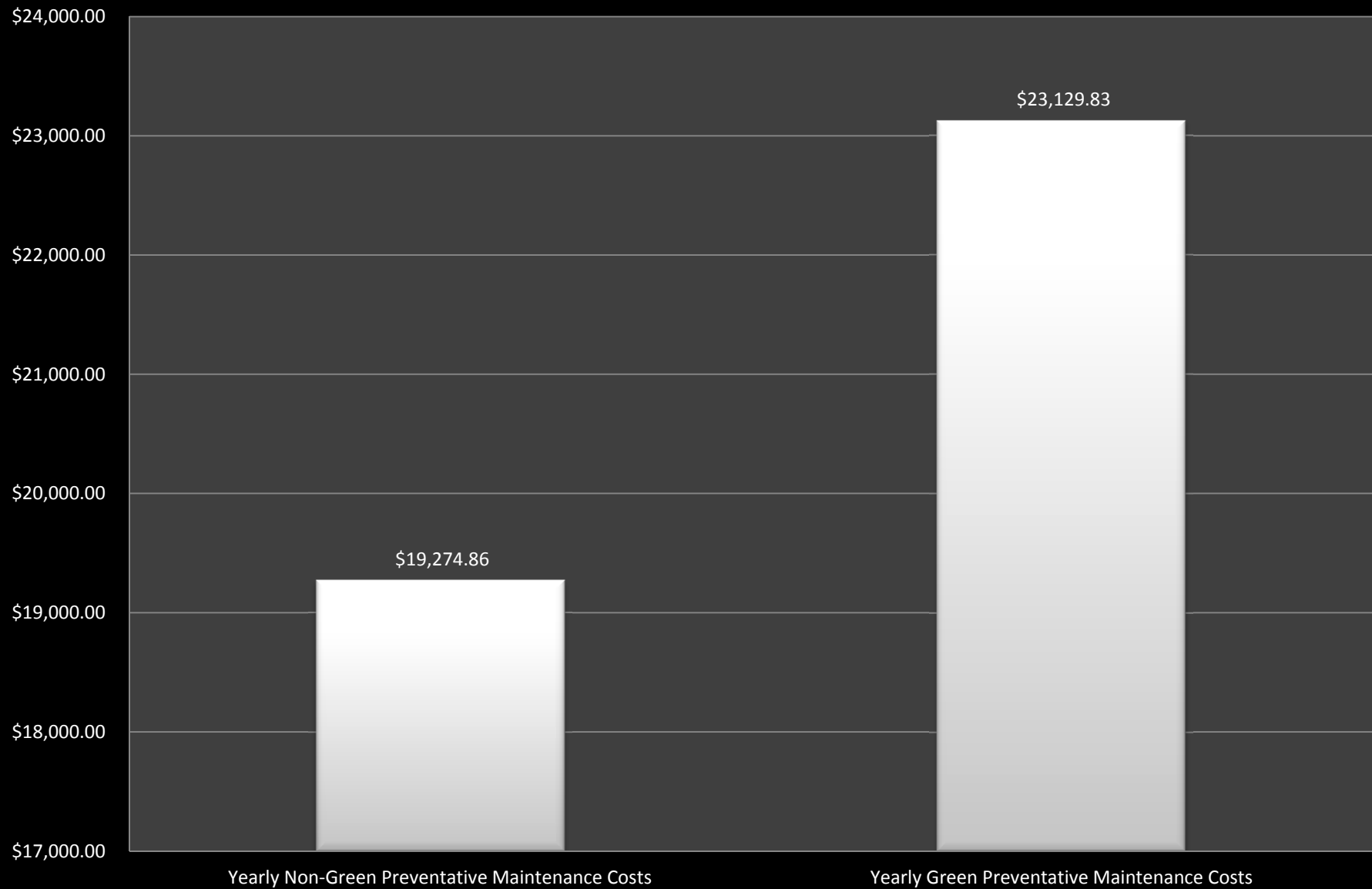
CostWorks 2010 -East Hall													
National Averages													
Escalation	6%												
De-Escalation to July 2009	1.03												
De-Escalation Factor to be Applied	0.97												
Green Factor	1.20	Assumed Value											
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Location Adjustment
FOOTNOTES:													
1													
RS Means CostWorks 2010 Operations and Maintenance													

Appendix C-E3 Summary of Green versus Non-Green Frequency Maintenance Repair
and Replacement Costs

Summary of Green versus Non-Green Major Repair and Replacement Costs based on Frequency (Electrical)			
Type of Construction	Description	Total Cost	Comments
Non-Green	Up to 10 Years	\$ 6,357.02	
Non-Green	10 th yr on till 25 th Year	\$ 5,849.08	
Non-Green	25 th yr on till 50 th Year	\$ 102,983.58	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
Green	Up to 10 Years	\$ 7,628.42	
Green	10 th yr on till 25 th Year	\$ 7,018.90	
Green	25 th yr on till 50 th Year	\$ 123,580.29	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
SUMMARY OF FINDINGS			
Green v. Non-Green	16.67%	Green	Major Repair and Replacement is 16.67% higher in cost than that of a traditional building

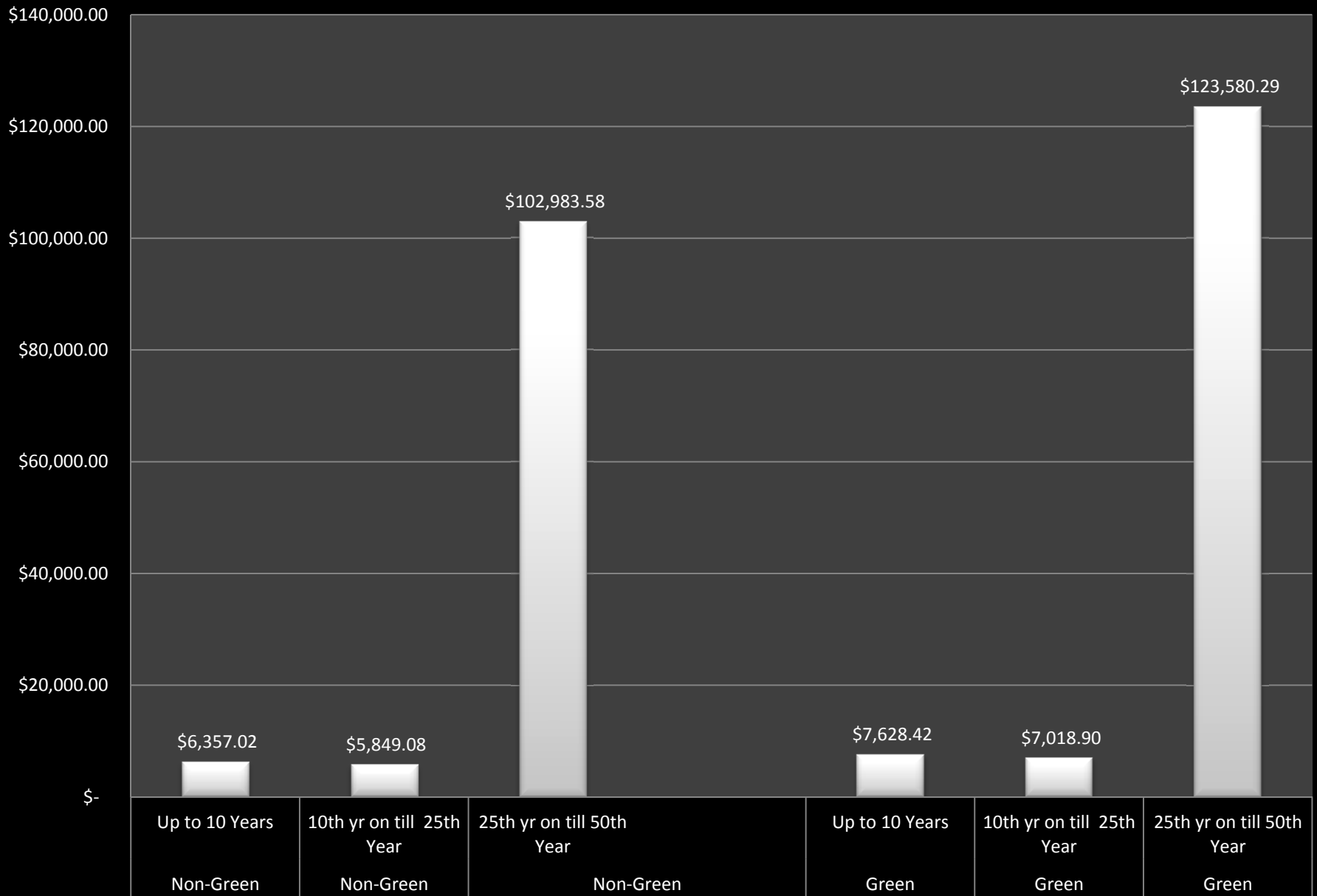
Appendix C-E4 Graph: Green and Non-Green Yearly Preventative Maintenance Costs

Electrical: Green & Non-Green Yearly Preventative Maintenance Costs (July 2009)



Appendix C-E5 Graph: Frequency and Magnitude of Maintenance Repair and Replacement Costs

Frequency and Magnitude of Major Repair and Replacement Costs



Appendix C-E6 RS Means Component Lists

Annualized Components Yearly Maintenance

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D5095 240 1950						
Battery system and charger						
1 Check that the charger is operating properly.	0.051		X	X	X	X
2 Check for any signs of corrosion on the battery terminals or wires.	0.117		X	X	X	X
3 Check the electrolyte level in the batteries; add if required.	0.062		X	X	X	X
4 Check the specific gravity of the electrolyte in a 10% sample of the batteries.	0.069		X	X	X	X
5 Check 25% of terminal-to-cell connection resistance; rehabilitate connections as required; add anti-corrosion grease to battery terminals and connections.	0.741			X	X	X
6 Measure and record individual cell and string float voltages.	0.281			X	X	X
7 Clean area around batteries.	0.066		X	X	X	X
8 Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period			.387	1.409	1.409	1.409
Total labor-hours/year	8.732		3.096	2.818	1.409	1.409

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D5015 222 1950						
Circuit breaker, HV oil						
1 Check the records on the circuit breaker for any full current rated trips which may indicate a potential problem.	0.066					X
2 Examine the exterior of the circuit breaker for any damage, cracks, rust or leaks; check around the gaskets and the drain valves.	0.074					X
3 Check the entrance bushings for cracks in the porcelain.	0.321					X
4 Check the condition of the ground system.	0.170					X
5 Draw oil sample from bottom of circuit breaker; have sample tested; replace removed oil to the proper level.	0.042					X
6 Clean the exterior of the circuit breaker and operating mechanism.	0.094					X
7 Clean the area around the circuit breaker.	0.066					X
8 Fill out maintenance checklist.	0.022					X
Total labor-hours/period						.855
Total labor-hours/year	0.855					.855

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D5015 220 1950							
Circuit breaker, HV air							
1	Check the records on the circuit breaker for any full current rated trips which may indicate a potential problem.	0.066					X
2	Examine the exterior of the circuit breaker for any damage or moisture.	0.060					X
3	Remove the circuit breaker from service, coordinate with appropriate authority.	0.038					X
4	Check operation of tripping mechanisms and relays.	0.096					X
5	Check the operation of the charging motor, if applicable.	0.038					X
6	Check hardware for tightness.	0.005					X
7	Check interlock for proper operation.	0.039					X
8	Clean area around switch.	0.066					X
9	Place the circuit breaker back in service, coordinate with appropriate authority.	0.040					X
10	Fill out maintenance checklist.	0.022					X
Total labor-hours/period							.470
Total labor-hours/year		0.470					.470

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D5035 610 1950							
Clocks, Central System							
1	Clean dirt and dust from interior and exterior of cabinet.	0.260				X	X
2	Adjust relays and check transmission of signal.	0.117				X	X
3	Tighten contacts and terminal screws.	0.065				X	X
4	Burnish contacts.	0.195				X	X
5	Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period						.659	.659
Total labor-hours/year		1.318				.659	.659

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D5095 210 2950							
Emergency diesel generator, over 15 KVA							
1	Check with the operating or area personnel for any obvious deficiencies.	0.044		X	X	X	X
2	Check engine oil level; add as required.	0.010		X	X	X	X
3	Change engine oil and oil filter.	0.511					X
4	Check battery charge and electrolyte specific gravity, add water as required; check terminals for corrosion; clean as required.	0.241		X	X	X	X
5	Check belts for wear and proper tension; adjust as necessary.	0.012		X	X	X	X
6	Check that crank case heater is operating.	0.038		X	X	X	X
7	Check engine air filter; change as required.	0.042					X
8	Check wiring, connections, switches, etc.; adjust as required.	0.036		X	X	X	X
9	Check spark plug or injector nozzle condition; service or replace as required.	0.281					X
10	Perform 30 minute generator test run; check for proper operation.	0.650		X	X	X	X
11	Check fuel level with gauge pole, add as required.	0.046		X	X	X	X
12	Wipe dust and dirt from engine and generator.	0.109		X	X	X	X
13	Clean area around generator.	0.066		X	X	X	X
14	Fill out maintenance checklist and report deficiencies.	0.025		X	X	X	X
Total labor-hours/period				1.277	1.277	1.277	2.111
Total labor-hours/year		16.158		10.216	2.554	1.277	2.111

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D5095 210 3950							
Emergency diesel generator, turbine							
1	Check with the operating or area personnel for any obvious deficiencies.	0.044		X	X	X	X
2	Check turbine oil level; add oil as required.	0.036		X	X	X	X
3	Change turbine oil and oil filter; check transmission oil level.	0.569					X
4	Check that the crankcase heater is operating properly.	0.022		X	X	X	X
5	Replace turbine air filter.	0.224					X
6	Check wiring, connections, switches, etc.; adjust as required.	0.060					X
7	Check starter for proper operation; lubricate as necessary.	0.047		X	X	X	X
8	Check fuel nozzles, fuel regulator and ignition device condition; service or replace as required.	0.813					X
9	Perform 30 minute generator test run; check for proper operation.	0.650		X	X	X	X
10	Check and record transmission oil pressure and temperature, and natural gas pressure: oil press: _____ oil temp: _____ gas press: _____.	0.021					X
11	Record running time: beginning _____ hours; ending _____ hours.	0.010					X
12	Check that the charger is operating properly.	0.127		X	X	X	X
13	Check for any signs of corrosion on battery terminals or wires.	0.117		X	X	X	X
14	Check the electrolyte level in the batteries; add if required.	0.049		X	X	X	X
15	Check the specific gravity of the electrolyte in a 10% sample of the batteries.	0.069					X
16	Check 25% of terminal-to-cell connection resistance; rehabilitate connections as required; add anti-corrosion grease to battery terminals and connections.	0.038					X
17	Measure and record individual cell and string float voltages.	0.140					X
18	Clean area around generator.	0.066		X	X	X	X
19	Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period				1,180	1,180	1,180	3,124
Total labor-hours/year		16,104		9,440	2,360	1,180	3,124

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D5095 210 1950							
Emergency generator up to 15 KVA							
1	Check with the operating or area personnel for any obvious deficiencies.	0.044		X	X	X	X
2	Check engine oil level; add as required.	0.010		X	X	X	X
3	Change engine oil and oil filter.	0.170					X
4	Check battery charge and electrolyte specific gravity, add water as required; check terminals for corrosion, clean as required.	0.120		X	X	X	X
5	Check belt tension and wear; adjust as required, if applicable.	0.012		X	X	X	X
6	Check engine air filter; change as required.	0.042					X
7	Check spark plug or injector nozzle condition; service or replace as required.	0.211					X
8	Check wiring, connections, switches, etc., adjust as required.	0.036		X	X	X	X
9	Perform 30 minute generator test run; check for proper operation.	0.650		X	X	X	X
10	Check fuel level; add as required.	0.046		X	X	X	X
11	Wipe dust and dirt from engine and generator.	0.056		X	X	X	X
12	Clean area around generator.	0.066		X	X	X	X
13	Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period				1,062	1,062	1,062	1,485
Total labor-hours/year		13,167		8,496	2,124	1,062	1,485

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D5035 710 1950						
Fire alarm annunciator system						
1 Visually inspect all alarm equipment for obstructions or physical damage, clean dirt and dust from interior and exterior of panel/pull boxes, tighten loose connections.	0.222		X	X	X	X
2 Notify cogniant personnel prior to testing.	0.112		X	X	X	X
3 Conduct operational test of initiating and signal transmitting devices in populated buildings by building zone/area; for those circuits which do not operate properly, check detectors, control units, and annunciators for dust on defective components; make minor adjustments as required.	0.112		X	X	X	X
4 Check battery voltages where installed; replace as required.	0.012		X	X	X	X
5 Conduct operational test of 10% of total number of spot type heat detectors and all smoke detectors; for those circuits which do not operate properly, check to determine if problem relates to circuit, device, or control unit, make minor adjustments as required; if detector is defective but no replacement is immediately available, remove detector, re-establish Initiating circuit and tag location until a replacement detector is installed.	2.171				X	X
6 Restore system to proper operating condition and notify personnel upon completion of tests.	0.079		X	X	X	X
7 Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period			.559	.559	2.730	2.730
Total labor-hours/year	11.050		4.472	1.118	2.730	2.730

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D5095 250 2950						
Light, emergency, dry cell						
1 Test for proper operation, replace lamps as required.	0.013				X	X
2 Clean exterior of emergency light cabinet and lamp heads.	0.025				X	X
3 Check condition of batteries and change as required.	0.012				X	X
4 Clean interior of cabinet, top of battery, and battery terminal.	0.009				X	X
5 Inspect cabinet, relay, relay contacts, pilot light, wiring, and gen. cond.	0.065				X	X
6 Adjust lamp heads for maximum illumination of area.	0.039				X	X
7 Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period					.185	.185
Total labor-hours/year	0.370				.185	.185

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D5095 250 1950						
Light, emergency, hardwired system						
1 Test for proper operation, replace lamps as required.	0.013				X	X
2 Clean exterior of cabinet and light heads.	0.025				X	X
3 Check wiring for obvious defects.	0.026				X	X
4 Adjust lamp heads for maximum illumination of area.	0.039				X	X
5 Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period					.125	.125
Total labor-hours/year	0.250				.125	.125

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D5095 250 3950							
Light, emergency, wet cell							
1	Test for proper operation; correct deficiencies as required.	0.013				X	X
2	Clean exterior of emergency light cabinet and lamp heads.	0.025				X	X
3	Clean interior of cabinet, top of battery, and battery terminal.	0.009				X	X
4	Check battery charge and electrolyte specific gravity; add water if nec.	0.012				X	X
5	Inspect cabinet, relay, relay contacts, pilot light, wiring, and gen. cond.	0.065				X	X
6	Apply anti-corrosion coating to battery terminals.	0.010				X	X
7	Adjust lamp heads for maximum illumination of area.	0.039				X	X
8	Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period						.195	.195
Total labor-hours/year		0.390				.195	.195

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D5015 280 1950							
Motor control center, over 400 amps							
1	Check with operating or area personnel for deficiencies.	0.044					X
2	Check starter lights, replace if required.	0.018					X
3	Check for excessive heat, odors, noise, and vibration.	0.239					X
4	Clean motor control center exterior and surrounding area.	0.066					X
5	Fill out maintenance checklist and report deficiencies.	0.022					X
Total labor-hours/period							.389
Total labor-hours/year		0.389					.389

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D5015 260 1950							
Panelboard, 225 amps and above							
1	Check with operating or area personnel for deficiencies.	0.066					X
2	Check for excessive heat, odors, noise, and vibration.	0.239					X
3	Clean and check general condition of panel.	0.114					X
4	Fill out maintenance checklist and report deficiencies.	0.022					X
Total labor-hours/period							.441
Total labor-hours/year		0.441					.441

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D5095 220 1950							
Power stabilizer							
1	Remove the covers or open the doors.	0.218					X
2	Check for signs of moisture or overheating.	0.022					X
3	Check fans and other auxiliary devices for proper operation.	0.027					X
4	Check for voltage creeping over transformer insulated surfaces, such as evidenced by tracking or carbonization.	0.018					X
5	Check condition of the ground system.	0.170					X
6	Check wiring, connections, relays, etc; tighten and adjust as necessary.	0.060					X
7	Replace the covers or close the doors.	0.022					X
8	Clean the surrounding area.	0.066					X
9	Fill out maintenance checklist and report deficiencies.	0.022					X
Total labor-hours/period							.625
Total labor-hours/year		0.625					.625

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D5035 810 1950							
Security / Intrusion alarm system							
1	Check in and out with area security officer, notify operating/facility personnel, obtain necessary alarm keys, alarm codes and escort when required.	0.520			X	X	X
2	Inspect alarm control panel and conduct operational test of initiating and signal transmitting devices; make minor adjustments as required.	0.241			X	X	X
3	Check indicating lamps for proper operation, replace if necessary.	0.018			X	X	X
4	Check battery voltages where installed, replace as required.	0.012			X	X	X
5	Restore system to proper operating condition and notify personnel upon completion of tests.	0.079			X	X	X
6	Clean exterior of cabinet and surrounding area.	0.066			X	X	X
7	Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period					.958	.958	.958
Total labor-hours/year		3.832			1.916	.958	.958

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D5015 234 1950							
Switch, automatic transfer							
1	Check with operating or area personnel for deficiencies.	0.044		X	X	X	X
2	Inspect wiring, wiring connections, and fuse blocks for looseness, charring, evidence of short circuiting, overheating and tighten all connections.	0.263		X	X	X	X
3	Inspect gen. cond. of transf. switch and clean exter. and surrounding area.	0.114		X	X	X	X
4	Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period				.443	.443	.443	.443
Total labor-hours/year		5.316		3.544	.886	.443	.443

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D5015 236 1950							
Switch, interrupt, HV, fused air							
1	Examine the exterior of the interrupt switch for any damage.	0.060					X
2	Check the condition of the ground system.	0.170					X
3	Clean the exterior of the interrupt switch and operating mechanism.	0.046					X
4	Clean the area around the interrupt switch.	0.066					X
5	Fill out maintenance checklist and report deficiencies.	0.022					X
Total labor-hours/period							.364
Total labor-hours/year		0.364					.364

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D5015 238 1950							
Switch, interrupt, HV, w/auxiliary fuses, air							
1	Examine the exterior of the interrupt switch for any damage.	0.060					X
2	Check the condition of the ground system.	0.170					X
3	Clean the exterior of the interrupt switch and operating mechanism.	0.046					X
4	Clean the area around the interrupt switch.	0.066					X
5	Fill out maintenance checklist and report deficiencies.	0.022					X
Total labor-hours/period							.364
Total labor-hours/year		0.364					.364

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D5015 230 1950						
Switch, selector, HV, air						
1 Examine the exterior of the selector switch for any damage.	0.060					X
2 Check that the switching handle is locked.	0.044					X
3 Check the condition of the ground system.	0.170					X
4 Clean the exterior of the selector switch and operating mechanism.	0.046					X
5 Clean the area around the selector switch.	0.066					X
6 Fill out maintenance checklist and report deficiencies.	0.022					X
Total labor-hours/period						.408
Total labor-hours/year	0.408					.408

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D5015 232 1950						
Switch, selector, HV, oil						
1 Examine the exterior of the interrupt switch for any damage, cracks, rust or leaks; check around the gaskets and the drain valves.	0.060					X
2 Check that the switching handle is locked.	0.044					X
3 Check the condition of the ground system.	0.170					X
4 Draw oil sample from bottom of selector switch; have sample tested; replace removed oil to the proper level.	0.042					X
5 Clean the exterior of the selector switch and operating mechanism.	0.046					X
6 Clean the area around the selector switch.	0.066					X
7 Fill out maintenance checklist and report deficiencies.	0.022					X
Total labor-hours/period						.450
Total labor-hours/year	0.450					.450

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D5015 217 1950						
Switchboard w/air circuit breaker and tie switch						
1 Check with operating or area personnel for deficiencies.	0.035					X
2 Check indicating lamps for proper operation, if appropriate; replace burned out lamps.	0.020					X
3 Remove switchboard from service, coordinate with appropriate authority.	0.038					X
4 Remove and reinstall cover.	0.051					X
5 Check for discolorations, hot spots, odors and charred insulation.	0.016					X
6 Check the records on the circuit breaker for any full current rated trips which may indicate a potential problem.	0.020					X
7 Examine the exterior of the switchboard for any damage or moisture.	0.020					X
8 Check operation of circuit breaker tripping mechanism and relays.	0.096					X
9 Check the operation of the circuit breaker charging motor.	0.020					X
10 Check hardware for tightness.	0.120					X
11 Check interlock for proper operation.	0.013					X
12 Operate the switching handle and check the locking mechanism.	0.052					X
13 Check that the charger is operating properly.	0.022		X	X	X	X
14 Check for any signs of corrosion on the battery terminals or wires.	0.020		X	X	X	X
15 Check the electrolyte level in the batteries; add if required.	0.624		X	X	X	X
16 Check the specific gravity of the electrolyte in a 10% sample of the batteries.	0.069		X	X	X	X
17 Check 25% of terminal-to-cell connection resistance; rehabilitate connections as required; add anti-corrosion grease to battery terminals and connections.	0.113					X
18 Measure and record individual cell and string float voltages.	2.808					X
19 Place switchboard back in service, notify appropriate authority.	0.057					X
20 Clean switchboard, charger and the surrounding area.	0.066		X	X	X	X
21 Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period			.823	.823	.823	4.302
Total labor-hours/year	13.355		6.584	1.646	.823	4.302

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D5015 214 1950							
Switchboard w/air circuit breaker							
1	Check with operating or area personnel for deficiencies.	0.035					X
2	Check indicating lamps for proper operation, if appropriate; replace burned out lamps.	0.020					X
3	Remove switchboard from service, coordinate with appropriate authority.	0.038					X
4	Remove and reinstall cover.	0.051					X
5	Check for discolorations, hot spots, odors and charred insulation.	0.016					X
6	Check the records on the circuit breaker for any full current rated trips which may indicate a potential problem.	0.020					X
7	Examine the exterior of the switchboard for any damage or moisture.	0.020					X
8	Check operation of circuit breaker tripping mechanism and relays.	0.096					X
9	Check the operation of the circuit breaker charging motor.	0.020					X
10	Check hardware for tightness.	0.120					X
11	Check interlock for proper operation.	0.013					X
12	Check that the charger is operating properly.	0.022		X	X	X	X
13	Check for any signs of corrosion on the battery terminals or wires.	0.020		X	X	X	X
14	Check the electrolyte level in the batteries; add if required.	0.624		X	X	X	X
15	Check the specific gravity of the electrolyte in a 10% sample of the batteries.	0.069		X	X	X	X
16	Check 25% of terminal-to-cell connection resistance; rehabilitate connections as required; add anti-corrosion grease to battery terminals and connections.	0.113					X
17	Measure and record individual cell and string float voltages.	2.808					X
18	Place switchboard back in service, notify appropriate authority.	0.057					X
19	Clean switchboard, charger and the surrounding area.	0.066		X	X	X	X
20	Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period				.823	.823	.823	4.250
Total labor-hours/year		13.303		6.584	1.646	.823	4.250

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D5015 210 1950							
Switchboard, electrical							
1	Check with operating or area personnel for deficiencies.	0.044					X
2	Check indicating lamps for proper operation, if appropriate; replace burned out lamps.	0.018					X
3	Remove and reinstall cover.	0.196					X
4	Check for discolorations, hot spots, odors and charred insulation.	0.359					X
5	Clean switchboard exterior and surrounding area.	0.066					X
6	Fill out maintenance checklist and report deficiencies.	0.022					X
Total labor-hours/period							.705
Total labor-hours/year		0.705					.705

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D5015 240 1950							
Transformer, dry type 500 KVA and over							
1	Examine the exterior of the transformer for any damage.	0.060					X
2	Remove the covers or open the doors.	0.196					X
3	Check for signs of moisture or overheating.	0.059					X
4	Check for voltage creeping over insulated surfaces, such as evidenced by tracking or carbonization.	0.018					X
5	Check fans, motors and other auxiliary devices for proper operation; where applicable.	0.049					X
6	Check the condition of the ground system.	0.170					X
7	Replace the covers or close the doors.	0.196					X
8	Fill out maintenance checklist and report deficiencies.	0.022					X
Total labor-hours/period							.770
Total labor-hours/year		0.770					.770

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D5015 240 2950							
Transformer, oil, pad mounted							
1	Examine the exterior of the transformer for any damage, cracks, rust or leaks; check around bushings, gaskets and pressure relief device.	0.014					X
2	Check the condition of the ground system.	0.170					X
3	Check and record the oil level, pressure and temperature readings.	0.263					X
4	Check fans, motors and other auxiliary devices for proper operation; where applicable.	0.022					X
5	Draw oil sample from top of transformer and have sample tested for dielectric strength; replace removed oil.	0.525					X
6	Clean transformer exterior and the surrounding area.	0.066					X
7	Fill out maintenance checklist and report deficiencies.	0.022					X
Total labor-hours/period							1.082
Total labor-hours/year		1.082					1.082

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D5015 240 3950							
Transformer, oil, pad mounted, PCB							
1	Check with operating or area personnel for deficiencies.	0.040			X	X	X
2	Examine the exterior of the transformer for any damage, cracks, rust or leaks; check around the gaskets, the pressure relief device and the cooling fins.	0.014			X	X	X
3	Check and record the oil levels, pressure and temperature readings. level _____; pressure _____; temperature _____	0.263					X
4	Check fans, motors and other auxiliary devices for proper operation; where applicable.	0.051					X
5	Check the exterior bushings for leaking oil.	0.321			X	X	X
6	Check the condition of the ground system.	0.170					X
7	Draw oil sample from top of transformer and have sample tested; replace removed oil.	0.525					X
8	Clean transformer exterior and the surrounding area.	0.066					X
9	Verify the PCB warning markings are intact and clearly visible.	0.022					X
10	Fill out maintenance checklist and report deficiencies; Note: the EPA PCB regulations under 40 CFR 716.30 shall apply to all inspections, samples, disposal, cleanups, decontamination, reporting and record-keeping.	0.022			X	X	X
Total labor-hours/period					.397	.397	1.494
Total labor-hours/year		2.685			.794	.397	1.494

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D5095 230 2950							
Uninterrupted power system, 200 KVA to 800 KVA							
1	Check with operating or area personnel for any obvious deficiencies.	0.044		X	X	X	X
2	Check electrolyte level of batteries; add water as required; check terminals for corrosion, clean as required.	3.510		X	X	X	X
3	Check 25% of the batteries for charge and electrolyte specific gravity.	3.107			X	X	X
4	Check batteries for cracks or leaks.	0.585		X	X	X	X
5	Check 25% of the terminal-to-cell connection resistances; rehabilitate connections as required; add anti-corrosion grease to battery terminals and connections.	0.234			X	X	X
6	Measure and record individual cell and string float voltages.	0.936			X	X	X
7	Check integrity of battery rack.	0.702		X	X	X	X
8	Check battery room temperature and ventilation systems.	0.010		X	X	X	X
9	Replace air filters on UPS modules.	0.036		X	X	X	X
10	Check output voltage and amperages, from control panel.	0.007		X	X	X	X
11	Check UPS room temperature and ventilation system.	0.062		X	X	X	X
12	Notify personnel and test UPS fault alarm system.	0.112			X	X	X
13	Clean around batteries and UPS modules.	0.066		X	X	X	X
14	Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period				5.044	9.433	9.433	9.433
Total labor-hours/year		78.084		40.352	18.866	9.433	9.433

CostWorks 2010 - EAST HALL

PM Components		Labor Hours	W	M	Q	S	A
PM System D5095 230 1950							
Uninterruptible power system, up to 200 KVA							
1	Check with operating or area personnel for any obvious deficiencies.	0.044		X	X	X	X
2	Check electrolyte level of batteries; add water as required; check terminals for corrosion, clean as required.	0.878		X	X	X	X
3	Check 25% of the batteries for charge and electrolyte specific gravity.	0.777			X	X	X
4	Check batteries for cracks or leaks.	0.059		X	X	X	X
5	Check 25% of the terminal-to-cell connection resistances; rehabilitate connections as required; add anti-corrosion grease to battery terminals and connections.	0.143			X	X	X
6	Measure and record individual cell and string float voltages.	0.618			X	X	X
7	Check integrity of battery rack.	0.176		X	X	X	X
8	Check battery room temperature and ventilation systems.	0.010		X	X	X	X
9	Replace air filters on UPS modules.	0.036		X	X	X	X
10	Check output voltage and amperages, from control panel.	0.007		X	X	X	X
11	Check UPS room temperature and ventilation system.	0.062		X	X	X	X
12	Notify personnel and test UPS fault alarm system.	0.112			X	X	X
13	Clean around batteries and UPS modules.	0.066		X	X	X	X
14	Fill out maintenance checklist and report deficiencies.	0.022		X	X	X	X
Total labor-hours/period				1.360	3.010	3.010	3.010
Total labor-hours/year		22.920		10.880	6.020	3.010	3.010

Appendix C-E7 RS Means Crew Lists

CREWS

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour		
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P
Crew ELEC (FMR)									
1 Electricians	\$49.00	\$392.00	\$60.10	\$480.80	\$75.30	\$602.40	\$49.00	\$60.10	\$75.30
8 L.H., Daily Totals		\$392.00		\$480.80		\$602.40	\$49.00	\$60.10	\$75.30

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour		
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P
Crew ELEC (FMR)									
2 Electricians	\$49.00	\$784.00	\$60.10	\$961.60	\$75.30	\$1,204.80	\$49.00	\$60.10	\$75.30
16 L.H., Daily Totals		\$784.00		\$961.60		\$1,204.80	\$49.00	\$60.10	\$75.30

CostWorks 2010 - EAST HALL

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour		
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P
Crew ELEC (FMR)									
3 Electricians	\$49.00	\$1,176.00	\$60.10	\$1,442.40	\$75.30	\$1,807.20	\$49.00	\$60.10	\$75.30
24 L.H., Daily Totals		\$1,176.00		\$1,442.40		\$1,807.20	\$49.00	\$60.10	\$75.30

Appendix C-LE1 LCCA 20% GF O&M

LIFE CYCLE COST (Present Worth Method)							
LCC -Electrical O&M				Green		Non-Green	
				Not East Hall Specific		RS Means CostWorks	
PROJECT LIFE CYCLE (YEARS)	25						
DISCOUNT RATE (% in decimals)	7.00%						
				Est.	PW	Est.	PW
Base Cost					\$ -		\$ -
Interface Cost							
A)					\$ -		\$ -
B)					\$ -		\$ -
C)					\$ -		\$ -
D)					\$ -		\$ -
Other Initial Costs							
A)					\$ -		\$ -
B)					\$ -		\$ -
Total Initial Cost Impact (IC)					\$ -		\$ -
Initial Cost PW Savings							\$ -
		Year	Factor				
	FMRRC Electrical Items	0.5	0.9667	\$ 95.64	\$ 92.00	\$ 79.70	\$ 77.00
		1	0.9346	\$ 76.51	\$ 71.00	\$ 63.76	\$ 59.00
		3	0.8163	\$ 47.82	\$ 39.00	\$ 39.85	\$ 32.00
		5	0.7130	\$ 2,490.38	\$ 1,775.00	\$ 2,075.31	\$ 1,479.00
		10	0.5083	\$ 4,918.08	\$ 2,500.00	\$ 4,098.40	\$ 2,083.00
		15	0.3624	\$ 270.33	\$ 97.00	\$ 225.28	\$ 81.00
		20	0.2584	\$ 6,185.77	\$ 1,598.00	\$ 5,154.81	\$ 1,332.00
		25	0.1842	\$ 562.79	\$ 103.00	\$ 468.99	\$ 86.00
		30	0.1314		\$ -		\$ -
Total Replacement/Salvage PW Costs						\$ 6,275.00	
Type of Annual Expense		Escl..00 %	PWA				
A	YPM-Electrical	6.00%	22.178	\$ 23,129.83	\$ 512,973.23	\$ 19,274.86	\$ 427,477.69
A	Operations	6.00%	22.178	\$ 100,000.00	\$ 2,217,799.31	\$ 100,000.00	\$ 2,217,799.31
Total Operation/Maintenance (PW) Costs					\$ 2,730,772.53		\$ 2,645,277.00
Total Present Worth Life Cycle Costs					\$ 2,737,047.53		\$ 2,650,506.00
Life Cycle (PW) Savings							\$ 86,541.54
PW - Present Worth		PWA - Present Worth of Annuity					
Summary-O&M per SF							
				East Hall SF		\$ 162,404.00	
				Non Green Costs per SF-YPM		\$ 16.29	
				Green Costs per SF-YPM		\$ 16.81	
				Non Green Costs per SF-FMRRC		\$ 0.03	
				Green Costs per SF-FMRRC		\$ 0.04	
				Non-Green Total Costs per SF-YPM& FMRRC		\$ 16.32	
				Green-Total Costs per SF-YPM& FMRRC		\$ 16.85	

Appendix C-LE2 LCCA 15% GF O&M

LIFE CYCLE COST (Present Worth Method)									
LCC -Electrical 15% O&M				Green		Non-Green			
				Not East Hall Specific		RS Means CostWorks			
PROJECT LIFE CYCLE (YEARS)		25							
DISCOUNT RATE (% in decimals)		7.00%							
				Est.	PW	Est.	PW		
Base Cost					\$ -		\$ -		
Interface Cost									
A)					\$ -		\$ -		
B)					\$ -		\$ -		
C)					\$ -		\$ -		
D)					\$ -		\$ -		
Other Initial Costs									
A)					\$ -		\$ -		
B)					\$ -		\$ -		
Total Initial Cost Impact (IC)					\$ -		\$ -		
Initial Cost PW Savings							\$ -		
				Year	Factor				
FMRRC Electrical Items				0.5	0.9667	\$ 91.65	\$ 88.00	\$ 79.70	\$ 77.00
				1	0.9346	\$ 73.32	\$ 68.00	\$ 63.76	\$ 59.00
				3	0.8163	\$ 45.83	\$ 37.00	\$ 39.85	\$ 32.00
				5	0.7130	\$ 2,386.61	\$ 1,701.00	\$ 2,075.31	\$ 1,479.00
				10	0.5083	\$ 4,713.16	\$ 2,395.00	\$ 4,098.40	\$ 2,083.00
				15	0.3624	\$ 259.07	\$ 93.00	\$ 225.28	\$ 81.00
				20	0.2584	\$ 5,928.03	\$ 1,531.00	\$ 5,154.81	\$ 1,332.00
				25	0.1842	\$ 539.34	\$ 99.00	\$ 468.99	\$ 86.00
				30	0.1314		\$ -		\$ -
				Total Replacement/Salvage PW Costs					
Type of Annual Expense				Escl..00 %	PWA				
A	YPM-Electrical	6.00%	22.178	\$ 22,166.09	\$ 491,599.34	\$ 19,274.86	\$ 427,477.69		
A	Operations	6.00%	22.178	\$ 100,000.00	\$ 2,217,799.31	\$ 100,000.00	\$ 2,217,799.31		
Total Operation/Maintenance (PW) Costs						\$ 2,709,398.65	\$ 2,645,277.00		
Total Present Worth Life Cycle Costs						\$ 2,715,410.65	\$ 2,650,506.00		
Life Cycle (PW) Savings							\$ 64,904.65		
PW - Present Worth PWA - Present Worth of Annuity									
Summary-O&M per SF									
				East Hall SF		\$ 162,404.00			
				Non Green Costs per SF-YPM		\$ 16.29			
				Green Costs per SF-YPM		\$ 16.68			
				Non Green Costs per SF-FMRRC		\$ 0.03			
				Green Costs per SF-FMRRC		\$ 0.04			
				Non-Green Total Costs per SF-YPM& FMRRC		\$ 16.32			
				Green-Total Costs per SF-YPM& FMRRC		\$ 16.72			

Appendix C-LE3 LCCA 10% GF O&M

LIFE CYCLE COST (Present Worth Method)							
LCC -Electrical 10% Green Factor O&M				Green		Non-Green	
				Not East Hall Specific		RS Means CostWorks	
PROJECT LIFE CYCLE (YEARS)	25						
DISCOUNT RATE (% in decimals)	7.00%						
				Est.	PW	Est.	PW
Base Cost					\$ -		\$ -
Interface Cost							
A)					\$ -		\$ -
B)					\$ -		\$ -
C)					\$ -		\$ -
D)					\$ -		\$ -
Other Initial Costs							
A)					\$ -		\$ -
B)					\$ -		\$ -
Total Initial Cost Impact (IC)					\$ -		\$ -
Initial Cost PW Savings							\$ -
		Year	Factor				
	FMRRC Electrical Items	0.5	0.9667	\$ 87.67	\$ 84.00	\$ 79.70	\$ 77.00
		1	0.9346	\$ 70.13	\$ 65.00	\$ 63.76	\$ 59.00
		3	0.8163	\$ 43.83	\$ 35.00	\$ 39.85	\$ 32.00
		5	0.7130	\$ 2,282.84	\$ 1,627.00	\$ 2,075.31	\$ 1,479.00
		10	0.5083	\$ 4,508.24	\$ 2,291.00	\$ 4,098.40	\$ 2,083.00
		15	0.3624	\$ 247.80	\$ 89.00	\$ 225.28	\$ 81.00
		20	0.2584	\$ 5,670.29	\$ 1,465.00	\$ 5,154.81	\$ 1,332.00
		25	0.1842	\$ 515.89	\$ 95.00	\$ 468.99	\$ 86.00
		30	0.1314		\$ -		\$ -
Total Replacement/Salvage PW Costs					\$ 5,751.00		\$ 5,229.00
Type of Annual Expense		Escl..00 %	PWA				
A	YPM-Electrical	6.00%	22.178	\$ 21,202.34	\$ 470,225.46	\$ 19,274.86	\$ 427,477.69
A	Operations	6.00%	22.178	\$ 100,000.00	\$ 2,217,799.31	\$ 100,000.00	\$ 2,217,799.31
Total Operation/Maintenance (PW) Costs				\$ 2,688,024.77		\$ 2,645,277.00	
Total Present Worth Life Cycle Costs				\$ 2,693,775.77		\$ 2,650,506.00	
Life Cycle (PW) Savings						\$ 43,269.77	
PW - Present Worth	PWA - Present Worth of Annuity						
Summary-O&M per SF							
				East Hall SF		\$ 162,404.00	
				Non Green Costs per SF-YPM		\$ 16.29	
				Green Costs per SF-YPM		\$ 16.55	
				Non Green Costs per SF-FMRRC		\$ 0.03	
				Green Costs per SF-FMRRC		\$ 0.04	
				Non-Green Total Costs per SF-YPM& FMRRC		\$ 16.32	
				Green-Total Costs per SF-YPM& FMRRC		\$ 16.59	

Appendix C-LE4 LCCA 5% GF O&M

LIFE CYCLE COST (Present Worth Method)							
LCC -Electrical 5% Green Factor O&M				Green		Non-Green	
				Not East Hall Specific		RS Means CostWorks	
PROJECT LIFE CYCLE (YEARS)	25						
DISCOUNT RATE (% in decimals)	7.00%						
				Est.	PW	Est.	PW
Base Cost					\$ -		\$ -
Interface Cost							
A)					\$ -		\$ -
B)					\$ -		\$ -
C)					\$ -		\$ -
D)					\$ -		\$ -
Other Initial Costs							
A)					\$ -		\$ -
B)					\$ -		\$ -
Total Initial Cost Impact (IC)					\$ -		\$ -
Initial Cost PW Savings							\$ -
		Year	Factor				
	FMRRC Electrical Items	0.5	0.9667	\$ 83.68	\$ 80.00	\$ 79.70	\$ 77.00
		1	0.9346	\$ 66.95	\$ 62.00	\$ 63.76	\$ 59.00
		3	0.8163	\$ 41.84	\$ 34.00	\$ 39.85	\$ 32.00
		5	0.7130	\$ 2,179.08	\$ 1,553.00	\$ 2,075.31	\$ 1,479.00
		10	0.5083	\$ 4,303.32	\$ 2,187.00	\$ 4,098.40	\$ 2,083.00
		15	0.3624	\$ 236.54	\$ 85.00	\$ 225.28	\$ 81.00
		20	0.2584	\$ 5,412.55	\$ 1,398.00	\$ 5,154.81	\$ 1,332.00
		25	0.1842	\$ 492.44	\$ 90.00	\$ 468.99	\$ 86.00
		30	0.1314		\$ -		\$ -
Total Replacement/Salvage PW Costs					\$ 5,489.00		\$ 5,229.00
Type of Annual Expense		Escl..00 %	PWA				
A	YPM-Electrical	6.00%	22.178	\$ 20,238.60	\$ 448,851.57	\$ 19,274.86	\$ 427,477.69
A	Operations	6.00%	22.178	\$ 100,000.00	\$ 2,217,799.31	\$ 100,000.00	\$ 2,217,799.31
Total Operation/Maintenance (PW) Costs				\$ 2,666,650.88		\$ 2,645,277.00	
Total Present Worth Life Cycle Costs				\$ 2,672,139.88		\$ 2,650,506.00	
Life Cycle (PW) Savings						\$ 21,633.88	
PW - Present Worth	PWA - Present Worth of Annuity						
Summary-O&M per SF							
				East Hall SF		\$ 162,404.00	
				Non Green Costs per SF-YPM		\$ 16.29	
				Green Costs per SF-YPM		\$ 16.42	
				Non Green Costs per SF-FMRRC		\$ 0.03	
				Green Costs per SF-FMRRC		\$ 0.03	
				Non-Green Total Costs per SF-YPM& FMRRC		\$ 16.32	
				Green-Total Costs per SF-YPM& FMRRC		\$ 16.45	

Water Maintenance Costs

Appendix C-W1 YPM Costs

PLUMBING PREVENTATIVE MAINTENANCE¹
Annualized Items
CostWorks 2010
National Averages Adjusted to Reflect East Hall Location

Escalation	6%											
De-Escalation to July 2009	1.03											
De-Escalation Factor to be Applied	0.97											
Green Factor	1.20	Assumed Value										

Qty	Assembly #	Description	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Release	Location Adjustment
1.000	D2015 100 0000	Facility Plumbing Fixture Service									
1.000	D2015 100 1950	Urinals, annualized	0.23	\$ -	\$ 11.85	\$ -	\$ 11.85	\$ 14.70	\$ 18.40	2010	1.095
1.000	D2015 100 2950	Toilet (vacuum breaker type), annualized	0.23	\$ -	\$ 11.85	\$ -	\$ 11.85	\$ 14.70	\$ 18.40	2010	1.095
1.000	D2015 100 3950	Toilet (tank type), annualized	0.39	\$ -	\$ 20.00	\$ -	\$ 20.00	\$ 25.00	\$ 31.50	2010	1.095
1.000	D2015 100 4950	Lavatories, annualized	0.35	\$ 6.25	\$ 14.85	\$ -	\$ 21.10	\$ 26.50	\$ 32.00	2010	1.095
1.000	D2015 100 5950	Showers, annualized	0.23	\$ 7.50	\$ 9.70	\$ -	\$ 17.20	\$ 21.00	\$ 25.00	2010	1.095
1.000	D2015 800 0000	Drinking Fountain									
1.000	D2015 800 1950	Drink fountain, annualized	0.62	\$ 15.95	\$ 26.50	\$ -	\$ 42.45	\$ 52.00	\$ 62.50	2010	1.095
1.000	D2025 120 0000	Valve, Butterfly									
1.000	D2025 120 1950	Valve, butterfly, above 4", annualized	0.17	\$ 7.10	\$ 7.05	\$ -	\$ 14.15	\$ 17.05	\$ 20.50	2010	1.095
1.000	D2025 120 2950	Valve, butterfly, auto, above 4", annualized	0.35	\$ 7.10	\$ 14.80	\$ -	\$ 21.90	\$ 27.00	\$ 33.00	2010	1.095
1.000	D2025 125 0000	Valve, Check									
1.000	D2025 125 1950	Valve, check, above 4", annualized	0.26	\$ 7.10	\$ 10.95	\$ -	\$ 18.05	\$ 22.00	\$ 26.50	2010	1.095
1.000	D2025 130 0000	Valve, Cock									
1.000	D2025 130 1950	Valve, ball, above 4", annualized	0.17	\$ 7.10	\$ 7.05	\$ -	\$ 14.15	\$ 17.05	\$ 20.50	2010	1.095
1.000	D2025 135 0000	Valve, Diaphragm									
1.000	D2025 135 1950	Valve, diaphragm, above 4", annualized	0.12	\$ 7.10	\$ 5.20	\$ -	\$ 12.30	\$ 14.60	\$ 17.30	2010	1.095
1.000	D2025 140 0000	Valve, Gate									
1.000	D2025 140 1950	Valve, gate, above 4", annualized	0.16	\$ 7.10	\$ 6.75	\$ -	\$ 13.85	\$ 16.65	\$ 19.85	2010	1.095
1.000	D2025 145 0000	Valve, Globe									
1.000	D2025 145 1950	Valve, globe, above 4", annualized	0.16	\$ 7.10	\$ 6.75	\$ -	\$ 13.85	\$ 16.65	\$ 19.85	2010	1.095
1.000	D2025 145 2950	Valve, globe, auto, above 4", annualized	0.33	\$ 7.10	\$ 13.85	\$ -	\$ 20.95	\$ 26.00	\$ 31.50	2010	1.095
1.000	D2025 150 0000	Valve, Motor Operated									
1.000	D2025 150 1950	Valve, motor operated, above 4", annualized	1.00	\$ 14.15	\$ 42.50	\$ -	\$ 56.65	\$ 71.50	\$ 86.50	2010	1.095
1.000	D2025 155 0000	Valve, OS&Y									
1.000	D2025 155 1950	Valve, OS&Y, above 4", annualized	0.16	\$ 7.10	\$ 6.75	\$ -	\$ 13.85	\$ 16.65	\$ 19.85	2010	1.095

PLUMBING PREVENTATIVE MAINTENANCE ¹									
Annualized Items									
CostWorks 2010									
National Averages Adjusted to Reflect East Hall Location									
Escalation	6%								
De-Escalation to July 2009	1.03								
De-Escalation Factor to be Applied	0.97								
Green Factor	1.20	Assumed Value							
Qty	Assembly #	Description	Total Adjusted	De-Escalation Factor to July 2009	Total Non-Green	Green Factor	Total Adjusted Green Factor	De-Escalation Factor to July 2009	Total with All Adjustments
1.000	D2015 100 0000	Facility Plumbing Fixture Service							
1.000	D2015 100 1950	Urinals, annualized	\$ 20.15	0.97	\$ 19.55	1.20	\$ 24.18	0.97	\$ 23.46
1.000	D2015 100 2950	Toilet (vacuum breaker type), annualized	\$ 20.15	0.97	\$ 19.55	1.20	\$ 24.18	0.97	\$ 23.46
1.000	D2015 100 3950	Toilet (tank type), annualized	\$ 34.49	0.97	\$ 33.47	1.20	\$ 41.39	0.97	\$ 40.17
1.000	D2015 100 4950	Lavatories, annualized	\$ 35.04	0.97	\$ 34.00	1.20	\$ 42.05	0.97	\$ 40.80
1.000	D2015 100 5950	Showers, annualized	\$ 27.38	0.97	\$ 26.57	1.20	\$ 32.85	0.97	\$ 31.88
1.000	D2015 800 0000	Drinking Fountain							
1.000	D2015 800 1950	Drink fountain, annualized	\$ 68.44	0.97	\$ 66.41	1.20	\$ 82.13	0.97	\$ 79.70
1.000	D2025 120 0000	Valve, Butterfly							
1.000	D2025 120 1950	Valve, butterfly, above 4", annualized	\$ 22.45	0.97	\$ 21.78	1.20	\$ 26.94	0.97	\$ 26.14
1.000	D2025 120 2950	Valve, butterfly, auto, above 4", annualized	\$ 36.14	0.97	\$ 35.07	1.20	\$ 43.36	0.97	\$ 42.08
1.000	D2025 125 0000	Valve, Check							
1.000	D2025 125 1950	Valve, check, above 4", annualized	\$ 29.02	0.97	\$ 28.16	1.20	\$ 34.82	0.97	\$ 33.79
1.000	D2025 130 0000	Valve, Cock							
1.000	D2025 130 1950	Valve, ball, above 4", annualized	\$ 22.45	0.97	\$ 21.78	1.20	\$ 26.94	0.97	\$ 26.14
1.000	D2025 135 0000	Valve, Diaphragm							
1.000	D2025 135 1950	Valve, diaphragm, above 4", annualized	\$ 18.94	0.97	\$ 18.38	1.20	\$ 22.73	0.97	\$ 22.06
1.000	D2025 140 0000	Valve, Gate							
1.000	D2025 140 1950	Valve, gate, above 4", annualized	\$ 21.74	0.97	\$ 21.09	1.20	\$ 26.08	0.97	\$ 25.31
1.000	D2025 145 0000	Valve, Globe							
1.000	D2025 145 1950	Valve, globe, above 4", annualized	\$ 21.74	0.97	\$ 21.09	1.20	\$ 26.08	0.97	\$ 25.31
1.000	D2025 145 2950	Valve, globe, auto, above 4", annualized	\$ 34.49	0.97	\$ 33.47	1.20	\$ 41.39	0.97	\$ 40.17
1.000	D2025 150 0000	Valve, Motor Operated							
1.000	D2025 150 1950	Valve, motor operated, above 4", annualized	\$ 94.72	0.97	\$ 91.92	1.20	\$ 113.66	0.97	\$ 110.30
1.000	D2025 155 0000	Valve, OS&Y							
1.000	D2025 155 1950	Valve, OS&Y, above 4", annualized	\$ 21.74	0.97	\$ 21.09	1.20	\$ 26.08	0.97	\$ 25.31

PLUMBING PREVENTATIVE MAINTENANCE¹
Annualized Items
CostWorks 2010
National Averages Adjusted to Reflect East Hall Location

Escalation	6%										
De-Escalation to July 2009	1.03										
De-Escalation Factor to be Applied	0.97										
Green Factor	1.20	Assumed Value									

Qty	Assembly #	Description	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Release	Location Adjustment
1.000	D2025 190 0000	Water Heater, Solar									
1.000	D2025 190 1950	Water heating systemclosed loop, panels, annualized	3.40	\$ 214.00	\$ 176.00	\$ -	\$ 390.00	\$ 455.00	\$ 540.00	2010	1.095
1.000	D2025 260 0000	Water Heater, Gas/Oil/Steam									
1.000	D2025 260 1950	Water heater, gas, to 120 gal., annualized	1.72	\$ 57.00	\$ 89.00	\$ -	\$ 146.00	\$ 173.00	\$ 209.00	2010	1.095
1.000	D2025 260 2950	Water heater, oil fired, to 100 gal., annualized	2.85	\$ 71.00	\$ 148.00	\$ -	\$ 219.00	\$ 261.00	\$ 320.00	2010	1.095
1.000	D2025 260 3950	Water heater, steam 2500 gal., annualized	1.55	\$ 28.50	\$ 80.50	\$ -	\$ 109.00	\$ 131.00	\$ 161.00	2010	1.095
1.000	D2025 262 0000	Valve, Pressure Relief									
1.000	D2025 262 1950	Valve, pressure relief, above 4", annualized	0.15	\$ -	\$ 6.30	\$ -	\$ 6.30	\$ 8.25	\$ 10.20	2010	1.095
1.000	D2025 265 0000	Valve, Pressure Regulator									
1.000	D2025 265 1950	Valve, pressure regular, above 4", annualized	0.36	\$ -	\$ 15.30	\$ -	\$ 15.30	\$ 20.00	\$ 24.50	2010	1.095
1.000	D2025 270 0000	Valve, Sediment Strainer									
1.000	D2025 270 1950	Valve, sediment strainer, above 4", annualized	0.31	\$ -	\$ 13.35	\$ -	\$ 13.35	\$ 17.45	\$ 21.50	2010	1.095
1.000	D2025 310 0000	Valve, Automatic									
1.000	D2025 310 1950	Valve, automatic, above 4", annualized	0.19	\$ 7.10	\$ 7.95	\$ -	\$ 15.05	\$ 18.25	\$ 22.00	2010	1.095
1.000	D2025 310 2950	Valve, auto diaphragm, above 4", annualized	0.18	\$ 7.10	\$ 7.45	\$ -	\$ 14.55	\$ 17.55	\$ 21.00	2010	1.095
1.000	D2095 905 0000	Duplex Sump									
1.000	D2095 905 1950	Duplex sump, annualized	1.65	\$ 28.50	\$ 86.00	\$ -	\$ 114.50	\$ 139.00	\$ 169.00	2010	1.095
1.000	D2095 910 0000	Pump, Submersible									
1.000	D2095 910 1950	Submersible, 1 H.P. and over, annualized	3.85	\$ 28.50	\$ 200.00	\$ -	\$ 228.50	\$ 281.00	\$ 345.00	2010	1.095
1.000	D2095 930 0000	Oxygen Monitor									
1.000	D2095 930 1950	Oxygen monitor, annualized	5.00	\$ 195.00	\$ 213.00	\$ -	\$ 408.00	\$ 495.00	\$ 590.00	2010	1.095

PLUMBING PREVENTATIVE MAINTENANCE ¹									
Annualized Items									
CostWorks 2010									
National Averages Adjusted to Reflect East Hall Location									
Escalation	6%								
De-Escalation to July 2009	1.03								
De-Escalation Factor to be Applied	0.97								
Green Factor	1.20	Assumed Value							
Qty	Assembly #	Description	Total Adjusted	De-Escalation Factor to July 2009	Total Non-Green	Green Factor	Total Adjusted Green Factor	De-Escalation Factor to July 2009	Total with All Adjustments
1.000	D2025 190 0000	Water Heater, Solar							
1.000	D2025 190 1950	Water heating systemclosed loop, panels, annualized	\$ 591.30	0.97	\$ 573.82	1.20	\$ 709.56	0.97	\$ 688.58
1.000	D2025 260 0000	Water Heater, Gas/Oil/Steam							
1.000	D2025 260 1950	Water heater, gas, to 120 gal., annualized	\$ 228.86	0.97	\$ 222.09	1.20	\$ 274.63	0.97	\$ 266.51
1.000	D2025 260 2950	Water heater, oil fired, to 100 gal., annualized	\$ 350.40	0.97	\$ 340.04	1.20	\$ 420.48	0.97	\$ 408.05
1.000	D2025 260 3950	Water heater, steam 2500 gal., annualized	\$ 176.30	0.97	\$ 171.08	1.20	\$ 211.55	0.97	\$ 205.30
1.000	D2025 262 0000	Valve, Pressure Relief							
1.000	D2025 262 1950	Valve, pressure relief, above 4", annualized	\$ 11.17	0.97	\$ 10.84	1.20	\$ 13.40	0.97	\$ 13.01
1.000	D2025 265 0000	Valve, Pressure Regulator							
1.000	D2025 265 1950	Valve, pressure regular, above 4", annualized	\$ 26.83	0.97	\$ 26.03	1.20	\$ 32.19	0.97	\$ 31.24
1.000	D2025 270 0000	Valve, Sediment Strainer							
1.000	D2025 270 1950	Valve, sediment strainer, above 4", annualized	\$ 23.54	0.97	\$ 22.85	1.20	\$ 28.25	0.97	\$ 27.42
1.000	D2025 310 0000	Valve, Automatic							
1.000	D2025 310 1950	Valve, automatic, above 4", annualized	\$ 24.09	0.97	\$ 23.38	1.20	\$ 28.91	0.97	\$ 28.05
1.000	D2025 310 2950	Valve, auto diaphragm, above 4", annualized	\$ 23.00	0.97	\$ 22.32	1.20	\$ 27.59	0.97	\$ 26.78
1.000	D2095 905 0000	Duplex Sump							
1.000	D2095 905 1950	Duplex sump, annualized	\$ 185.06	0.97	\$ 179.58	1.20	\$ 222.07	0.97	\$ 215.50
1.000	D2095 910 0000	Pump, Submersible							
1.000	D2095 910 1950	Submersible, 1 H.P. and over, annualized	\$ 377.78	0.97	\$ 366.61	1.20	\$ 453.33	0.97	\$ 439.93
1.000	D2095 930 0000	Oxygen Monitor							
1.000	D2095 930 1950	Oxygen monitor, annualized	\$ 646.05	0.97	\$ 626.95	1.20	\$ 775.26	0.97	\$ 752.34
					\$ 3,099.00				\$ 3,718.80
					Total Yearly Preventative Maintenance Cost			Total Yearly Preventative Maintenance Cost	
					Non-Green			Green	

PLUMBING PREVENTATIVE MAINTENANCE ¹											
Annualized Items											
CostWorks 2010											
National Averages Adjusted to Reflect East Hall Location											
Escalation	6%										
De-Escalation to July 2009	1.03										
De-Escalation Factor to be Applied	0.97										
Green Factor	1.20	Assumed Value									
SUMMARY OF FINDINGS											
Qty	Assembly #	Description	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Release	Location Adjustment
		Description	Cost	% Difference	Comments						
		Yearly Non-Green Preventative Maintenance Costs	\$ 3,099.00								
		Yearly Green Preventative Maintenance Costs	\$ 3,718.80	16.67%	Green Costs are 16.67% higher than Non-Green based on this analysis						
FOOTNOTES:											
1											
		RS Means CostWorks 2010 Operations and Maintenance									

Appendix C-W2 FMRR Costs

PLUMBING REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.20	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2023 260 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/12 HP	0.5	1 Plum	Ea.	\$ 7.04	\$ 8.79	1.095	\$ 9.63	0.97
1.000	D2023 266 0020	Inspect/check pump/motor operation, lub. circulation pump, bronze 1 HP	0.5	1 Plum	Ea.	\$ 7.04	\$ 8.79	1.095	\$ 9.63	0.97
1.000	D2023 267 0020	Insp/chk pump/mtr oper, lub, chk align circulation pump, CI 1-1/2 HP	0.5	1 Plum	Ea.	\$ 10.48	\$ 13.09	1.095	\$ 14.33	0.97
1.000	D2013 810 0010	Check / minor repairs drinking fountain	1	1 Plum	Ea.	\$ 43.00	\$ 54.00	1.095	\$ 59.13	0.97
1.000	D2023 210 0020	Clean and service water heater, gas / oil, 30 gallon	1	1 Plum	Ea.	\$ 172.00	\$ 215.00	1.095	\$ 235.43	0.97
1.000	D2023 212 0020	Clean & service water heater, gas / oil, 70 gallon	1	1 Plum	Ea.	\$ 172.00	\$ 215.00	1.095	\$ 235.43	0.97
1.000	D2023 230 0020	Inspect for leaks steam converter, domestic hot water	1	1 Plum	Ea.	\$ 5.94	\$ 7.43	1.095	\$ 8.14	0.97
1.000	D2023 261 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/8 HP	1	1 Plum	Ea.	\$ 7.04	\$ 8.79	1.095	\$ 9.63	0.97
1.000	D2023 262 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/6 HP	1	1 Plum	Ea.	\$ 7.04	\$ 8.79	1.095	\$ 9.63	0.97
1.000	D2023 264 0020	Insp./chk. pump/mtr. oper., lub., chk. align. circulation pump, 1/2 HP	1	1 Plum	Ea.	\$ 10.48	\$ 13.09	1.095	\$ 14.33	0.97
1.000	D2043 110 1010	General maintenance & repair distribution: gutters, pipe	1	1 Plum	M.L.F.	\$ 264.70	\$ 333.40	1.095	\$ 365.07	0.97
1.000	D2043 210 1010	General maintenance & repair drain: roof, scupper, area	1	1 Plum	Ea.	\$ 32.70	\$ 40.90	1.095	\$ 44.79	0.97
1.000	D2043 310 1020	Insp./chk. pump/mtr. oper., lub., chk. align. rainwater sump pump	1	1 Plum	Ea.	\$ 10.48	\$ 13.09	1.095	\$ 14.33	0.97
1.000	D2093 946 1010	Check and adjust 2 H.P. compressor	1	1 Plum	Ea.	\$ 74.29	\$ 92.78	1.095	\$ 101.59	0.97
1.000	D2093 946 3010	Check and adjust 10 H.P. compressor	1	1 Plum	Ea.	\$ 74.29	\$ 92.78	1.095	\$ 101.59	0.97
1.000	D2093 946 4010	Check and adjust 25 H.P. compressor	1	1 Plum	Ea.	\$ 74.29	\$ 92.78	1.095	\$ 101.59	0.97
1.000	D2093 946 5030	Check operation compressed air systems	1	1 Stpi	Ea.	\$ 20.50	\$ 25.50	1.095	\$ 27.92	0.97
1.000	D2013 310 0020	Replace washer in faucet lavatory, iron, enamel	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 310 0050	Clean out strainer and P trap lavatory, iron, enamel	2	1 Plum	Ea.	\$ 30.60	\$ 38.65	1.095	\$ 42.32	0.97
1.000	D2013 330 0020	Replace washer in faucet lavatory, vitreous china	2	1 Plum	Ea.	\$ 11.22	\$ 13.97	1.095	\$ 15.30	0.97
1.000	D2013 330 0050	Clean out strainer and P trap lavatory, vitreous china	2	1 Plum	Ea.	\$ 30.60	\$ 38.65	1.095	\$ 42.32	0.97
1.000	D2013 350 0020	Replace washer in faucet lavatory, enameled steel	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97

PLUMBING REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

CostWorks 2010

Costs Reflect National Averages

Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value			GREEN		

Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2023 260 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/12 HP	\$ 9.34	1.20	\$ 11.55	0.97	\$ 11.21
1.000	D2023 266 0020	Inspect/check pump/motor operation, lub. circulation pump, bronze 1 HP	\$ 9.34	1.20	\$ 11.55	0.97	\$ 11.21
1.000	D2023 267 0020	Insp/chk pump/mtr oper, lub, chk align circulation pump, CI 1-1/2 HP	\$ 13.91	1.20	\$ 17.20	0.97	\$ 16.69
			\$ 32.59				\$ 39.11
			\$ 32.59	Assumed 100%		Assumed 100%	\$ 39.11
				PER 0.5 YR		PER 0.5 YR	
1.000	D2013 810 0010	Check / minor repairs drinking fountain	\$ 57.38	1.20	\$ 70.96	0.97	\$ 68.86
1.000	D2023 210 0020	Clean and service water heater, gas / oil, 30 gallon	\$ 228.47	1.20	\$ 282.51	0.97	\$ 274.16
1.000	D2023 212 0020	Clean & service water heater, gas / oil, 70 gallon	\$ 228.47	1.20	\$ 282.51	0.97	\$ 274.16
1.000	D2023 230 0020	Inspect for leaks steam converter, domestic hot water	\$ 7.90	1.20	\$ 9.76	0.97	\$ 9.47
1.000	D2023 261 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/8 HP	\$ 9.34	1.20	\$ 11.55	0.97	\$ 11.21
1.000	D2023 262 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/6 HP	\$ 9.34	1.20	\$ 11.55	0.97	\$ 11.21
1.000	D2023 264 0020	Insp./chk. pump/mtr. oper., lub., chk. align. circulation pump, 1/2 HP	\$ 13.91	1.20	\$ 17.20	0.97	\$ 16.69
1.000	D2043 110 1010	General maintenance & repair distribution: gutters, pipe	\$ 354.28	1.20	\$ 438.09	0.97	\$ 425.14
1.000	D2043 210 1010	General maintenance & repair drain: roof, scupper, area	\$ 43.46	1.20	\$ 53.74	0.97	\$ 52.15
1.000	D2043 310 1020	Insp./chk. pump/mtr. oper., lub., chk. align. rainwater sump pump	\$ 13.91	1.20	\$ 17.20	0.97	\$ 16.69
1.000	D2093 946 1010	Check and adjust 2 H.P. compressor	\$ 98.59	1.20	\$ 121.91	0.97	\$ 118.31
1.000	D2093 946 3010	Check and adjust 10 H.P. compressor	\$ 98.59	1.20	\$ 121.91	0.97	\$ 118.31
1.000	D2093 946 4010	Check and adjust 25 H.P. compressor	\$ 98.59	1.20	\$ 121.91	0.97	\$ 118.31
1.000	D2093 946 5030	Check operation compressed air systems	\$ 27.10	1.20	\$ 33.51	0.97	\$ 32.52
			\$ 1,289.32				\$ 1,547.18
			\$ 1,289.32	Assumed 100%		Assumed 100%	\$ 1,547.18
				PER 1 YR		PER 1 YR	
1.000	D2013 310 0020	Replace washer in faucet lavatory, iron, enamel	\$ 14.75	1.20	\$ 18.24	0.97	\$ 17.70
1.000	D2013 310 0050	Clean out strainer and P trap lavatory, iron, enamel	\$ 41.07	1.20	\$ 50.79	0.97	\$ 49.28
1.000	D2013 330 0020	Replace washer in faucet lavatory, vitreous china	\$ 14.84	1.20	\$ 18.36	0.97	\$ 17.81
1.000	D2013 330 0050	Clean out strainer and P trap lavatory, vitreous china	\$ 41.07	1.20	\$ 50.79	0.97	\$ 49.28
1.000	D2013 350 0020	Replace washer in faucet lavatory, enameled steel	\$ 14.75	1.20	\$ 18.24	0.97	\$ 17.70

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.20	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2013 350 0050	Clean out strainer and P trap lavatory, enameled steel	2	1 Plum	Ea.	\$ 30.60	\$ 38.65	1.095	\$ 42.32	0.97
1.000	D2013 410 0010	Replace faucet washer sink, iron enamel	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 410 0040	Unstop sink sink, iron enamel	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 420 0010	Replace faucet washer sink, enameled steel	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 420 0040	Unstop sink enameled steel	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 430 0010	Replace faucet washer sink, stainless steel	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 430 0040	Unstop sink, stainless steel	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 440 0010	Replace faucet washer sink, plastic	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 440 0040	Unstop, sink, plastic	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 450 0020	Replace washer in faucet laundry sink, plastic	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 450 0050	Clean out strainer and P trap laundry sink, plastic	2	1 Plum	Ea.	\$ 30.60	\$ 38.65	1.095	\$ 42.32	0.97
1.000	D2013 460 0010	Replace faucet washer	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 460 0040	Unstop sink	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 510 0020	Replace mixing valve barrel bathtub, cast iron enamel	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 530 0020	Replace mixing valve barrel bathtub, enameled steel	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 550 0020	Replace mixing valve barrel bathtub, fiberglass	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 710 0020	Replace mixing valve barrel shower, terrazzo	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 730 0020	Replace mixing valve barrel shower, enameled steel	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 750 0020	Replace mixing valve barrel shower, fiberglass	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 770 0020	Replace mixing valve barrel shower, misc.	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 810 0030	Correct water pressure drinking fountain	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 810 0040	Replace refrigerant drinking fountain	2	1 Plum	Ea.	\$ 22.50	\$ 26.50	1.095	\$ 29.02	0.97
1.000	D2023 214 0010	Minor repairs, adjustments water heater, gas / oil, 1150 GPH	2	2 Plum	Ea.	\$ 86.00	\$ 108.00	1.095	\$ 118.26	0.97
1.000	D2023 214 0020	Clean & service water heater, gas / oil, 1150 GPH	2	2 Plum	Ea.	\$ 515.00	\$ 645.00	1.095	\$ 706.28	0.97
1.000	D2093 910 1010	General maintenance pipe & fittings, industrial gas	2	1 Plum	M.L.F.	\$ 32.50	\$ 40.50	1.095	\$ 44.35	0.97
1.000	D2093 940 1010	General maintenance pipe & fittings, compressed air	2	1 Plum	M.L.F.	\$ 32.50	\$ 40.50	1.095	\$ 44.35	0.97
1.000	D2013 410 0020	Clean trap sink, iron enamel	3	1 Plum	Ea.	\$ 7.51	\$ 9.39	1.095	\$ 10.28	0.97
1.000	D2013 420 0020	Clean trap sink, enameled steel	3	1 Plum	Ea.	\$ 7.51	\$ 9.39	1.095	\$ 10.28	0.97
1.000	D2013 430 0020	Clean trap sink, stainless steel	3	1 Plum	Ea.	\$ 7.51	\$ 9.39	1.095	\$ 10.28	0.97
1.000	D2013 440 0020	Clean trap sink, plastic	3	1 Plum	Ea.	\$ 7.51	\$ 9.39	1.095	\$ 10.28	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2013 350 0050	Clean out strainer and P trap lavatory, enameled steel	\$ 41.07	1.20	\$ 50.79	0.97	\$ 49.28
1.000	D2013 410 0010	Replace faucet washer sink, iron enamel	\$ 14.75	1.20	\$ 18.24	0.97	\$ 17.70
1.000	D2013 410 0040	Unstop sink sink, iron enamel	\$ 48.88	1.20	\$ 60.44	0.97	\$ 58.66
1.000	D2013 420 0010	Replace faucet washer sink, enameled steel	\$ 14.75	1.20	\$ 18.24	0.97	\$ 17.70
1.000	D2013 420 0040	Unstop sink enameled steel	\$ 48.88	1.20	\$ 60.44	0.97	\$ 58.66
1.000	D2013 430 0010	Replace faucet washer sink, stainless steel	\$ 14.75	1.20	\$ 18.24	0.97	\$ 17.70
1.000	D2013 430 0040	Unstop sink, stainless steel	\$ 48.88	1.20	\$ 60.44	0.97	\$ 58.66
1.000	D2013 440 0010	Replace faucet washer sink, plastic	\$ 14.75	1.20	\$ 18.24	0.97	\$ 17.70
1.000	D2013 440 0040	Unstop, sink, plastic	\$ 48.88	1.20	\$ 60.44	0.97	\$ 58.66
1.000	D2013 450 0020	Replace washer in faucet laundry sink, plastic	\$ 14.75	1.20	\$ 18.24	0.97	\$ 17.70
1.000	D2013 450 0050	Clean out strainer and P trap laundry sink, plastic	\$ 41.07	1.20	\$ 50.79	0.97	\$ 49.28
1.000	D2013 460 0010	Replace faucet washer	\$ 14.75	1.20	\$ 18.24	0.97	\$ 17.70
1.000	D2013 460 0040	Unstop sink	\$ 48.88	1.20	\$ 60.44	0.97	\$ 58.66
1.000	D2013 510 0020	Replace mixing valve barrel bathtub, cast iron enamel	\$ 213.72	1.20	\$ 264.27	0.97	\$ 256.46
1.000	D2013 530 0020	Replace mixing valve barrel bathtub, enameled steel	\$ 213.72	1.20	\$ 264.27	0.97	\$ 256.46
1.000	D2013 550 0020	Replace mixing valve barrel bathtub, fiberglass	\$ 213.72	1.20	\$ 264.27	0.97	\$ 256.46
1.000	D2013 710 0020	Replace mixing valve barrel shower, terrazzo	\$ 213.72	1.20	\$ 264.27	0.97	\$ 256.46
1.000	D2013 730 0020	Replace mixing valve barrel shower, enameled steel	\$ 213.72	1.20	\$ 264.27	0.97	\$ 256.46
1.000	D2013 750 0020	Replace mixing valve barrel shower, fiberglass	\$ 213.72	1.20	\$ 264.27	0.97	\$ 256.46
1.000	D2013 770 0020	Replace mixing valve barrel shower, misc.	\$ 213.72	1.20	\$ 264.27	0.97	\$ 256.46
1.000	D2013 810 0030	Correct water pressure drinking fountain	\$ 48.88	1.20	\$ 60.44	0.97	\$ 58.66
1.000	D2013 810 0040	Replace refrigerant drinking fountain	\$ 28.16	1.20	\$ 34.82	0.97	\$ 33.79
1.000	D2023 214 0010	Minor repairs, adjustments water heater, gas / oil, 1150 GPH	\$ 114.76	1.20	\$ 141.91	0.97	\$ 137.72
1.000	D2023 214 0020	Clean & service water heater, gas / oil, 1150 GPH	\$ 685.40	1.20	\$ 847.53	0.97	\$ 822.47
1.000	D2093 910 1010	General maintenance pipe & fittings, industrial gas	\$ 43.04	1.20	\$ 53.22	0.97	\$ 51.64
1.000	D2093 940 1010	General maintenance pipe & fittings, compressed air	\$ 43.04	1.20	\$ 53.22	0.97	\$ 51.64
			\$ 3,000.81				\$ 3,600.97
			\$ 3,000.81	Assumed 100%		Assumed 100%	\$ 3,600.97
				PER 1 YR		PER 1 YR	
1.000	D2013 410 0020	Clean trap sink, iron enamel	\$ 9.98	1.20	\$ 12.34	0.97	\$ 11.97
1.000	D2013 420 0020	Clean trap sink, enameled steel	\$ 9.98	1.20	\$ 12.34	0.97	\$ 11.97
1.000	D2013 430 0020	Clean trap sink, stainless steel	\$ 9.98	1.20	\$ 12.34	0.97	\$ 11.97
1.000	D2013 440 0020	Clean trap sink, plastic	\$ 9.98	1.20	\$ 12.34	0.97	\$ 11.97

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.20	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2013 460 0020	Clean trap	3	1 Plum	Ea.	\$ 7.51	\$ 9.39	1.095	\$ 10.28	0.97
1.000	D2013 510 0010	Inspect / clean shower head bathtub, cast iron enamel	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 530 0010	Inspect / clean shower head bathtub, enameled steel	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 550 0010	Inspect / clean shower head bathtub, fiberglass	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 710 0010	Inspect / clean shower head shower, terrazzo	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 730 0010	Inspect / clean shower head shower, enameled steel	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 750 0010	Inspect / clean shower head fiberglass	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 770 0010	Inspect / clean shower head	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 910 0020	Inspect and clean shower head emergency shower station	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 920 0020	Inspect and clean spray heads, emergency eye wash	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2023 220 0020	Check operation water heater, electric, 120 gallon	3	1 Plum	Ea.	\$ 2.27	\$ 2.83	1.095	\$ 3.10	0.97
1.000	D2023 222 0020	Check operation water heater, electric, 300 gallon	3	1 Plum	Ea.	\$ 2.27	\$ 2.83	1.095	\$ 3.10	0.97
1.000	D2023 224 0020	Check operation water heater, electric, 1000 gallon	3	1 Plum	Ea.	\$ 2.27	\$ 2.83	1.095	\$ 3.10	0.97
1.000	D2023 226 0020	Check operation water heater, electric, 2000 gallon	3	1 Plum	Ea.	\$ 2.27	\$ 2.83	1.095	\$ 3.10	0.97
1.000	D2013 810 0020	Repair internal leaks drinking fountain	4	1 Plum	Ea.	\$ 39.50	\$ 49.50	1.095	\$ 54.20	0.97
1.000	D2013 810 0050	Repair drain leak drinking fountain	4	1 Plum	Ea.	\$ 25.85	\$ 31.19	1.095	\$ 34.15	0.97
1.000	D2033 310 0010	Clean floor drain w/o bucket	4	1 Plum	Ea.	\$ 103.00	\$ 128.00	1.095	\$ 140.16	0.97
1.000	D2013 110 0020	Unplug clogged line tankless water closet	5	1 Plum	Ea.	\$ 191.32	\$ 239.44	1.095	\$ 262.19	0.97
1.000	D2013 110 0050	Replace wax ring gasket tankless water closet	5	1 Plum	Ea.	\$ 124.82	\$ 155.94	1.095	\$ 170.75	0.97
1.000	D2013 130 0010	Unplug clogged line flush-tank water closet	5	1 Plum	Ea.	\$ 191.32	\$ 239.44	1.095	\$ 262.19	0.97
1.000	D2013 130 0020	Replace washer / diaphragm in ball cock flush-tank water closet	5	1 Plum	Ea.	\$ 15.72	\$ 19.48	1.095	\$ 21.33	0.97
1.000	D2013 210 0020	Unplug line urinal	5	1 Plum	Ea.	\$ 127.32	\$ 159.44	1.095	\$ 174.59	0.97
1.000	D2023 210 0010	Overhaul water heater, gas / oil, 30 gallon	5	1 Plum	Ea.	\$ 102.58	\$ 128.45	1.095	\$ 140.65	0.97
1.000	D2023 212 0010	Overhaul water heater, gas / oil, 70 gallon	5	1 Plum	Ea.	\$ 143.80	\$ 180.22	1.095	\$ 197.34	0.97
1.000	D2023 250 0010	Refill expansion chamber	5	1 Plum	Ea.	\$ 2.52	\$ 3.15	1.095	\$ 3.45	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2013 460 0020	Clean trap	\$ 9.98	1.20	\$ 12.34	0.97	\$ 11.97
1.000	D2013 510 0010	Inspect / clean shower head bathtub, cast iron enamel	\$ 57.40	1.20	\$ 70.98	0.97	\$ 68.88
1.000	D2013 530 0010	Inspect / clean shower head bathtub, enameled steel	\$ 57.40	1.20	\$ 70.98	0.97	\$ 68.88
1.000	D2013 550 0010	Inspect / clean shower head bathtub, fiberglass	\$ 57.40	1.20	\$ 70.98	0.97	\$ 68.88
1.000	D2013 710 0010	Inspect / clean shower head shower, terrazzo	\$ 57.40	1.20	\$ 70.98	0.97	\$ 68.88
1.000	D2013 730 0010	Inspect / clean shower head shower, enameled steel	\$ 57.40	1.20	\$ 70.98	0.97	\$ 68.88
1.000	D2013 750 0010	Inspect / clean shower head fiberglass	\$ 57.40	1.20	\$ 70.98	0.97	\$ 68.88
1.000	D2013 770 0010	Inspect / clean shower head	\$ 57.40	1.20	\$ 70.98	0.97	\$ 68.88
1.000	D2013 910 0020	Inspect and clean shower head emergency shower station	\$ 57.40	1.20	\$ 70.98	0.97	\$ 68.88
1.000	D2013 920 0020	Inspect and clean spray heads, emergency eye wash	\$ 57.40	1.20	\$ 70.98	0.97	\$ 68.88
1.000	D2023 220 0020	Check operation water heater, electric, 120 gallon	\$ 3.01	1.20	\$ 3.72	0.97	\$ 3.61
1.000	D2023 222 0020	Check operation water heater, electric, 300 gallon	\$ 3.01	1.20	\$ 3.72	0.97	\$ 3.61
1.000	D2023 224 0020	Check operation water heater, electric, 1000 gallon	\$ 3.01	1.20	\$ 3.72	0.97	\$ 3.61
1.000	D2023 226 0020	Check operation water heater, electric, 2000 gallon	\$ 3.01	1.20	\$ 3.72	0.97	\$ 3.61
			\$ 578.55				\$ 694.26
			\$ 578.55	Assumed 100%		Assumed 100%	\$ 694.26
				PER 3 YR		PER 3 YR	
1.000	D2013 810 0020	Repair internal leaks drinking fountain	\$ 52.60	1.20	\$ 65.04	0.97	\$ 63.12
1.000	D2013 810 0050	Repair drain leak drinking fountain	\$ 33.14	1.20	\$ 40.98	0.97	\$ 39.77
1.000	D2033 310 0010	Clean floor drain w/o bucket	\$ 136.02	1.20	\$ 168.19	0.97	\$ 163.22
			\$ 221.76				\$ 266.11
			\$ 221.76	Assumed 100%		Assumed 100%	\$ 266.11
				PER 4 YR		PER 4 YR	
1.000	D2013 110 0020	Unplug clogged line tankless water closet	\$ 254.44	1.20	\$ 314.62	0.97	\$ 305.32
1.000	D2013 110 0050	Replace wax ring gasket tankless water closet	\$ 165.71	1.20	\$ 204.91	0.97	\$ 198.85
1.000	D2013 130 0010	Unplug clogged line flush-tank water closet	\$ 254.44	1.20	\$ 314.62	0.97	\$ 305.32
1.000	D2013 130 0020	Replace washer / diaphragm in ball cock flush-tank water closet	\$ 20.70	1.20	\$ 25.60	0.97	\$ 24.84
1.000	D2013 210 0020	Unplug line urinal	\$ 169.43	1.20	\$ 209.50	0.97	\$ 203.31
1.000	D2023 210 0010	Overhaul water heater, gas / oil, 30 gallon	\$ 136.49	1.20	\$ 168.78	0.97	\$ 163.79
1.000	D2023 212 0010	Overhaul water heater, gas / oil, 70 gallon	\$ 191.51	1.20	\$ 236.81	0.97	\$ 229.81
1.000	D2023 250 0010	Refill expansion chamber	\$ 3.35	1.20	\$ 4.14	0.97	\$ 4.02

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.20	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2033 330 0010	Clean out bucket floor drain with bucket	5	1 Plum	Ea.	\$ 258.00	\$ 325.00	1.095	\$ 355.88	0.97
1.000	D2013 210 0010	Replace flush valve diaphragm urinal	7	1 Plum	Ea.	\$ 34.51	\$ 41.39	1.095	\$ 45.32	0.97
1.000	D2013 310 0010	Replace washer in spud connection lavatory, iron, enamel	7	1 Plum	Ea.	\$ 21.74	\$ 25.46	1.095	\$ 27.88	0.97
1.000	D2013 330 0010	Replace washer in spud connection lavatory, vitreous china	7	1 Plum	Ea.	\$ 25.80	\$ 30.54	1.095	\$ 33.44	0.97
1.000	D2013 350 0010	Replace washer in spud connection lavatory, enameled steel	7	1 Plum	Ea.	\$ 26.01	\$ 30.80	1.095	\$ 33.73	0.97
1.000	D2023 220 0010	Drain and flush water heater, electric, 120 gallon	7	1 Plum	Ea.	\$ 258.00	\$ 325.00	1.095	\$ 355.88	0.97
1.000	D2023 222 0010	Drain and flush water heater, electric, 300 gallon	7	1 Plum	Ea.	\$ 258.00	\$ 325.00	1.095	\$ 355.88	0.97
1.000	D2023 224 0010	Drain and flush water heater, electric, 1000 gallon	7	1 Plum	Ea.	\$ 258.00	\$ 325.00	1.095	\$ 355.88	0.97
1.000	D2023 226 0010	Drain and flush water heater, electric, 2000 gallon	7	1 Plum	Ea.	\$ 258.00	\$ 325.00	1.095	\$ 355.88	0.97
1.000	D2013 110 0010	Replace flush valve diaphragm tankless water closet	10	1 Plum	Ea.	\$ 34.51	\$ 41.39	1.095	\$ 45.32	0.97
1.000	D2013 310 0040	Replace faucets lavatory, iron, enamel	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 330 0040	Replace faucets lavatory, vitreous china	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 350 0040	Replace faucets lavatory, enameled steel	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 410 0030	Replace faucets sink, iron enamel	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 420 0030	Replace faucets sink, enameled steel	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 430 0030	Replace faucets sink, stainless steel	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 440 0030	Replace faucets sink, plastic	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 450 0040	Replace faucets laundry sink, plastic	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 460 0030	Replace faucets	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 510 0030	Replace mixing valve bathtub, cast iron enamel	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 530 0030	Replace mixing valve bathtub, enameled steel	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 550 0030	Replace mixing valve bathtub, fiberglass	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 710 0030	Replace mixing valve shower, terrazzo	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 730 0030	Replace mixing valve shower, enameled steel	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 750 0030	Replace mixing valve shower, fiberglass	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2033 330 0010	Clean out bucket floor drain with bucket	\$ 345.35	1.20	\$ 427.05	0.97	\$ 414.43
			\$ 1,541.41				\$ 1,849.69
			\$ 1,541.41	Assumed 100%		Assumed 100%	\$ 1,849.69
				PER 5 YR		PER 5 YR	
1.000	D2013 210 0010	Replace flush valve diaphragm urinal	\$ 43.98	1.20	\$ 54.39	0.97	\$ 52.78
1.000	D2013 310 0010	Replace washer in spud connection lavatory, iron, enamel	\$ 27.05	1.20	\$ 33.45	0.97	\$ 32.47
1.000	D2013 330 0010	Replace washer in spud connection lavatory, vitreous china	\$ 32.45	1.20	\$ 40.13	0.97	\$ 38.94
1.000	D2013 350 0010	Replace washer in spud connection lavatory, enameled steel	\$ 32.73	1.20	\$ 40.47	0.97	\$ 39.27
1.000	D2023 220 0010	Drain and flush water heater, electric, 120 gallon	\$ 345.35	1.20	\$ 427.05	0.97	\$ 414.43
1.000	D2023 222 0010	Drain and flush water heater, electric, 300 gallon	\$ 345.35	1.20	\$ 427.05	0.97	\$ 414.43
1.000	D2023 224 0010	Drain and flush water heater, electric, 1000 gallon	\$ 345.35	1.20	\$ 427.05	0.97	\$ 414.43
1.000	D2023 226 0010	Drain and flush water heater, electric, 2000 gallon	\$ 345.35	1.20	\$ 427.05	0.97	\$ 414.43
			\$ 1,517.64				\$ 1,821.16
			\$ 1,517.64	Assumed 100%		Assumed 100%	\$ 1,821.16
				PER 7 YR		PER 7 YR	
1.000	D2013 110 0010	Replace flush valve diaphragm tankless water closet	\$ 43.98	1.20	\$ 54.39	0.97	\$ 52.78
1.000	D2013 310 0040	Replace faucets lavatory, iron, enamel	\$ 183.96	1.20	\$ 227.48	0.97	\$ 220.75
1.000	D2013 330 0040	Replace faucets lavatory, vitreous china	\$ 183.96	1.20	\$ 227.48	0.97	\$ 220.75
1.000	D2013 350 0040	Replace faucets lavatory, enameled steel	\$ 183.96	1.20	\$ 227.48	0.97	\$ 220.75
1.000	D2013 410 0030	Replace faucets sink, iron enamel	\$ 183.96	1.20	\$ 227.48	0.97	\$ 220.75
1.000	D2013 420 0030	Replace faucets sink, enameled steel	\$ 183.96	1.20	\$ 227.48	0.97	\$ 220.75
1.000	D2013 430 0030	Replace faucets sink, stainless steel	\$ 183.96	1.20	\$ 227.48	0.97	\$ 220.75
1.000	D2013 440 0030	Replace faucets sink, plastic	\$ 183.96	1.20	\$ 227.48	0.97	\$ 220.75
1.000	D2013 450 0040	Replace faucets laundry sink, plastic	\$ 183.96	1.20	\$ 227.48	0.97	\$ 220.75
1.000	D2013 460 0030	Replace faucets	\$ 183.96	1.20	\$ 227.48	0.97	\$ 220.75
1.000	D2013 510 0030	Replace mixing valve bathtub, cast iron enamel	\$ 417.21	1.20	\$ 515.90	0.97	\$ 500.65
1.000	D2013 530 0030	Replace mixing valve bathtub, enameled steel	\$ 417.21	1.20	\$ 515.90	0.97	\$ 500.65
1.000	D2013 550 0030	Replace mixing valve bathtub, fiberglass	\$ 417.21	1.20	\$ 515.90	0.97	\$ 500.65
1.000	D2013 710 0030	Replace mixing valve shower, terrazzo	\$ 417.21	1.20	\$ 515.90	0.97	\$ 500.65
1.000	D2013 730 0030	Replace mixing valve shower, enameled steel	\$ 417.21	1.20	\$ 515.90	0.97	\$ 500.65
1.000	D2013 750 0030	Replace mixing valve shower, fiberglass	\$ 417.21	1.20	\$ 515.90	0.97	\$ 500.65

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.20	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2013 770 0030	Replace mixing valve shower, misc.	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 770 0070	Replace shower head with water conserving head	10	1 Plum	Ea.	\$ 127.67	\$ 149.29	1.095	\$ 163.47	0.97
1.000	D2013 810 0070	Replace fountain drinking fountain	10	2 Plum	Ea.	\$ 1,086.00	\$ 1,289.00	1.095	\$ 1,411.46	0.97
1.000	D2023 110 0010	Resolder joint pipe & fittings, copper	10	1 Plum	Ea.	\$ 37.94	\$ 47.30	1.095	\$ 51.79	0.97
1.000	D2023 130 0010	Reglue joint, install 1" tee solar piping: pipe & fittings, PVC	10	1 Plum	Ea.	\$ 65.15	\$ 81.65	1.095	\$ 89.41	0.97
1.000	D2023 130 0110	Reglue joint, install 1-1/4" tee solar piping: pipe & fittings, PVC	10	1 Plum	Ea.	\$ 71.15	\$ 88.65	1.095	\$ 97.07	0.97
1.000	D2023 130 0210	Reglue joint, install 1-1/2" tee solar piping: pipe & fittings, PVC	10	1 Plum	Ea.	\$ 77.65	\$ 96.65	1.095	\$ 105.83	0.97
1.000	D2023 130 0310	Reglue joint, install 2" tee solar piping: pipe & fittings, PVC	10	Q1	Ea.	\$ 82.65	\$ 103.15	1.095	\$ 112.95	0.97
1.000	D2023 150 0020	Replace old valve, non-drain, less than 1-1/2"	10	1 Plum	Ea.	\$ 322.00	\$ 372.50	1.095	\$ 407.89	0.97
1.000	D2023 152 0020	Replace old valve, non-drain, 2"	10	1 Plum	Ea.	\$ 1,396.50	\$ 1,608.00	1.095	\$ 1,760.76	0.97
1.000	D2023 154 0020	Replace old valve, non-drain, 3"	10	1 Plum	Ea.	\$ 1,396.50	\$ 1,608.00	1.095	\$ 1,760.76	0.97
1.000	D2023 156 0020	Replace old valve, non-drain, 4"	10	2 Plum	Ea.	\$ 1,690.00	\$ 1,990.00	1.095	\$ 2,179.05	0.97
1.000	D2023 156 0030	Replace old valve, non-drain, 6"	10	2 Plum	Ea.	\$ 2,528.00	\$ 2,970.00	1.095	\$ 3,252.15	0.97
1.000	D2023 156 0040	Replace old valve, non-drain, 8"	10	2 Plum	Ea.	\$ 3,758.00	\$ 4,366.00	1.095	\$ 4,780.77	0.97
1.000	D2023 156 0050	Replace old valve, non-drain, 10"	10	3 Plum	Ea.	\$ 5,953.00	\$ 6,904.00	1.095	\$ 7,559.88	0.97
1.000	D2023 210 0030	Replace water heater, gas / oil, 30 gallon	10	2 Plum	Ea.	\$ 1,506.95	\$ 1,777.45	1.095	\$ 1,946.31	0.97
1.000	D2023 250 0020	Remove old chamber, install new expansion chamber	10	1 Plum	Ea.	\$ 625.00	\$ 720.00	1.095	\$ 788.40	0.97
1.000	D2023 260 0030	Replace pump / motor assembly circulation pump, 1/12 HP	10	2 Plum	Ea.	\$ 846.00	\$ 996.00	1.095	\$ 1,090.62	0.97
1.000	D2023 310 0020	Replace old valve with new hose bibb	10	1 Plum	Ea.	\$ 51.00	\$ 62.45	1.095	\$ 68.38	0.97
1.000	D2033 110 0020	Unclog main drain pipe & fittings, cast iron	10	1 Plum	Ea.	\$ 40.50	\$ 51.00	1.095	\$ 55.85	0.97
1.000	D2033 130 0020	Unclog main drain pipe, PVC	10	1 Plum	M.L.F.	\$ 40.50	\$ 51.00	1.095	\$ 55.85	0.97
1.000	D2033 130 0040	Repair joint pipe and fittings, PVC	10	1 Plum	Ea.	\$ 131.55	\$ 164.15	1.095	\$ 179.74	0.97
1.000	D2033 305 3010	Unclog floor drain per M.L.F. pipe	10	1 Plum	Ea.	\$ 285.50	\$ 352.50	1.095	\$ 385.99	0.97
1.000	D2033 305 3020	Unclog main drain per M.L.F. pipe	10	1 Plum	Ea.	\$ 40.50	\$ 50.50	1.095	\$ 55.30	0.97
1.000	D2023 212 0030	Replace water heater, gas / oil, 70 gallon	12	2 Plum	Ea.	\$ 2,518.00	\$ 2,935.00	1.095	\$ 3,213.83	0.97
1.000	D2093 920 1010	Resolder joint pipe & fittings, anesthesia	12	1 Plum	Ea.	\$ 45.44	\$ 56.30	1.095	\$ 61.65	0.97
1.000	D2093 930 1010	Resolder joint pipe & fittings, oxygen	12	1 Plum	Ea.	\$ 60.65	\$ 75.50	1.095	\$ 82.67	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2013 770 0030	Replace mixing valve shower, misc.	\$ 417.21	1.20	\$ 515.90	0.97	\$ 500.65
1.000	D2013 770 0070	Replace shower head with water conserving head	\$ 158.64	1.20	\$ 196.17	0.97	\$ 190.37
1.000	D2013 810 0070	Replace fountain drinking fountain	\$ 1,369.73	1.20	\$ 1,693.75	0.97	\$ 1,643.67
1.000	D2023 110 0010	Resolder joint pipe & fittings, copper	\$ 50.26	1.20	\$ 62.15	0.97	\$ 60.31
1.000	D2023 130 0010	Reglue joint, install 1" tee solar piping: pipe & fittings, PVC	\$ 86.76	1.20	\$ 107.29	0.97	\$ 104.12
1.000	D2023 130 0110	Reglue joint, install 1-1/4" tee solar piping: pipe & fittings, PVC	\$ 94.20	1.20	\$ 116.49	0.97	\$ 113.04
1.000	D2023 130 0210	Reglue joint, install 1-1/2" tee solar piping: pipe & fittings, PVC	\$ 102.70	1.20	\$ 127.00	0.97	\$ 123.24
1.000	D2023 130 0310	Reglue joint, install 2" tee solar piping: pipe & fittings, PVC	\$ 109.61	1.20	\$ 135.54	0.97	\$ 131.53
1.000	D2023 150 0020	Replace old valve, non-drain, less than 1-1/2"	\$ 395.83	1.20	\$ 489.47	0.97	\$ 474.99
1.000	D2023 152 0020	Replace old valve, non-drain, 2"	\$ 1,708.71	1.20	\$ 2,112.91	0.97	\$ 2,050.45
1.000	D2023 154 0020	Replace old valve, non-drain, 3"	\$ 1,708.71	1.20	\$ 2,112.91	0.97	\$ 2,050.45
1.000	D2023 156 0020	Replace old valve, non-drain, 4"	\$ 2,114.63	1.20	\$ 2,614.86	0.97	\$ 2,537.56
1.000	D2023 156 0030	Replace old valve, non-drain, 6"	\$ 3,156.01	1.20	\$ 3,902.58	0.97	\$ 3,787.21
1.000	D2023 156 0040	Replace old valve, non-drain, 8"	\$ 4,639.44	1.20	\$ 5,736.92	0.97	\$ 5,567.32
1.000	D2023 156 0050	Replace old valve, non-drain, 10"	\$ 7,336.39	1.20	\$ 9,071.86	0.97	\$ 8,803.66
1.000	D2023 210 0030	Replace water heater, gas / oil, 30 gallon	\$ 1,888.77	1.20	\$ 2,335.57	0.97	\$ 2,266.52
1.000	D2023 250 0020	Remove old chamber, install new expansion chamber	\$ 765.09	1.20	\$ 946.08	0.97	\$ 918.11
1.000	D2023 260 0030	Replace pump / motor assembly circulation pump, 1/12 HP	\$ 1,058.38	1.20	\$ 1,308.74	0.97	\$ 1,270.05
1.000	D2023 310 0020	Replace old valve with new hose bibb	\$ 66.36	1.20	\$ 82.06	0.97	\$ 79.63
1.000	D2033 110 0020	Unclog main drain pipe & fittings, cast iron	\$ 54.19	1.20	\$ 67.01	0.97	\$ 65.03
1.000	D2033 130 0020	Unclog main drain pipe, PVC	\$ 54.19	1.20	\$ 67.01	0.97	\$ 65.03
1.000	D2033 130 0040	Repair joint pipe and fittings, PVC	\$ 174.43	1.20	\$ 215.69	0.97	\$ 209.32
1.000	D2033 305 3010	Unclog floor drain per M.L.F. pipe	\$ 374.58	1.20	\$ 463.19	0.97	\$ 449.49
1.000	D2033 305 3020	Unclog main drain per M.L.F. pipe	\$ 53.66	1.20	\$ 66.36	0.97	\$ 64.40
			\$ 32,141.38				\$ 38,569.65
			\$ 32,141.38	Assumed 100%		Assumed 100%	\$ 38,569.65
				PER 10 YR		PER 10 YR	
1.000	D2023 212 0030	Replace water heater, gas / oil, 70 gallon	\$ 3,118.81	1.20	\$ 3,856.59	0.97	\$ 3,742.58
1.000	D2093 920 1010	Resolder joint pipe & fittings, anesthesia	\$ 59.83	1.20	\$ 73.98	0.97	\$ 71.79
1.000	D2093 930 1010	Resolder joint pipe & fittings, oxygen	\$ 80.23	1.20	\$ 99.21	0.97	\$ 96.27
			\$ 3,258.87				\$ 3,910.64
			\$ 3,258.87	Assumed 100%		Assumed 100%	\$ 3,910.64

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.20	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2023 320 0010	Overhaul water meter	13	1 Plum	Ea.	\$ 33.00	\$ 39.50	1.095	\$ 43.25	0.97
1.000	D2013 130 0030	Replace valve and ball cock assembly flush-tank water closet	15	1 Plum	Ea.	\$ 83.77	\$ 102.79	1.095	\$ 112.56	0.97
1.000	D2013 440 0060	Replace sink and fittings, polyethylene sink, plastic	15	2 Plum	Ea.	\$ 1,951.00	\$ 2,277.00	1.095	\$ 2,493.32	0.97
1.000	D2023 160 0020	Remove old insulation & replace with new, pipe 1/2", wall 1"	15	1 Plum	L.F.	\$ 7.25	\$ 8.90	1.095	\$ 9.75	0.97
1.000	D2023 160 0030	Remove old insulation & replace with new, pipe 3/4", wall 1"	15	1 Plum	L.F.	\$ 7.55	\$ 9.25	1.095	\$ 10.13	0.97
1.000	D2023 160 0040	Remove old insulation & replace with new, pipe 1-1/2", wall 1"	15	1 Plum	L.F.	\$ 8.30	\$ 10.15	1.095	\$ 11.11	0.97
1.000	D2023 160 0050	Remove old insulation & replace with new, pipe 1/2", wall 3/4"	15	1 Plum	L.F.	\$ 9.60	\$ 11.80	1.095	\$ 12.92	0.97
1.000	D2023 160 0060	Remove old insulation & replace with new, pipe 3/4", wall 3/4"	15	1 Plum	L.F.	\$ 9.85	\$ 12.10	1.095	\$ 13.25	0.97
1.000	D2023 160 0070	Remove old insulation & replace with new, pipe 1-1/2", wall 3/4"	15	1 Plum	L.F.	\$ 11.00	\$ 13.45	1.095	\$ 14.73	0.97
1.000	D2023 220 0030	Replace water heater, electric, 120 gallon	15	2 Plum	Ea.	\$ 9,305.00	\$ 10,650.00	1.095	\$ 11,661.75	0.97
1.000	D2023 222 0030	Replace water heater, electric, 300 gallon	15	2 Plum	Ea.	\$ 38,365.00	\$ 43,780.00	1.095	\$ 47,939.10	0.97
1.000	D2023 224 0030	Replace water heater, electric, 1000 gallon	15	2 Plum	Ea.	\$ 85,850.00	\$ 98,175.00	1.095	\$ 107,501.63	0.97
1.000	D2023 226 0030	Replace water heater, electric, 2000 gallon	15	2 Plum	Ea.	\$ 123,875.00	\$ 141,350.00	1.095	\$ 154,778.25	0.97
1.000	D2023 370 0030	Replace water softener	15	2 Plum	Ea.	\$ 1,318.00	\$ 1,560.00	1.095	\$ 1,708.20	0.97
1.000	D2013 110 0015	Rebuild flush valve tankless water closet	20	1 Plum	Ea.	\$ 155.17	\$ 186.83	1.095	\$ 204.58	0.97
1.000	D2013 130 0040	Install gasket between tank and bowl flush-tank water closet	20	1 Plum	Ea.	\$ 34.66	\$ 43.22	1.095	\$ 47.33	0.97
1.000	D2013 210 0015	Rebuild flush valve urinal	20	1 Plum	Ea.	\$ 155.17	\$ 186.83	1.095	\$ 204.58	0.97
1.000	D2013 450 0060	Replace laundry sink ,plastic	20	2 Plum	Ea.	\$ 550.43	\$ 667.78	1.095	\$ 731.22	0.97
1.000	D2013 550 0070	Replace bathtub, fiberglass	20	2 Plum	Ea.	\$ 1,276.00	\$ 1,514.00	1.095	\$ 1,657.83	0.97
1.000	D2013 750 0060	Replace shower and fittings, fiberglass	20	2 Plum	Ea.	\$ 1,027.00	\$ 1,220.00	1.095	\$ 1,335.90	0.97
1.000	D2013 770 0120	Replace shower, C.M.U.	20	D8	Ea.	\$ 878.00	\$ 1,061.00	1.095	\$ 1,161.80	0.97
1.000	D2023 110 0020	Replace pipe and fittings, copper 3/4"	20	2 Plum	L.F.	\$ 20.23	\$ 24.60	1.095	\$ 26.94	0.97
1.000	D2023 130 1020	Install 10' section PVC 1" diameter solar piping	20	1 Plum	Ea.	\$ 299.40	\$ 370.75	1.095	\$ 405.97	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor PER 12 YR	TOTAL with Green Factor	De-Escalation Factor PER 12 YR	Total Green with All Adjustments
1.000	D2023 320 0010	Overhaul water meter	\$ 41.97	1.20	\$ 51.90	0.97	\$ 50.37
			\$ 41.97				\$ 50.37
			\$ 41.97	Assumed 100%		Assumed 100%	\$ 50.37
				PER 12 YR		PER 12 YR	
1.000	D2013 130 0030	Replace valve and ball cock assembly flush-tank water closet	\$ 109.23	1.20	\$ 135.07	0.97	\$ 131.07
1.000	D2013 440 0060	Replace sink and fittings, polyethylene sink, plastic	\$ 2,419.61	1.20	\$ 2,991.98	0.97	\$ 2,903.53
1.000	D2023 160 0020	Remove old insulation & replace with new, pipe 1/2", wall 1"	\$ 9.46	1.20	\$ 11.69	0.97	\$ 11.35
1.000	D2023 160 0030	Remove old insulation & replace with new, pipe 3/4", wall 1"	\$ 9.83	1.20	\$ 12.15	0.97	\$ 11.80
1.000	D2023 160 0040	Remove old insulation & replace with new, pipe 1-1/2", wall 1"	\$ 10.79	1.20	\$ 13.34	0.97	\$ 12.94
1.000	D2023 160 0050	Remove old insulation & replace with new, pipe 1/2", wall 3/4"	\$ 12.54	1.20	\$ 15.51	0.97	\$ 15.05
1.000	D2023 160 0060	Remove old insulation & replace with new, pipe 3/4", wall 3/4"	\$ 12.86	1.20	\$ 15.90	0.97	\$ 15.43
1.000	D2023 160 0070	Remove old insulation & replace with new, pipe 1-1/2", wall 3/4"	\$ 14.29	1.20	\$ 17.67	0.97	\$ 17.15
1.000	D2023 220 0030	Replace water heater, electric, 120 gallon	\$ 11,316.99	1.20	\$ 13,994.10	0.97	\$ 13,580.39
1.000	D2023 222 0030	Replace water heater, electric, 300 gallon	\$ 46,521.88	1.20	\$ 57,526.92	0.97	\$ 55,826.25
1.000	D2023 224 0030	Replace water heater, electric, 1000 gallon	\$ 104,323.55	1.20	\$ 129,001.95	0.97	\$ 125,188.26
1.000	D2023 226 0030	Replace water heater, electric, 2000 gallon	\$ 150,202.54	1.20	\$ 185,733.90	0.97	\$ 180,243.05
1.000	D2023 370 0030	Replace water softener	\$ 1,657.70	1.20	\$ 2,049.84	0.97	\$ 1,989.24
			\$ 316,621.26				\$ 379,945.51
			\$ 316,621.26	Assumed 100%		Assumed 100%	\$ 379,945.51
				PER 15 YR		PER 15 YR	
1.000	D2013 110 0015	Rebuild flush valve tankless water closet	\$ 198.53	1.20	\$ 245.49	0.97	\$ 238.24
1.000	D2013 130 0040	Install gasket between tank and bowl flush-tank water closet	\$ 45.93	1.20	\$ 56.79	0.97	\$ 55.11
1.000	D2013 210 0015	Rebuild flush valve urinal	\$ 198.53	1.20	\$ 245.49	0.97	\$ 238.24
1.000	D2013 450 0060	Replace laundry sink ,plastic	\$ 709.60	1.20	\$ 877.46	0.97	\$ 851.52
1.000	D2013 550 0070	Replace bathtub, fiberglass	\$ 1,608.82	1.20	\$ 1,989.40	0.97	\$ 1,930.58
1.000	D2013 750 0060	Replace shower and fittings, fiberglass	\$ 1,296.41	1.20	\$ 1,603.08	0.97	\$ 1,555.69
1.000	D2013 770 0120	Replace shower, C.M.U.	\$ 1,127.45	1.20	\$ 1,394.15	0.97	\$ 1,352.94
1.000	D2023 110 0020	Replace pipe and fittings, copper 3/4"	\$ 26.14	1.20	\$ 32.32	0.97	\$ 31.37
1.000	D2023 130 1020	Install 10' section PVC 1" diameter solar piping	\$ 393.97	1.20	\$ 487.17	0.97	\$ 472.76

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.20	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2023 130 1120	Install 10' PVC 1-1/4" diameter solar piping	20	1 Plum	Ea.	\$ 331.40	\$ 411.75	1.095	\$ 450.87	0.97
1.000	D2023 130 1220	Install 10' PVC 1-1/2" diameter solar piping	20	1 Plum	Ea.	\$ 384.40	\$ 478.75	1.095	\$ 524.23	0.97
1.000	D2023 130 1320	Install 10' section PVC 2" diameter solar piping	20	Q1	Ea.	\$ 428.40	\$ 524.75	1.095	\$ 574.60	0.97
1.000	D2023 214 0030	Replace water heater, gas / oil, 1150 GPH	20	2 Plum	Ea.	\$ 31,800.00	\$ 36,700.00	1.095	\$ 40,186.50	0.97
1.000	D2023 230 0030	Replace steam converter	20	2 Plum	Ea.	\$ 2,212.00	\$ 2,540.00	1.095	\$ 2,781.30	0.97
1.000	D2023 245 0010	Replace 1000 gallon solar storage tank	20	Q9	Ea.	\$ 6,895.00	\$ 7,980.00	1.095	\$ 8,738.10	0.97
1.000	D2023 261 0030	Replace pump / motor assembly circulation pump, 1/8 HP	20	2 Plum	Ea.	\$ 1,251.00	\$ 1,451.00	1.095	\$ 1,588.85	0.97
1.000	D2023 262 0030	Replace pump / motor assembly circulation pump, 1/6 HP	20	2 Plum	Ea.	\$ 1,509.00	\$ 1,743.00	1.095	\$ 1,908.59	0.97
1.000	D2023 264 0030	Replace pump / motor assembly, partial circulation pump, 1/2 HP	20	2 Plum	Ea.	\$ 2,651.00	\$ 3,064.00	1.095	\$ 3,355.08	0.97
1.000	D2023 266 0040	Replace pump / motor assembly circulation pump, bronze 1 HP	20	2 Plum	Ea.	\$ 4,351.00	\$ 5,014.00	1.095	\$ 5,490.33	0.97
1.000	D2023 267 0040	Replace pump / motor assembly circulation pump, CI 1-1/2 HP	20	2 Plum	Ea.	\$ 2,251.00	\$ 2,589.00	1.095	\$ 2,834.96	0.97
1.000	D2033 130 0010	Unclog floor drain, PVC	20	1 Plum	Ea.	\$ 42.00	\$ 52.50	1.095	\$ 57.49	0.97
1.000	D2043 110 1020	Replace pipe or gutter distribution	20	1 Plum	L.F.	\$ 53.10	\$ 64.75	1.095	\$ 70.90	0.97
1.000	D2043 310 1030	Replace rainwater sump pump / motor assembly	20	2 Plum	Ea.	\$ 479.00	\$ 570.00	1.095	\$ 624.15	0.97

1.000	D2013 110 0040	Replace tankless flush valve	25	1 Plum	Ea.	\$ 262.67	\$ 306.83	1.095	\$ 335.98	0.97
1.000	D2013 770 0060	Replace shower and fittings, aluminum	25	2 Plum	Ea.	\$ 1,027.00	\$ 1,220.00	1.095	\$ 1,335.90	0.97
1.000	D2013 770 0200	Replace shower, glazed C.M.U.	25	D8	Ea.	\$ 1,398.00	\$ 1,673.00	1.095	\$ 1,831.94	0.97
1.000	D2013 910 0030	Replace shower emergency shower station	25	2 Plum	Ea.	\$ 826.00	\$ 989.00	1.095	\$ 1,082.96	0.97
1.000	D2013 920 0030	Replace eye wash station, emergency eye wash	25	2 Plum	Ea.	\$ 871.00	\$ 1,039.00	1.095	\$ 1,137.71	0.97
1.000	D2023 110 0030	Replace pipe and fittings, copper 1"	25	2 Plum	L.F.	\$ 23.58	\$ 28.35	1.095	\$ 31.04	0.97
1.000	D2023 110 0050	Replace pipe and fittings, copper 1-1/2"	25	2 Plum	L.F.	\$ 34.20	\$ 41.40	1.095	\$ 45.33	0.97
1.000	D2023 110 0060	Replace pipe and fittings, copper 2"	25	2 Plum	L.F.	\$ 47.40	\$ 56.50	1.095	\$ 61.87	0.97
1.000	D2023 110 0070	Replace pipe and fittings, copper 4"	25	2 Plum	L.F.	\$ 127.90	\$ 150.90	1.095	\$ 165.24	0.97
1.000	D2023 110 0080	Replace pipe and fittings, copper 8"	25	2 Plum	L.F.	\$ 657.00	\$ 757.00	1.095	\$ 828.92	0.97
1.000	D2023 120 0010	Install new gasket, 4" pipe size, steel/iron	25	1 Plum	Ea.	\$ 169.50	\$ 210.50	1.095	\$ 230.50	0.97
1.000	D2023 320 0020	Remove old meter, install new water meter 5/8"	25	1 Plum	Ea.	\$ 109.00	\$ 131.00	1.095	\$ 143.45	0.97
1.000	D2023 320 0025	Remove old meter, install new water meter 3/4"	25	1 Plum	Ea.	\$ 156.00	\$ 186.00	1.095	\$ 203.67	0.97
1.000	D2023 320 0030	Remove old meter, install new water meter 1"	25	1 Plum	Ea.	\$ 212.00	\$ 250.00	1.095	\$ 273.75	0.97
1.000	D2023 320 0035	Remove old meter, install new water meter 1-1/2"	25	1 Plum	Ea.	\$ 437.00	\$ 512.50	1.095	\$ 561.19	0.97
1.000	D2023 320 0040	Remove old meter, install new water meter 2"	25	1 Plum	Ea.	\$ 591.00	\$ 690.00	1.095	\$ 755.55	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2023 130 1120	Install 10' PVC 1-1/4" diameter solar piping	\$ 437.54	1.20	\$ 541.04	0.97	\$ 525.04
1.000	D2023 130 1220	Install 10' PVC 1-1/2" diameter solar piping	\$ 508.73	1.20	\$ 629.08	0.97	\$ 610.48
1.000	D2023 130 1320	Install 10' section PVC 2" diameter solar piping	\$ 557.61	1.20	\$ 689.52	0.97	\$ 669.14
1.000	D2023 214 0030	Replace water heater, gas / oil, 1150 GPH	\$ 38,998.47	1.20	\$ 48,223.80	0.97	\$ 46,798.16
1.000	D2023 230 0030	Replace steam converter	\$ 2,699.08	1.20	\$ 3,337.56	0.97	\$ 3,238.89
1.000	D2023 245 0010	Replace 1000 gallon solar storage tank	\$ 8,479.78	1.20	\$ 10,485.72	0.97	\$ 10,175.73
1.000	D2023 261 0030	Replace pump / motor assembly circulation pump, 1/8 HP	\$ 1,541.87	1.20	\$ 1,906.61	0.97	\$ 1,850.25
1.000	D2023 262 0030	Replace pump / motor assembly circulation pump, 1/6 HP	\$ 1,852.16	1.20	\$ 2,290.30	0.97	\$ 2,222.59
1.000	D2023 264 0030	Replace pump / motor assembly, partial circulation pump, 1/2 HP	\$ 3,255.89	1.20	\$ 4,026.10	0.97	\$ 3,907.07
1.000	D2023 266 0040	Replace pump / motor assembly circulation pump, bronze 1 HP	\$ 5,328.02	1.20	\$ 6,588.40	0.97	\$ 6,393.62
1.000	D2023 267 0040	Replace pump / motor assembly circulation pump, CI 1-1/2 HP	\$ 2,751.15	1.20	\$ 3,401.95	0.97	\$ 3,301.37
1.000	D2033 130 0010	Unclog floor drain, PVC	\$ 55.79	1.20	\$ 68.99	0.97	\$ 66.95
1.000	D2043 110 1020	Replace pipe or gutter distribution	\$ 68.81	1.20	\$ 85.08	0.97	\$ 82.57
1.000	D2043 310 1030	Replace rainwater sump pump / motor assembly	\$ 605.70	1.20	\$ 748.98	0.97	\$ 726.84
			\$ 72,745.96				\$ 87,295.16
			\$ 72,745.96	Assumed 100%		Assumed 100%	\$ 87,295.16
				PER 20 YR		PER 20 YR	
1.000	D2013 110 0040	Replace tankless flush valve	\$ 326.05	1.20	\$ 403.17	0.97	\$ 391.26
1.000	D2013 770 0060	Replace shower and fittings, aluminum	\$ 1,296.41	1.20	\$ 1,603.08	0.97	\$ 1,555.69
1.000	D2013 770 0200	Replace shower, glazed C.M.U.	\$ 1,777.78	1.20	\$ 2,198.32	0.97	\$ 2,133.33
1.000	D2013 910 0030	Replace shower emergency shower station	\$ 1,050.94	1.20	\$ 1,299.55	0.97	\$ 1,261.13
1.000	D2013 920 0030	Replace eye wash station, emergency eye wash	\$ 1,104.07	1.20	\$ 1,365.25	0.97	\$ 1,324.89
1.000	D2023 110 0030	Replace pipe and fittings, copper 1"	\$ 30.13	1.20	\$ 37.25	0.97	\$ 36.15
1.000	D2023 110 0050	Replace pipe and fittings, copper 1-1/2"	\$ 43.99	1.20	\$ 54.40	0.97	\$ 52.79
1.000	D2023 110 0060	Replace pipe and fittings, copper 2"	\$ 60.04	1.20	\$ 74.24	0.97	\$ 72.05
1.000	D2023 110 0070	Replace pipe and fittings, copper 4"	\$ 160.35	1.20	\$ 198.28	0.97	\$ 192.42
1.000	D2023 110 0080	Replace pipe and fittings, copper 8"	\$ 804.41	1.20	\$ 994.70	0.97	\$ 965.29
1.000	D2023 120 0010	Install new gasket, 4" pipe size, steel/iron	\$ 223.68	1.20	\$ 276.60	0.97	\$ 268.42
1.000	D2023 320 0020	Remove old meter, install new water meter 5/8"	\$ 139.20	1.20	\$ 172.13	0.97	\$ 167.05
1.000	D2023 320 0025	Remove old meter, install new water meter 3/4"	\$ 197.65	1.20	\$ 244.40	0.97	\$ 237.18
1.000	D2023 320 0030	Remove old meter, install new water meter 1"	\$ 265.66	1.20	\$ 328.50	0.97	\$ 318.79
1.000	D2023 320 0035	Remove old meter, install new water meter 1-1/2"	\$ 544.60	1.20	\$ 673.43	0.97	\$ 653.52
1.000	D2023 320 0040	Remove old meter, install new water meter 2"	\$ 733.21	1.20	\$ 906.66	0.97	\$ 879.86

Costs Reflect National Averages										
Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.20	Assumed Value							NON GREEN	
Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2023 320 0045	Remove old meter, install new water meter 3"	25	Q1	Ea.	\$ 3,501.00	\$ 4,027.00	1.095	\$ 4,409.57	0.97
1.000	D2023 320 0050	Remove old meter, install new water meter 4"	25	Q1	Ea.	\$ 5,825.00	\$ 6,755.00	1.095	\$ 7,396.73	0.97
1.000	D2023 320 0055	Remove old meter, install new water meter 6"	25	Q1	Ea.	\$ 9,155.00	\$ 10,605.00	1.095	\$ 11,612.48	0.97
1.000	D2023 320 0060	Remove old meter, install new water meter 8"	25	Q1	Ea.	\$ 13,855.00	\$ 15,945.00	1.095	\$ 17,459.78	0.97
1.000	D2093 920 1030	Replace pipe and fittings, anesthesia	25	2 Plum	L.F.	\$ 20.12	\$ 24.45	1.095	\$ 26.77	0.97
1.000	D2093 930 1030	Replace pipe and fittings, oxygen	25	2 Plum	L.F.	\$ 20.12	\$ 24.45	1.095	\$ 26.77	0.97
1.000	D2093 946 1030	Replace 2 H.P. compressor	25	2 Plum	Ea.	\$ 4,567.00	\$ 5,285.00	1.095	\$ 5,787.08	0.97
1.000	D2093 946 3030	Replace 10 H.P. compressor	25	2 Plum	Ea.	\$ 9,525.00	\$ 11,150.00	1.095	\$ 12,209.25	0.97
1.000	D2093 946 4030	Replace 25 H.P. compressor	25	2 Plum	Ea.	\$ 18,150.00	\$ 21,250.00	1.095	\$ 23,268.75	0.97
1.000	D2013 710 0060	Replace terrazzo shower surface	30	2 Plum	Ea.	\$ 1,102.00	\$ 1,322.00	1.095	\$ 1,447.59	0.97
1.000	D2013 770 0280	Replace shower surface, ceramic tile	30	D7	Ea.	\$ 757.00	\$ 923.00	1.095	\$ 1,010.69	0.97
1.000	D2023 130 2030	Replace 1000' PVC pipe 1" diameter solar piping	30	1 Plum	M.L.F.	\$ 24,840.00	\$ 30,775.00	1.095	\$ 33,698.63	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2023 320 0045	Remove old meter, install new water meter 3"	\$ 4,279.20	1.20	\$ 5,291.48	0.97	\$ 5,135.05
1.000	D2023 320 0050	Remove old meter, install new water meter 4"	\$ 7,178.06	1.20	\$ 8,876.07	0.97	\$ 8,613.67
1.000	D2023 320 0055	Remove old meter, install new water meter 6"	\$ 11,269.18	1.20	\$ 13,934.97	0.97	\$ 13,523.01
1.000	D2023 320 0060	Remove old meter, install new water meter 8"	\$ 16,943.61	1.20	\$ 20,951.73	0.97	\$ 20,332.33
1.000	D2093 920 1030	Replace pipe and fittings, anesthesia	\$ 25.98	1.20	\$ 32.13	0.97	\$ 31.18
1.000	D2093 930 1030	Replace pipe and fittings, oxygen	\$ 25.98	1.20	\$ 32.13	0.97	\$ 31.18
1.000	D2093 946 1030	Replace 2 H.P. compressor	\$ 5,615.99	1.20	\$ 6,944.49	0.97	\$ 6,739.19
1.000	D2093 946 3030	Replace 10 H.P. compressor	\$ 11,848.31	1.20	\$ 14,651.10	0.97	\$ 14,217.97
1.000	D2093 946 4030	Replace 25 H.P. compressor	\$ 22,580.86	1.20	\$ 27,922.50	0.97	\$ 27,097.03
			\$ 88,525.33				\$ 106,230.39
			\$ 88,525.33	Assumed 100%		Assumed 100%	\$ 106,230.39
				PER 25 YR		PER 25 YR	
1.000	D2013 710 0060	Replace terrazzo shower surface	\$ 1,404.79	1.20	\$ 1,737.11	0.97	\$ 1,685.75
1.000	D2013 770 0280	Replace shower surface, ceramic tile	\$ 980.81	1.20	\$ 1,212.82	0.97	\$ 1,176.97
1.000	D2023 130 2030	Replace 1000' PVC pipe 1" diameter solar piping	\$ 32,702.39	1.20	\$ 40,438.35	0.97	\$ 39,242.87

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.20	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2023 130 2130	Replace 1000' PVC pipe 1-1/4" diameter solar piping	30	1 Plum	M.L.F.	\$ 27,540.00	\$ 34,075.00	1.095	\$ 37,312.13	0.97
1.000	D2023 130 2230	Replace 1000' PVC pipe 1-1/2" diameter solar piping	30	1 Plum	M.L.F.	\$ 31,840.00	\$ 39,575.00	1.095	\$ 43,334.63	0.97
1.000	D2023 130 2330	Replace 1000' PVC pipe 2" diameter solar piping	30	Q1	M.L.F.	\$ 35,340.00	\$ 43,375.00	1.095	\$ 47,495.63	0.97
1.000	D2033 130 0060	Replace pipe, 1-1/2" pipe and fittings, PVC	30	2 Plum	L.F.	\$ 51.75	\$ 64.40	1.095	\$ 70.52	0.97
1.000	D2033 130 0080	Replace pipe, 2" pipe and fittings, PVC	30	2 Plum	L.F.	\$ 55.75	\$ 69.30	1.095	\$ 75.88	0.97
1.000	D2033 130 0100	Replace pipe, 4" pipe and fittings, PVC	30	2 Plum	L.F.	\$ 69.10	\$ 85.75	1.095	\$ 93.90	0.97
1.000	D2033 130 0120	Replace pipe, 6" pipe and fittings, PVC	30	2 Plum	L.F.	\$ 90.00	\$ 110.85	1.095	\$ 121.38	0.97
1.000	D2033 130 0140	Replace pipe, 8" pipe and fittings, PVC	30	2 Plum	L.F.	\$ 108.05	\$ 132.50	1.095	\$ 145.09	0.97
1.000	D2013 110 0030	Replace tankless water closet	35	2 Plum	Ea.	\$ 541.32	\$ 637.99	1.095	\$ 698.60	0.97
1.000	D2013 130 0050	Replace two piece water closet flush-tank	35	2 Plum	Ea.	\$ 526.01	\$ 622.39	1.095	\$ 681.52	0.97
1.000	D2013 130 0060	Replace one piece water closet flush-tank	35	2 Plum	Ea.	\$ 866.01	\$ 1,012.39	1.095	\$ 1,108.57	0.97
1.000	D2013 210 0030	Replace wall-hung urinal	35	2 Plum	Ea.	\$ 843.02	\$ 1,016.39	1.095	\$ 1,112.95	0.97
1.000	D2013 330 0060	Replace lavatory, vitreous china	35	2 Plum	Ea.	\$ 613.43	\$ 731.78	1.095	\$ 801.30	0.97
1.000	D2013 350 0060	Replace lavatory lavatory, enameled steel	35	2 Plum	Ea.	\$ 593.43	\$ 721.78	1.095	\$ 790.35	0.97
1.000	D2013 410 0060	Replace sink, P.E.C.I. sink, iron enamel	35	2 Plum	Ea.	\$ 759.50	\$ 893.00	1.095	\$ 977.84	0.97
1.000	D2013 420 0060	Replace sink, enameled steel	35	2 Plum	Ea.	\$ 519.00	\$ 625.00	1.095	\$ 684.38	0.97
1.000	D2013 460 0060	Replace sink, P.E.C.I.	35	1 Plum	Ea.	\$ 1,094.50	\$ 1,293.00	1.095	\$ 1,415.84	0.97
1.000	D2013 530 0070	Replace tub bathtub, enameled steel	35	2 Plum	Ea.	\$ 755.00	\$ 892.00	1.095	\$ 976.74	0.97
1.000	D2013 730 0060	Replace shower, enameled steel	35	2 Plum	Ea.	\$ 1,525.00	\$ 1,800.00	1.095	\$ 1,971.00	0.97
1.000	D2013 310 0060	Replace lavatory, iron, enamel	40	2 Plum	Ea.	\$ 657.93	\$ 771.28	1.095	\$ 844.55	0.97
1.000	D2013 430 0060	Replace sink, stainless steel	40	2 Plum	Ea.	\$ 984.50	\$ 1,168.00	1.095	\$ 1,278.96	0.97
1.000	D2013 510 0070	Replace tub bathtub, cast iron enamel	40	2 Plum	Ea.	\$ 1,360.00	\$ 1,587.00	1.095	\$ 1,737.77	0.97
1.000	D2033 110 0030	Replace pipe & fittings, cast iron	40	2 Plum	L.F.	\$ 47.45	\$ 57.70	1.095	\$ 63.18	0.97
1.000	D2033 310 0030	Replace floor drain w/o bucket	40	1 Plum	Ea.	\$ 1,027.00	\$ 1,184.00	1.095	\$ 1,296.48	0.97
1.000	D2033 330 0030	Replace floor drain with bucket	40	1 Plum	Ea.	\$ 1,027.00	\$ 1,184.00	1.095	\$ 1,296.48	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2023 130 2130	Replace 1000' PVC pipe 1-1/4" diameter solar piping	\$ 36,209.07	1.20	\$ 44,774.55	0.97	\$ 43,450.88
1.000	D2023 130 2230	Replace 1000' PVC pipe 1-1/2" diameter solar piping	\$ 42,053.52	1.20	\$ 52,001.55	0.97	\$ 50,464.23
1.000	D2023 130 2330	Replace 1000' PVC pipe 2" diameter solar piping	\$ 46,091.51	1.20	\$ 56,994.75	0.97	\$ 55,309.81
1.000	D2033 130 0060	Replace pipe, 1-1/2" pipe and fittings, PVC	\$ 68.43	1.20	\$ 84.62	0.97	\$ 82.12
1.000	D2033 130 0080	Replace pipe, 2" pipe and fittings, PVC	\$ 73.64	1.20	\$ 91.06	0.97	\$ 88.37
1.000	D2033 130 0100	Replace pipe, 4" pipe and fittings, PVC	\$ 91.12	1.20	\$ 112.68	0.97	\$ 109.34
1.000	D2033 130 0120	Replace pipe, 6" pipe and fittings, PVC	\$ 117.79	1.20	\$ 145.66	0.97	\$ 141.35
1.000	D2033 130 0140	Replace pipe, 8" pipe and fittings, PVC	\$ 140.80	1.20	\$ 174.11	0.97	\$ 168.96
			\$ 159,933.88				\$ 191,920.65
			\$ 159,933.88	Assumed 100%		Assumed 100%	\$ 191,920.65
				PER 25 YR		PER 25 YR	
1.000	D2013 110 0030	Replace tankless water closet	\$ 677.95	1.20	\$ 838.32	0.97	\$ 813.54
1.000	D2013 130 0050	Replace two piece water closet flush-tank	\$ 661.37	1.20	\$ 817.82	0.97	\$ 793.64
1.000	D2013 130 0060	Replace one piece water closet flush-tank	\$ 1,075.79	1.20	\$ 1,330.28	0.97	\$ 1,290.95
1.000	D2013 210 0030	Replace wall-hung urinal	\$ 1,080.04	1.20	\$ 1,335.54	0.97	\$ 1,296.05
1.000	D2013 330 0060	Replace lavatory, vitreous china	\$ 777.61	1.20	\$ 961.56	0.97	\$ 933.13
1.000	D2013 350 0060	Replace lavatory lavatory, enameled steel	\$ 766.98	1.20	\$ 948.42	0.97	\$ 920.38
1.000	D2013 410 0060	Replace sink, P.E.C.I. sink, iron enamel	\$ 948.93	1.20	\$ 1,173.40	0.97	\$ 1,138.71
1.000	D2013 420 0060	Replace sink, enameled steel	\$ 664.14	1.20	\$ 821.25	0.97	\$ 796.97
1.000	D2013 460 0060	Replace sink, P.E.C.I.	\$ 1,373.98	1.20	\$ 1,699.00	0.97	\$ 1,648.77
1.000	D2013 530 0070	Replace tub bathtub, enameled steel	\$ 947.86	1.20	\$ 1,172.09	0.97	\$ 1,137.44
1.000	D2013 730 0060	Replace shower, enameled steel	\$ 1,912.73	1.20	\$ 2,365.20	0.97	\$ 2,295.28
			\$ 10,887.39				\$ 13,064.87
			\$ 10,887.39	Assumed 100%		Assumed 100%	\$ 13,064.87
				PER 25 YR		PER 25 YR	
1.000	D2013 310 0060	Replace lavatory, iron, enamel	\$ 819.58	1.20	\$ 1,013.46	0.97	\$ 983.50
1.000	D2013 430 0060	Replace sink, stainless steel	\$ 1,241.15	1.20	\$ 1,534.75	0.97	\$ 1,489.38
1.000	D2013 510 0070	Replace tub bathtub, cast iron enamel	\$ 1,686.39	1.20	\$ 2,085.32	0.97	\$ 2,023.67
1.000	D2033 110 0030	Replace pipe & fittings, cast iron	\$ 61.31	1.20	\$ 75.82	0.97	\$ 73.58
1.000	D2033 310 0030	Replace floor drain w/o bucket	\$ 1,258.15	1.20	\$ 1,555.78	0.97	\$ 1,509.78
1.000	D2033 330 0030	Replace floor drain with bucket	\$ 1,258.15	1.20	\$ 1,555.78	0.97	\$ 1,509.78

Costs Reflect National Averages										
Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.20	Assumed Value							NON GREEN	
Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2043 210 1020	Replace drain: roof, scupper, area	40	1 Plum	Ea.	\$ 481.50	\$ 563.00	1.095	\$ 616.49	0.97
1.000	D2023 240 0020	Replace storage tank, glass lined, P.E., 80 gal.	50	2 Plum	Ea.	\$ 2,962.50	\$ 3,396.50	1.095	\$ 3,719.17	0.97
FOOTNOTES:										
1										
RS Means CostWorks 2010 Operations and Maintenance										

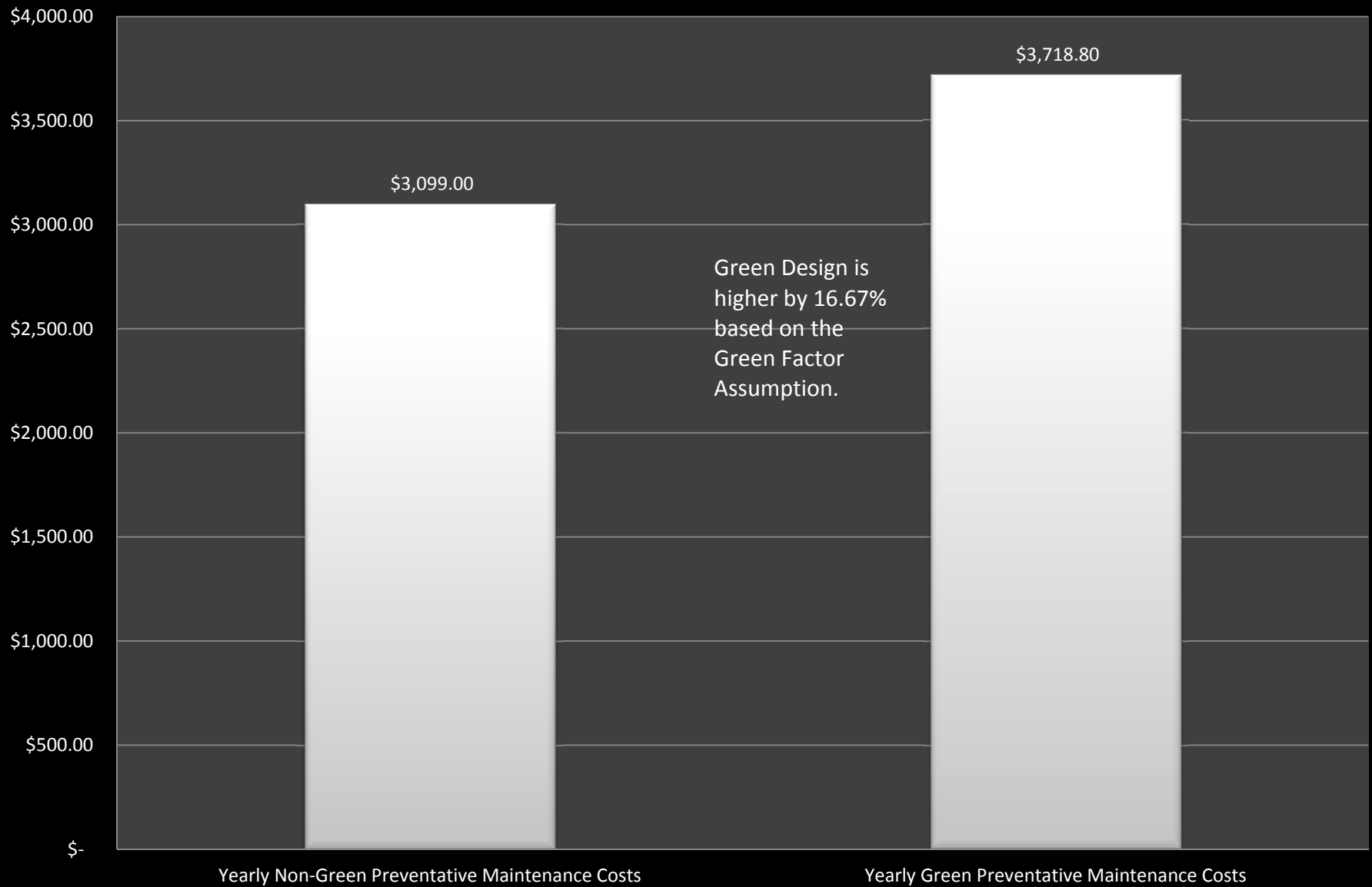
Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.20	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2043 210 1020	Replace drain: roof, scupper, area	\$ 598.26	1.20	\$ 739.78	0.97	\$ 717.91
			\$ 6,923.00				\$ 8,307.60
			\$ 6,923.00	Assumed 100%		Assumed 100%	\$ 8,307.60
				PER 40 YR		PER 40 YR	
1.000	D2023 240 0020	Replace storage tank, glass lined, P.E., 80 gal.	\$ 3,609.22	1.20	\$ 4,463.00	0.97	\$ 4,331.06
			\$ 3,609.22				\$ 4,331.06
			\$ 3,609.22	Assumed 100%		Assumed 100%	\$ 4,331.06
				PER 50 YR		PER 50 YR	
FOOTNOTES:							
1							
RS Means CostWorks 2010 Operations and Maintenance							

Appendix C-W3 Summary of Green and Non-Green Frequency Maintenance Repair and Replacement Costs

Summary of Green versus Non-Green Major Repair and Replacement Costs based on Frequency (Plumbing)			
Type of Construction	Description	TOTAL COST	COMMENTS
Non-Green	Up to 10 Years	\$ 40,323.45	
Non-Green	10 th yr on till 25 th Year	\$ 652,014.66	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
Non-Green	25 th yr on till 50 th Year	\$ 10,532.22	
Green	Up to 10 Years	\$ 48,388.14	
Green	10 th yr on till 25 th Year	\$ 782,417.59	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
Green	25 th yr on till 50 th Year	\$ 12,638.67	
SUMMARY OF FINDINGS			
Green v. Non-Green	16.67%	Green Major Repair and Replacement is 16.67% higher in cost than that of a traditional building	

Appendix C-W4 Graph: Green versus Non-Green Yearly Preventative Maintenance Costs

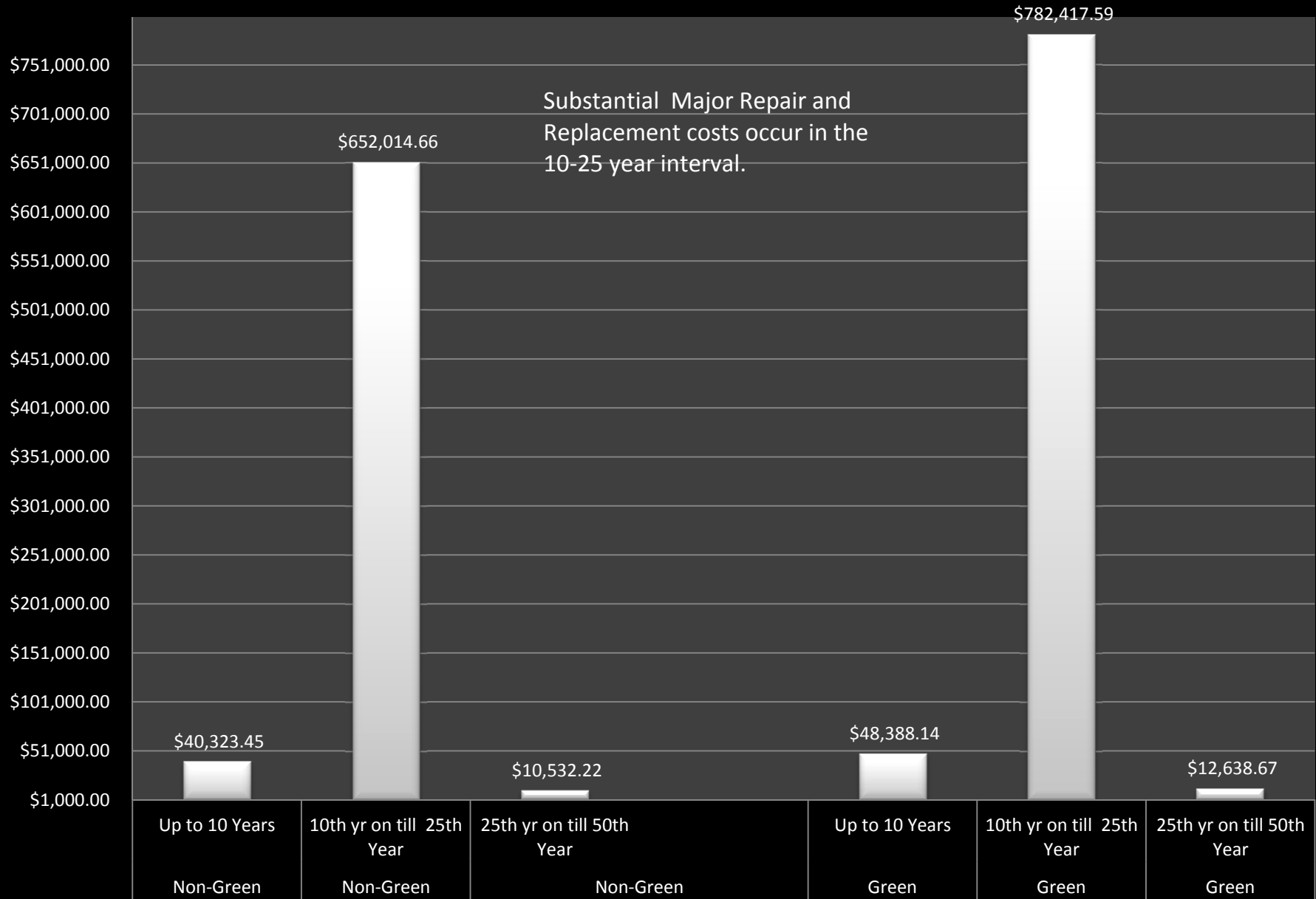
Plumbing: Green v. Non-Green Yearly Preventative Maintenance Costs (July 2009)



Appendix C-W5 Graph: Frequency and Magnitude Maintenance Repair and Replacement

Costs

Frequency and Magnitude of Major Repair and Replacement Costs



Appendix C-W6 RS Means Component Lists

**Plumbing Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2095 905 1950						
Duplex sump pump						
1 Check electrical cords, plugs and connections.	0.239				X	X
2 Activate float switches and check pumps for proper operation.	0.078				X	X
3 Lubricate pumps as required.	0.094				X	X
4 Inspect packing and tighten as required.	0.062				X	X
5 Check pumps for misalignment and bearings for overheating.	0.260				X	X
6 Clean out trash from sump bottom.	0.072				X	X
7 Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period					.827	.827
Total labor-hours/year	1.654				.827	.827

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2015 100 4950						
Lavatories (Time is per fixture)						
1 Lavatories - Operate faucets, replace washers/"O" Rings as necessary.	0.040			X	X	X
2 Observe drain flow, clean trap if flow is obstructed.	0.030			X	X	X
3 Fill out maintenance checklist and report deficiencies.	0.017			X	X	X
Total labor-hours/period				.087	.087	.087
Total labor-hours/year	0.348			.174	.087	.087

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2095 930 1950						
Oxygen monitor						
1 Check alarm set points	0.167			X	X	X
2 Check alarm lights for replacement	0.167			X	X	X
3 Check audible annunciator for proper operation	0.167			X	X	X
4 Check battery backup for proper operation	0.167			X	X	X
5 Check and test oxygen sensor for proper operation	0.276			X	X	X
6 Replace oxygen sensor annually	1.000					X
7 Clean area.	0.034			X	X	X
8 Fill out maintenance checklist and report deficiencies.	0.022			X	X	X
Total labor-hours/period				1.000	1.000	2.000
Total labor-hours/year	5.000			2.000	1.000	2.000

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2015 100 5950						
Showers (Time is per fixture)						
1 Showers - Check for damaged, or missing shower heads/handles and replace if required.	0.040			X	X	X
2 Fill out maintenance checklist and report deficiencies.	0.017			X	X	X
Total labor-hours/period				.057	.057	.057
Total labor-hours/year	0.228			.114	.057	.057

Plumbing Yearly Preventative Maintenance Component List

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2025 190 1950						
Solar, closed loop hot water heating system, up to 6 panels						
1 Check with operating or area personnel for deficiencies.	0.035				X	X
2 Inspect interior piping and connections for leaks and damaged insulation; tighten connections and repair damaged insulation as necessary.	0.125				X	X
3 Check zone and circulating pump motors for excessive overheating; lubricate motor bearings.	0.077				X	X
4 Check pressure and air relief valves for proper operation.	0.030				X	X
5 Check control panel and differential thermostat for proper operation.	0.094				X	X
6 Clean sight glasses, controls, pumps, and flow indicators on tanks.	0.127				X	X
7 Check system pressure on closed loop for loss of fluid.	0.046				X	X
8 Check fluid level on drain-back systems; add fluid as necessary.	0.029				X	X
9 Test glycol strength in closed systems, as applicable; if required, drain system and replace with new fluid mixture.	0.222					X
10 Check heat exchanger for exterior leaks.	0.077				X	X
11 Clean strainers and traps.	0.181					X
12 Check storage and expansion tanks; for leaks and deteriorated insulation.	0.077					X
13 Inspect all collector piping for leaks and damaged insulation; tighten connections and repair as required.	0.133				X	X
14 Inspect collector glazing for cracks and seals for tightness; tighten or replace seals as necessary.	0.124				X	X
15 Wash/clean glazing on collector panels.	0.585					X
16 Inspect ferrule around pipe flashing where solar piping runs through roof; repair as necessary.	0.086				X	X
17 Check collector mounting brackets and bolts; tighten as required.	0.094				X	X
18 Clean area.	0.066				X	X
19 Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period					1.165	2.230
Total labor-hours/year	3.395				1.165	2.230

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2095 910 1950						
Submersible pump, 1 H.P. and over						
1 Check with operating personnel for any deficiencies.	0.035				X	X
2 Remove pump from pit.	0.585				X	X
3 Clean out trash from pump intake.	0.338				X	X
4 Check electrical plug, cord and connection.	0.120				X	X
5 Inspect pump body for corrosion; prime and paint as necessary.	0.053				X	X
6 Check pump and motor operation for excessive vibration, noise and overheating.	0.022				X	X
7 Lubricate pump and motor, where applicable.	0.099				X	X
8 Return pump to pit; reset and check float switch for proper operation.	0.585				X	X
9 Clean area.	0.066				X	X
10 Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period					1.925	1.925
Total labor-hours/year	3.850				1.925	1.925

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2015 100 3950						
Toilet, tank type (Time is per fixture)						
1 Toilet - Clean flapper seat if leaking, adjust fill level if required.	0.050			X	X	X
2 Inspect for missing or damaged parts/caps, seat supports, and replace.	0.030			X	X	X
3 Fill out maintenance checklist and report deficiencies.	0.017			X	X	X
Total labor-hours/period				.097	.097	.097
Total labor-hours/year	0.388			.194	.097	.097

Plumbing Yearly Preventative Maintenance Component List

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2015 100 2950						
Toilet, vacuum breaker type (Time is per fixture)						
1 Toilet (vacuum breaker type) - Flush and adjust water flow if required.	0.020			X	X	X
2 Inspect for missing or damaged parts/caps, seat supports, and replace.	0.020			X	X	X
3 Fill out maintenance checklist and report deficiencies.	0.017			X	X	X
Total labor-hours/period				.057	.057	.057
Total labor-hours/year	0.228			.114	.057	.057

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2015 100 1950						
Urinals (Time is per fixture)						
1 Urinals - Flush and adjust water flow if required.	0.020			X	X	X
2 Inspect for missing or damaged parts/caps and replace.	0.020			X	X	X
3 Fill out maintenance checklist and report deficiencies.	0.017			X	X	X
Total labor-hours/period				.057	.057	.057
Total labor-hours/year	0.228			.114	.057	.057

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2025 310 2950						
Valve, auto diaphragm, above 4"						
1 Lubricate valve actuator mechanism and valve stem.	0.022					X
2 Check valve for proper operation and leaks; tighten packing and flange bolts as required.	0.044					X
3 Check pneumatic tubing and operator mechanism for proper alignment and damage; adjust as necessary and soap solution test for leaks after maintenance.	0.053					X
4 Clean valve exterior and area around valve.	0.034					X
5 Fill out maintenance report and report deficiencies.	0.022					X
Total labor-hours/period						.175
Total labor-hours/year	0.175					.175

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2025 310 1950						
Valve, automatic, above 4"						
1 Lubricate valve actuator stem and valve stem, where possible.	0.022					X
2 Check automatic valve for proper operation.	0.062					X
3 Check packing gland for leaks; adjust as required.	0.022					X
4 Check pneumatic operator and tubing for air leaks.	0.025					X
5 Clean valve exterior and area around valve.	0.034					X
6 Fill out maintenance report and report deficiencies.	0.022					X
Total labor-hours/period						.187
Total labor-hours/year	0.187					.187

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2025 130 1950						
Valve, ball, above 4"						
1 Lubricate valves that have grease fittings.	0.022					X
2 Open and close valve using handle, wrench, or hand wheel to check operation.	0.049					X
3 Check for leaks.	0.007					X
4 Clean valve and area around valve.	0.066					X
5 Fill out maintenance report and report deficiencies.	0.022					X
Total labor-hours/period						.166
Total labor-hours/year	0.166					.166

Plumbing Yearly Preventative Maintenance Component List

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2025 120 1950						
Valve, butterfly, above 4"						
1 Lubricate valves that have grease fittings.	0.022					X
2 Open and close valve using handle, wrench, or hand wheel to check operation.	0.049					X
3 Check for leaks.	0.007					X
4 Clean valve exterior and area around valve.	0.066					X
5 Fill out maintenance report and report deficiencies.	0.022					X
Total labor-hours/period						.166
Total labor-hours/year	0.166					.166

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2025 120 2950						
Valve, butterfly, auto, above 4"						
1 Lubricate valve actuator stem and valve stem, where possible.	0.022					X
2 Check automatic valve for proper operation.	0.062					X
3 Check packing gland for leaks; adjust as required.	0.160					X
4 Check pneumatic operator and tubing for air leaks.	0.047					X
5 Clean valve exterior and area around valve.	0.034					X
6 Fill out maintenance report and report deficiencies.	0.022					X
Total labor-hours/period						.347
Total labor-hours/year	0.347					.347

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2025 125 1950						
Valve, check, above 4"						
1 Inspect valve for leaks; repair as necessary.	0.009					X
2 Adjust system pressure/flow to verify that valve is opening and closing properly, if applicable.	0.160					X
3 Clean valve and area around valve.	0.066					X
4 Fill out maintenance report and report deficiencies.	0.022					X
Total labor-hours/period						.257
Total labor-hours/year	0.257					.257

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2025 135 1950						
Valve, diaphragm, above 4"						
1 Lubricate valve stem, close and open valve to check operation.	0.022					X
2 Check valve for proper operation and leaks; tighten packing and flange bolts as required.	0.044					X
3 Clean valve exterior and area around valve.	0.034					X
4 Fill out maintenance report and report deficiencies.	0.022					X
Total labor-hours/period						.122
Total labor-hours/year	0.122					.122

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2025 140 1950						
Valve, gate, above 4"						
1 Lubricate valve stem; close and open valve to check operation.	0.049					X
2 Check packing gland for leaks; tighten packing and flange bolts as req.	0.022					X
3 Clean valve exterior and area around valve.	0.066					X
4 Fill out maintenance report and report deficiencies.	0.022					X
Total labor-hours/period						.159
Total labor-hours/year	0.159					.159

Plumbing Yearly Preventative Maintenance Component List

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2025 145 1950						
Valve, globe, above 4"						
1 Lubricate stem, close and open valve to check operation.	0.049					X
2 Check packing gland for leaks; tighten packing and flange bolts as req.	0.022					X
3 Clean valve exterior.	0.066					X
4 Fill out maintenance report and report deficiencies.	0.022					X
Total labor-hours/period						.159
Total labor-hours/year	0.159					.159

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2025 145 2950						
Valve, globe, auto, above 4"						
1 Lubricate valve actuator stem and valve stem, where possible.	0.022					X
2 Check automatic valve for proper operation.	0.062					X
3 Check packing gland for leaks; adjust as required.	0.160					X
4 Check pneumatic operator and tubing for air leaks.	0.025					X
5 Clean valve exterior and area around valve.	0.034					X
6 Fill out maintenance report and report deficiencies.	0.022					X
Total labor-hours/period						.325
Total labor-hours/year	0.325					.325

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2025 150 1950						
Valve, motor operated, above 4"						
1 Lubricate valve actuator stem and valve stem, where possible.	0.091				X	X
2 Check motor and valve for proper operation, including limit switch; adjust as required.	0.022				X	X
3 Check packing gland for leaks; adjust as required.	0.113				X	X
4 Check electrical wiring, connections and contacts; repair as necessary.	0.120				X	X
5 Inspect and lubricate motor gearbox as required.	0.099				X	X
6 Clean valve exterior and area around valve.	0.034				X	X
7 Fill out maintenance report and report deficiencies.	0.022				X	X
Total labor-hours/period					.501	.501
Total labor-hours/year	1.002				.501	.501

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2025 155 1950						
Valve, OS&Y, above 4"						
1 Lubricate stem; open and close valve to check operation.	0.049					X
2 Check packing gland for leaks; tighten packing and flange bolts as required.	0.022					X
3 Clean valve exterior and area around valve.	0.066					X
4 Fill out maintenance report and report deficiencies.	0.022					X
Total labor-hours/period						.159
Total labor-hours/year	0.159					.159

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2025 265 1950						
Valve, pressure regulator, above 4"						
1 Inspect valve for leaks; repair as necessary.	0.160					X
2 Manually operate to check operation; adjust as required.	0.049					X
3 Check pressure mechanism for proper opening and closing action.	0.062					X
4 Clean valve and area around regulator.	0.066					X
5 Fill out maintenance report and report deficiencies.	0.022					X
Total labor-hours/period						.359
Total labor-hours/year	0.359					.359

**Plumbing Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2025 262 1950						
Valve, pressure relief, above 4"						
1 Inspect valve for leaks, tighten fittings as necessary.	0.022					X
2 Manually operate to check operation.	0.038					X
3 Clean valve and area around valve.	0.066					X
4 Fill out maintenance report and report deficiencies.	0.022					X
Total labor-hours/period						.148
Total labor-hours/year	0.148					.148

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2025 270 1950						
Valve, sediment strainer, above 4"						
1 Inspect valve for leaks, tighten fittings as necessary.	0.160					X
2 Open valve drain to remove collected sediment.	0.065					X
3 Clean valve exterior and around strainer.	0.066					X
4 Fill out maintenance checklist and report deficiencies.	0.022					X
Total labor-hours/period						.313
Total labor-hours/year	0.313					.313

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2025 260 1950						
Water heater, gas, to 120 gallon						
1 Check with operating or area personnel for deficiencies.	0.035				X	X
2 Check for water leaks to tank and piping; check for fuel system leaks.	0.077				X	X
3 Check gas burner and pilot for proper flame; adjust if required.	0.118				X	X
4 Check operation and condition of pressure relief valve.	0.010				X	X
5 Check automatic controls for proper operation (temperature regulators, thermostatic devices, automatic fuel shut off valve, etc.).	0.094				X	X
6 Check draft diverter and clear openings, if clogged.	0.027				X	X
7 Check electrical wiring for fraying and loose connections on oil burner.	0.072				X	X
8 Check for proper water temperature setting; adjust as required.	0.029				X	X
9 Check condition of flue pipe, and chimney.	0.147				X	X
10 Drain sediment from tank.	0.325					X
11 Clean up area around unit.	0.066				X	X
12 Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period					.697	1.022
Total labor-hours/year	1.719				.697	1.022

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2025 260 2950						
Water heater, oil fired, to 100 gallon						
1 Check with operating or area personnel for deficiencies.	0.035				X	X
2 Check for water leaks to tank and piping; check for fuel system leaks.	0.077				X	X
3 Check burner flame and pilot on oil burner; adjust if required.	0.073				X	X
4 Check operation and condition of pressure relief valve.	0.010				X	X
5 Check automatic controls for proper operation (temperature regulators, thermostatic devices, automatic fuel shut off valve, etc.).	0.094				X	X
6 Check fuel filter element on oil burner.	0.068				X	X
7 Check fuel level in tank; check tank, fill pipe and fuel lines and connections for damage.	0.022				X	X
8 Inspect, clean, and adjust electrodes and nozzles on oil burners; inspect fire box and flame detection scanner.	0.254				X	X
9 Check electrical wiring for fraying and loose connections on oil burner.	0.072				X	X
10 Check for proper water temperature setting; adjust as required.	0.029				X	X
11 Clean fire box.	0.577					X
12 Check for proper draft adjustment; adjust draft meter if necessary.	0.005				X	X
13 Check condition of flue pipe, damper and chimney.	0.147				X	X
14 Drain sediment from tank.	0.325					X
15 Clean up area around unit.	0.066				X	X
16 Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period					.974	1.876
Total labor-hours/year	2.850				.974	1.876

**Plumbing Yearly Preventative Maintenance
Component List**

CostWorks 2010 - EAST HALL

PM Components	Labor Hours	W	M	Q	S	A
PM System D2025 260 3950						
Water heater, steam coil, to 2500 gallon						
1 Check with operating or area personnel for deficiencies.	0.035				X	X
2 Check for water leaks to tank and piping; check steam lines for leaks.	0.077				X	X
3 Check operation and condition of pressure relief valve.	0.010				X	X
4 Check steam modulating valve and steam condensate trap for proper operation.	0.068				X	X
5 Check electrical wiring connections on controls and switches.	0.094				X	X
6 Check for proper water temperature setting; adjust as required.	0.029				X	X
7 Clean, test and inspect sight gauges, valves and drains.	0.040				X	X
8 Check automatic controls for proper operation including temperature regulators and thermostatic devices.	0.094				X	X
9 Check insulation on heater; repair as necessary.	0.077				X	X
10 Drain sediment from tank.	0.325					X
11 Clean up area around unit.	0.066				X	X
12 Fill out maintenance checklist and report deficiencies.	0.022				X	X
Total labor-hours/period					.612	.937
Total labor-hours/year	1.549				.612	.937

Appendix C-LW1 LCCA 20% GF O&M

LIFE CYCLE COST (Present Worth Method)							
LCC -Plumbing O&M		Green			Non-Green		
		Not East Hall Specific			RS Means CostWorks		
PROJECT LIFE CYCLE (YEARS)	25						
DISCOUNT RATE (% in decimals)	7.00%						
				Est.	PW	Est.	PW
Base Cost					\$ -		\$ -
Interface Cost							
A)					\$ -		\$ -
B)					\$ -		\$ -
C)					\$ -		\$ -
D)					\$ -		\$ -
Other Initial Costs							
A)					\$ -		\$ -
B)					\$ -		\$ -
Total Initial Cost Impact (IC)					\$ -		\$ -
Initial Cost PW Savings							\$ -
		Year	Factor				
		0.5	0.9667	\$ 39.11	\$ 37.00	\$ 32.59	\$ 31.00
		1	0.9346	\$ 5,148.15	\$ 4,811.00	\$ 4,290.13	\$ 4,009.00
		3	0.8163	\$ 694.26	\$ 566.00	\$ 578.55	\$ 472.00
		4	0.7629	\$ 266.11	\$ 203.00	\$ 221.76	\$ 169.00
		5	0.7130	\$ 1,849.69	\$ 1,318.00	\$ 1,541.41	\$ 1,099.00
		7	0.6227	\$ 1,821.16	\$ 1,134.00	\$ 1,517.64	\$ 945.00
		10	0.5083	\$ 38,569.65	\$ 19,606.00	\$ 32,141.38	\$ 16,339.00
		12	0.4440	\$ 3,961.01	\$ 1,758.00	\$ 41.97	\$ 18.00
		15	0.3624	\$ 379,945.51	\$ 137,709.00	\$ 316,621.26	\$ 114,758.00
		20	0.2584	\$ 87,295.16	\$ 22,558.00	\$ 72,745.96	\$ 18,798.00
		25	0.1842	\$ 311,215.92	\$ 57,341.00	\$ 259,346.60	\$ 47,784.00
		40	0.0668		\$ -		\$ -
		50	0.0339		\$ -		\$ -
			1.0000		\$ -		\$ -
					\$ 247,041.00		\$ 204,422.00
		Type of Annual Expense	Escl..00 %	PWA			
A		YPM-Plumbing	6.00%	22.178	\$ 3,718.80	\$ 82,475.43	\$ 3,099.00
A		Operations	6.00%	22.178	\$ 50,000.00	\$ 1,108,899.65	\$ 50,000.00
		Total Operation/Maintenance (PW) Costs			\$ 1,191,375.09		\$ 1,177,629.18
		Total Present Worth Life Cycle Costs			\$ 1,438,416.09		\$ 1,382,051.18
		Life Cycle (PW) Savings					\$ 56,364.91
		PW - Present Worth	PWA - Present Worth of Annuity				
		Summary-O&M per SF					
		East Hall SF			\$ 162,404.00		
		Non Green Costs per SF-YPM			\$ 7.25		
		Green Costs per SF-YPM			\$ 7.34		
		Non Green Costs per SF-FMRRC			\$ 1.26		
		Green Costs per SF-FMRRC			\$ 1.52		
		Non-Green Total Costs per SF-YPM& FMRRC			\$ 8.51		
		Green-Total Costs per SF-YPM& FMRRC			\$ 8.86		

Appendix C-LW2 LCCA 15% GF O&M

LIFE CYCLE COST (Present Worth Method)								
LCC -Plumbing 15% GF O&M		Green				Non-Green		
PROJECT LIFE CYCLE (YEARS)		25		Not East Hall Specific		RS Means CostWorks		
DISCOUNT RATE (% in decimals)		7.00%						
				Est.		PW		
Base Cost				\$ -		\$ -		
Interface Cost								
A)				\$ -		\$ -		
B)				\$ -		\$ -		
C)				\$ -		\$ -		
D)				\$ -		\$ -		
Other Initial Costs								
A)				\$ -		\$ -		
B)				\$ -		\$ -		
Total Initial Cost Impact (IC)				\$ -		\$ -		
Initial Cost PW Savings						\$ -		
		Year Factor						
FMRRC Plumbing Items		0.5		0.9667	\$ 37.48	\$ 36.00	\$ 32.59	\$ 31.00
		1		0.9346	\$ 4,933.65	\$ 4,610.00	\$ 4,290.13	\$ 4,009.00
		3		0.8163	\$ 665.33	\$ 543.00	\$ 578.55	\$ 472.00
		4		0.7629	\$ 255.02	\$ 194.00	\$ 221.76	\$ 169.00
		5		0.7130	\$ 1,772.62	\$ 1,263.00	\$ 1,541.41	\$ 1,099.00
		7		0.6227	\$ 1,745.28	\$ 1,086.00	\$ 1,517.64	\$ 945.00
		10		0.5083	\$ 36,962.58	\$ 18,789.00	\$ 32,141.38	\$ 16,339.00
		12		0.4440	\$ 3,747.70	\$ 1,664.00	\$ 41.97	\$ 18.00
		15		0.3624	\$ 364,114.44	\$ 131,971.00	\$ 316,621.26	\$ 114,758.00
		20		0.2584	\$ 83,657.86	\$ 21,618.00	\$ 72,745.96	\$ 18,798.00
25		0.1842	\$ 298,248.59	\$ 54,952.00	\$ 259,346.60	\$ 47,784.00		
40		0.0668		\$ -		\$ -		
50		0.0339		\$ -		\$ -		
		1.0000			\$ -		\$ -	
Total Replacement/Salvage PW Costs				\$ 236,726.00		\$ 204,422.00		
Type of Annual Expense		Escl..00 % PWA						
A	YPM-Plumbing	6.00%	22.178	\$ 3,563.85	\$ 79,038.95	\$ 3,099.00	\$ 68,729.53	
A	Operations	6.00%	22.178	\$ 50,000.00	\$ 1,108,899.65	\$ 50,000.00	\$ 1,108,899.65	
Total Operation/Maintenance (PW) Costs				\$ 1,187,938.61		\$ 1,177,629.18		
Total Present Worth Life Cycle Costs				\$ 1,424,664.61		\$ 1,382,051.18		
Life Cycle (PW) Savings						\$ 42,613.43		
PW - Present Worth PWA - Present Worth of Annuity								
Summary-O&M per SF								
East Hall SF				\$ 162,404.00				
Non Green Costs per SF-YPM				\$ 7.25				
Green Costs per SF-YPM				\$ 7.31				
Non Green Costs per SF-FMRRC				\$ 1.26				
Green Costs per SF-FMRRC				\$ 1.46				
Non-Green Total Costs per SF-YPM& FMRRC				\$ 8.51				
Green-Total Costs per SF-YPM& FMRRC				\$ 8.77				

Appendix C-LW3 LCCA 10% GF O&M

LIFE CYCLE COST (Present Worth Method)								
LCC -Plumbing 10% GF O&M		Green				Non-Green		
PROJECT LIFE CYCLE (YEARS)		25		Not East Hall Specific		RS Means CostWorks		
DISCOUNT RATE (% in decimals)		7.00%						
				Est.		PW		
Base Cost				\$ -		\$ -		
Interface Cost								
A)				\$ -		\$ -		
B)				\$ -		\$ -		
C)				\$ -		\$ -		
D)				\$ -		\$ -		
Other Initial Costs								
A)				\$ -		\$ -		
B)				\$ -		\$ -		
Total Initial Cost Impact (IC)				\$ -		\$ -		
Initial Cost PW Savings						\$ -		
		Year Factor						
FMRRC Plumbing Items		0.5		0.9667	\$ 35.85	\$ 34.00	\$ 32.59	\$ 31.00
		1		0.9346	\$ 4,719.14	\$ 4,410.00	\$ 4,290.13	\$ 4,009.00
		3		0.8163	\$ 636.40	\$ 519.00	\$ 578.55	\$ 472.00
		4		0.7629	\$ 243.94	\$ 186.00	\$ 221.76	\$ 169.00
		5		0.7130	\$ 1,695.55	\$ 1,208.00	\$ 1,541.41	\$ 1,099.00
		7		0.6227	\$ 1,669.40	\$ 1,039.00	\$ 1,517.64	\$ 945.00
		10		0.5083	\$ 35,355.52	\$ 17,972.00	\$ 32,141.38	\$ 16,339.00
		12		0.4440	\$ 3,630.93	\$ 1,612.00	\$ 3,300.84	\$ 1,465.00
		15		0.3624	\$ 348,283.38	\$ 126,233.00	\$ 316,621.26	\$ 114,758.00
		20		0.2584	\$ 80,020.56	\$ 20,678.00	\$ 72,745.96	\$ 18,798.00
25		0.1842	\$ 285,281.26	\$ 52,562.00	\$ 259,346.60	\$ 47,784.00		
40		0.0668		\$ -		\$ -	\$ -	
50		0.0339		\$ -		\$ -	\$ -	
		1.0000			\$ -		\$ -	
Total Replacement/Salvage PW Costs				\$ 226,453.00		\$ 205,869.00		
Type of Annual Expense		Escl..00 % PWA						
A YPM-Plumbing		6.00% 22.178		\$ 3,408.90	\$ 75,602.48	\$ 3,099.00	\$ 68,729.53	
A Operations		6.00% 22.178		\$ 50,000.00	\$ 1,108,899.65	\$ 50,000.00	\$ 1,108,899.65	
Total Operation/Maintenance (PW) Costs				\$ 1,184,502.13		\$ 1,177,629.18		
Total Present Worth Life Cycle Costs				\$ 1,410,955.13		\$ 1,383,498.18		
Life Cycle (PW) Savings						\$ 27,456.95		
PW - Present Worth PWA - Present Worth of Annuity								
Summary-O&M per SF								
East Hall SF				\$ 162,404.00				
Non Green Costs per SF-YPM				\$ 7.25				
Green Costs per SF-YPM				\$ 7.29				
Non Green Costs per SF-FMRRC				\$ 1.27				
Green Costs per SF-FMRRC				\$ 1.39				
Non-Green Total Costs per SF-YPM& FMRRC				\$ 8.52				
Green-Total Costs per SF-YPM& FMRRC				\$ 8.69				

Appendix C-LW4 LCCA 5% GF O&M

LIFE CYCLE COST (Present Worth Method)								
LCC -Plumbing 5% GF O&M		Green				Non-Green		
PROJECT LIFE CYCLE (YEARS)		25		Not East Hall Specific		RS Means CostWorks		
DISCOUNT RATE (% in decimals)		7.00%						
				Est.		PW		
Base Cost				\$ -		\$ -		
Interface Cost								
A)				\$ -		\$ -		
B)				\$ -		\$ -		
C)				\$ -		\$ -		
D)				\$ -		\$ -		
Other Initial Costs								
A)				\$ -		\$ -		
B)				\$ -		\$ -		
Total Initial Cost Impact (IC)				\$ -		\$ -		
Initial Cost PW Savings						\$ -		
		Year Factor						
FMRRC Plumbing Items		0.5		0.9667	\$ 34.22	\$ 33.00	\$ 32.59	\$ 31.00
		1		0.9346	\$ 4,504.64	\$ 4,209.00	\$ 4,290.13	\$ 4,009.00
		3		0.8163	\$ 607.48	\$ 495.00	\$ 578.55	\$ 472.00
		4		0.7629	\$ 232.85	\$ 177.00	\$ 221.76	\$ 169.00
		5		0.7130	\$ 1,618.48	\$ 1,153.00	\$ 1,541.41	\$ 1,099.00
		7		0.6227	\$ 1,593.52	\$ 992.00	\$ 1,517.64	\$ 945.00
		10		0.5083	\$ 33,748.45	\$ 17,155.00	\$ 32,141.38	\$ 16,339.00
		12		0.4440	\$ 3,421.81	\$ 1,519.00	\$ 3,258.87	\$ 1,446.00
		15		0.3624	\$ 332,452.32	\$ 120,496.00	\$ 316,621.26	\$ 114,758.00
		20		0.2584	\$ 76,383.26	\$ 19,738.00	\$ 72,745.96	\$ 18,798.00
		25		0.1842	\$ 272,313.93	\$ 50,173.00	\$ 259,346.60	\$ 47,784.00
		40		0.0668		\$ -		\$ -
50		0.0339		\$ -		\$ -		
		1.0000			\$ -		\$ -	
Total Replacement/Salvage PW Costs				\$ 216,140.00		\$ 205,850.00		
Type of Annual Expense		Escl..00 % PWA						
A YPM-Plumbing		6.00% 22.178		\$ 3,253.95	\$ 72,166.00	\$ 3,099.00	\$ 68,729.53	
A Operations		6.00% 22.178		\$ 50,000.00	\$ 1,108,899.65	\$ 50,000.00	\$ 1,108,899.65	
Total Operation/Maintenance (PW) Costs				\$ 1,181,065.66		\$ 1,177,629.18		
Total Present Worth Life Cycle Costs				\$ 1,397,205.66		\$ 1,383,479.18		
Life Cycle (PW) Savings						\$ 13,726.48		
PW - Present Worth PWA - Present Worth of Annuity								
Summary-O&M per SF								
East Hall SF				\$ 162,404.00				
Non Green Costs per SF-YPM				\$ 7.25				
Green Costs per SF-YPM				\$ 7.27				
Non Green Costs per SF-FMRRC				\$ 1.27				
Green Costs per SF-FMRRC				\$ 1.33				
Non-Green Total Costs per SF-YPM& FMRRC				\$ 8.52				
Green-Total Costs per SF-YPM& FMRRC				\$ 8.60				

Summary Operations and Maintenance

Appendix C-OM1 Summary Table of All Costs

Summary Table of All Costs				
Description of Costs	Green	Percent of Total	Non-Green	Percent of Total
Total Construction	\$ 37,469,713.06	81.79%	\$ 35,248,164.16	80.91%
Consumption	\$ 179,815.70	0.39%	\$ 392,175.82	0.90%
FMRRRC & YPM& Operations	\$ 8,162,425.04	17.82%	\$ 7,923,691.16	18.19%
TOTALS	\$ 45,811,953.80		\$ 43,564,031.14	
operations and maintenance	\$ 8,162,425.04	17.82%	\$ 7,923,691.16	18.19%
Typical Cost Distribution		5.00%		5.00%
		12.82%		13.19%
		Assumptions indicate much higher bracket		Assumptions indicate much higher bracket
NOTES:				
Non-green costs the baseline case was assumed for consumption costs				
Non-green maintenance costs do not include a green factor (GF)				
Water consumption costs assumed the 25% reduction values				

Appendix C-OM2 Summary Table of All Costs-Assuming 30% of Total O&M Costs

Summary Table of All Costs-Assuming 30% of Total O&M Costs				
Description of Costs	Green	Percent of Total	Non-Green	Percent of Total
Total Construction	\$ 37,469,713.06	81.79%	\$ 35,248,164.16	80.91%
Consumption	\$ 179,815.70	0.39%	\$ 392,175.82	0.90%
FMRRRC &YPM & Operations	\$ 8,162,425.04	17.82%	\$ 7,923,691.16	18.19%
TOTALS	\$ 45,811,953.80		\$ 43,564,031.14	
operations and maintenance	\$ 2,448,727.51	5.35%	\$ 2,377,107.35	5.46%
Typical Cost Distribution		5.00%		5.00%
		0.35%		0.46%
		Assuming 30% of total O&M Costs		Assuming 30% of total O&M Costs
		Apply		Apply
NOTES:				
Non-green costs the baseline case was assumed for consumption costs				
Non-green maintenance costs do not include a green factor (GF)				
Water consumption costs assumed the 25% reduction values				

Operations Costs

Appendix C-O1 Yearly Operations Costs (Mechanical, Electrical and Plumbing)

Yearly Operations Costs		
TOTAL YEARLY OPERATIONS BUDGET	\$	250,000.00
DESCRIPTION OF DISCIPLINE	YEARLY OPERATIONS COST	
MECHANICAL	\$	100,000.00 Assumed 40% of budget
PLUMBING	\$	50,000.00 Assumed 20% of budget
ELECTRICAL	\$	100,000.00 Assumed 40% of budget
Total Operations Budget	\$	250,000.00
NOTES:		
Information provided by Alfred DiMauro		
the percentage breakdown of the total value has not been confirmed by the		
facilities department		

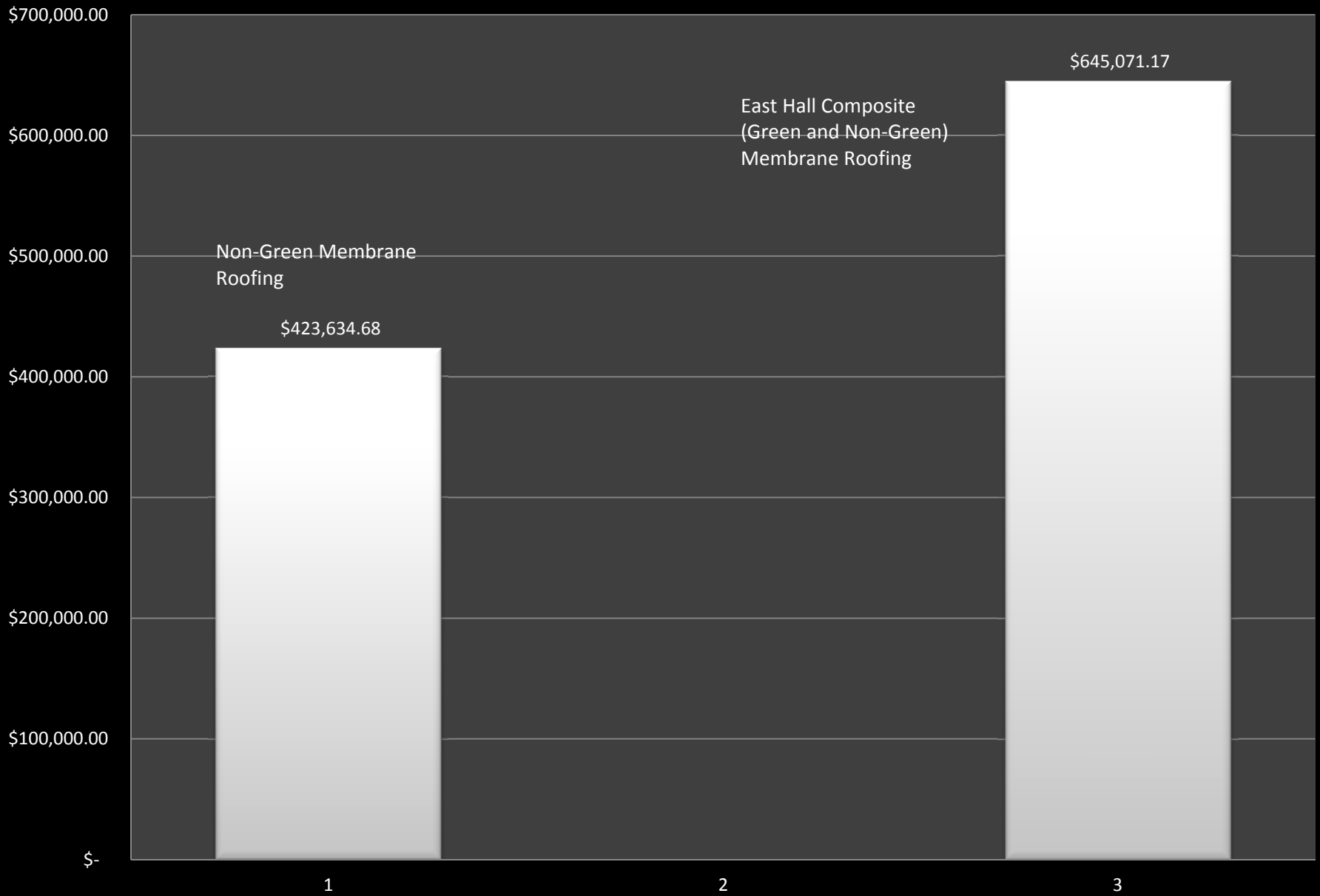
Roof Costs

Appendix D-R1 Non-Green Built-Up Roof Cost Comparison to WPI East Hall Roof Costs

Non-Green Built-up Roofing Cost Comparison to WPI East Hall Composite (Green & Non-Green) Roof Costs						
Project: East Hall 232 Residents						
Project	EAST HALL					
Total Roof Area=	24920	SF				
Green Roof Area=	5123	SF				
Built-up Roof Area=	19797	SF				
Escalation	6%					
De-Escalation to July 2009	1.03					
De-Escalation Factor to be Applied	0.97					
Green Factor	1.20	Assumed Value				
Type of construction	U/P	QTY	U/M	Total	Comments	
Non-Green Built-up Roofing	\$ 17.00	24,919.69	sf	\$ 423,634.68	U/P Based on historical project information (NHRYP*)	
Composite Green & Non-Green		24,919.69	sf	\$ 645,071.17		
SUMMARY OF FINDINGS						
Composite Roof versus Non-Green	34.33%	WPI's Composite roof was 34.33% higher in cost than that of a non-green built up roof.				
*NHRYP-New Haven Rail Yard Projects						

Appendix D-R2 Graph: WPI and Non-Green Built-Up Roof Construction Cost Comparison

WPI and Non-Green Built-up Roof Construction Cost Comparison



Appendix D-R3 Yearly Preventative Maintenance and Frequency Maintenance Repair
and Replacement Costs

GREEN ROOF REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

Project	EAST HALL												
Total Roof Area (SF)=	24920												
Green Roof Area (SF)=	5123												
Built-up Roof Area (SF)=	19797												
Escalation	6%												
De-Escalation to July 2009	1.03												
De-Escalation Factor to be Applied	0.97												
Green Factor (Assumed Value)	1.20												

Assembly Number	Description	Frequency (yrs)	Crew	Unit	Area	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Qty
B3013105000Z	Built-up Roofing											
B3013 105 0100	Debris removal and visual inspection built-up roofing	0.5	2 Rofc	M.S.F.	19.8	0.71	\$ -	\$ 24.94	\$ -	\$ 24.94	\$ 36.27	1
B3013 105 0200	Non-destructive moisture inspection built-up roofing	5	2 Rofc	M.S.F.	19.8	2.19	\$ -	\$ 77.34	\$ -	\$ 77.34	\$ 112.67	1
B3013 105 0200	Non-destructive moisture inspection built-up roofing-Green Roof	5	2 Rofc	M.S.F.	5.123	2.19	\$ -	\$ 77.34	\$ -	\$ 77.34	\$ 112.67	1
B3013 105 0300	Minor membrane repairs - (2% of roof area) built-up roofing	1	G5	Sq.	3.959	5.97	\$ 91.50	\$ 203.25	\$ 28.00	\$ 322.75	\$ 424.25	1
B3013 105 0300	Minor membrane repairs - (2% of roof area) built-up roofing-Green Roof	1	G5	Sq.	1.025	5.97	\$ 91.50	\$ 203.25	\$ 28.00	\$ 322.75	\$ 424.25	1
B3013 105 0400	Flashing repairs - (2 S.F. per sq. repaired) built-up roofing	1	2 Rofc	S.F.	7.919	0.06	\$ 0.19	\$ 2.17	\$ -	\$ 2.36	\$ 3.38	1
B3013 105 0400	Flashing repairs - (2 S.F. per sq. repaired) built-up roofing-Green Roof	1	2 Rofc	S.F.	2.049	0.06	\$ 0.19	\$ 2.17	\$ -	\$ 2.36	\$ 3.38	1
B3013 105 0500	Minor membrane replacement - (25% of roof area) built-up roofing	15	G5	Sq.	49.49	10.23	\$ 192.00	\$ 344.26	\$ 31.50	\$ 567.76	\$ 725.51	1
B3013 105 0500	Minor membrane replacement - (25% of roof area) built-up roofing-Green Roof	15	G5	Sq.	12.81	10.23	\$ 192.00	\$ 344.26	\$ 31.50	\$ 567.76	\$ 725.51	1
B3013 105 0600	Place new membrane over existing built-up roofing	20	G5	Sq.	198	5.21	\$ 130.39	\$ 175.09	\$ 31.50	\$ 336.98	\$ 430.82	1
B3013 105 0600	Place new membrane over existing built-up roofing-Green Roof	20	G5	Sq.	51.23	5.21	\$ 130.39	\$ 175.09	\$ 31.50	\$ 336.98	\$ 430.82	1
B3013 105 0700	Total roof replacement built-up roofing	28	G1	Sq.	198	9.04	\$ 210.39	\$ 306.19	\$ 24.00	\$ 540.58	\$ 686.07	1
B3013 105 0700	Total roof replacement built-up roofing-Green Roof	28	G1	Sq.	51.23	9.04	\$ 210.39	\$ 306.19	\$ 24.00	\$ 540.58	\$ 686.07	1

Summary of Green versus Non-Green Major Repair and Replacement Costs based on Frequency (Roof)												
Type of Construction	Description	TOTAL COST	COMMENTS									
Non-Green	Up to 10 Years	\$ 6,612.43										
Non-Green	10 th yr on till 25 th Year	\$ 174,983.85										
Non-Green	25 th yr on till 50 th Year	\$ 196,701.99	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME									
Green	Up to 10 Years	\$ 6,849.36										
Green	10 th yr on till 25 th Year	\$ 182,178.54										
Green	25 th yr on till 50 th Year	\$ 204,789.65	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME									

GREEN ROOF REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

Project	EAST HALL								
Total Roof Area (SF)=	24920								
Green Roof Area (SF)=	5123								
Built-up Roof Area (SF)=	19797								
Escalation	6%								
De-Escalation to July 2009	1.03								
De-Escalation Factor to be Applied	0.97								
Green Factor (Assumed Value)	1.20								

Assembly Number	Description	U/P Total Incl. O&P	Total Cost 2010	De-Escalation Factor	Total Cost De-Escalated with All Add-ons	Green Factor	Total Green Cost with All Add-ons and De-Escalation	Type
B3013105000Z	Built-up Roofing							
B3013 105 0100	Debris removal and visual inspection built-up roofing	\$ 44.24	\$ 875.80	0.97	\$ 849.91	1.00	\$ 849.91	
					\$ 849.91		\$ 849.91	Every 0.5 Years
B3013 105 0200	Non-destructive moisture inspection built-up roofing	\$ 136.24	\$ 2,697.10	0.97	\$ 2,617.36	1.00	\$ 2,617.36	
B3013 105 0200	Non-destructive moisture inspection built-up roofing-Green Roof	\$ 136.24	\$ 697.96	0.97	\$ 677.33	1.20	\$ 812.79	
					\$ 3,294.69		\$ 3,430.16	Every 5 years
B3013 105 0300	Minor membrane repairs - (2% of roof area) built-up roofing	\$ 502.10	\$ 1,987.98	0.97	\$ 1,929.21	1.00	\$ 1,929.21	
B3013 105 0300	Minor membrane repairs - (2% of roof area) built-up roofing-Green Roof	\$ 502.10	\$ 514.45	0.97	\$ 499.25	1.20	\$ 599.09	
B3013 105 0400	Flashing repairs - (2 S.F. per sq. repaired) built-up roofing	\$ 4.07	\$ 32.23	0.97	\$ 31.28	1.00	\$ 31.28	
B3013 105 0400	Flashing repairs - (2 S.F. per sq. repaired) built-up roofing-Green Roof	\$ 4.07	\$ 8.34	0.97	\$ 8.09	1.20	\$ 9.71	
					\$ 2,467.83		\$ 2,569.29	Every Year
B3013 105 0500	Minor membrane replacement - (25% of roof area) built-up roofing	\$ 864.37	\$ 42,779.10	0.97	\$ 41,514.42	1.00	\$ 41,514.42	
B3013 105 0500	Minor membrane replacement - (25% of roof area) built-up roofing-Green Roof	\$ 864.37	\$ 11,070.48	0.97	\$ 10,743.20	1.20	\$ 12,891.84	
					\$ 52,257.62		\$ 54,406.26	Every 15 Years
B3013 105 0600	Place new membrane over existing built-up roofing	\$ 507.49	\$ 100,466.07	0.97	\$ 97,495.99	1.00	\$ 97,495.99	
B3013 105 0600	Place new membrane over existing built-up roofing-Green Roof	\$ 507.49	\$ 25,998.85	0.97	\$ 25,230.24	1.20	\$ 30,276.29	
					\$ 122,726.24		\$ 127,772.28	Every 20 Years
B3013 105 0700	Total roof replacement built-up roofing	\$ 813.39	\$ 161,024.05	0.97	\$ 156,263.70	1.00	\$ 156,263.70	
B3013 105 0700	Total roof replacement built-up roofing-Green Roof	\$ 813.39	\$ 41,670.19	0.97	\$ 40,438.29	1.20	\$ 48,525.95	
					\$ 196,701.99		\$ 204,789.65	Every 28 Years

GREEN ROOF REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

Project	EAST HALL												
Total Roof Area (SF)=	24920	Yearly Preventative Maintenance											
Green Roof Area (SF)=	5123	\$	0.25	per sf per yr									
Built-up Roof Area (SF)=	19797	\$	6,229.92	Non-Green									
Escalation	6%	\$	7,766.83	Composite Green and Non Green									
De-Escalation to July 2009	1.03												
De-Escalation Factor to be Applied	0.97												
Green Factor (Assumed Value)	1.20												

Assembly Number	Description	Frequency (yrs)	Crew	Unit	Area	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Qty
-----------------	-------------	-----------------	------	------	------	-------------	-----------	------------	-------------	------------	----------------	-----

SUMMARY OF FINDINGS

	Green v. Non-Green	3.95%	Green Major Repair and Replacement is 3.95% higher in cost than that of a traditional building									

Abbreviations:

MSF= Thousand Square Feet
 SQ= square
 square=1. A quantity of shingles, shakes, or other roofing or siding materials sufficient to cover 100 square feet when applied in a standard manner; the basic sales units of shingles and shakes. 2. See carpenter's square.
 carpenter's square= A flat, metal, L-shaped tool that constitutes an accurate right angle and is engraved with divisions and markings useful to a carpenter laying out and erecting framing.

NOTES:

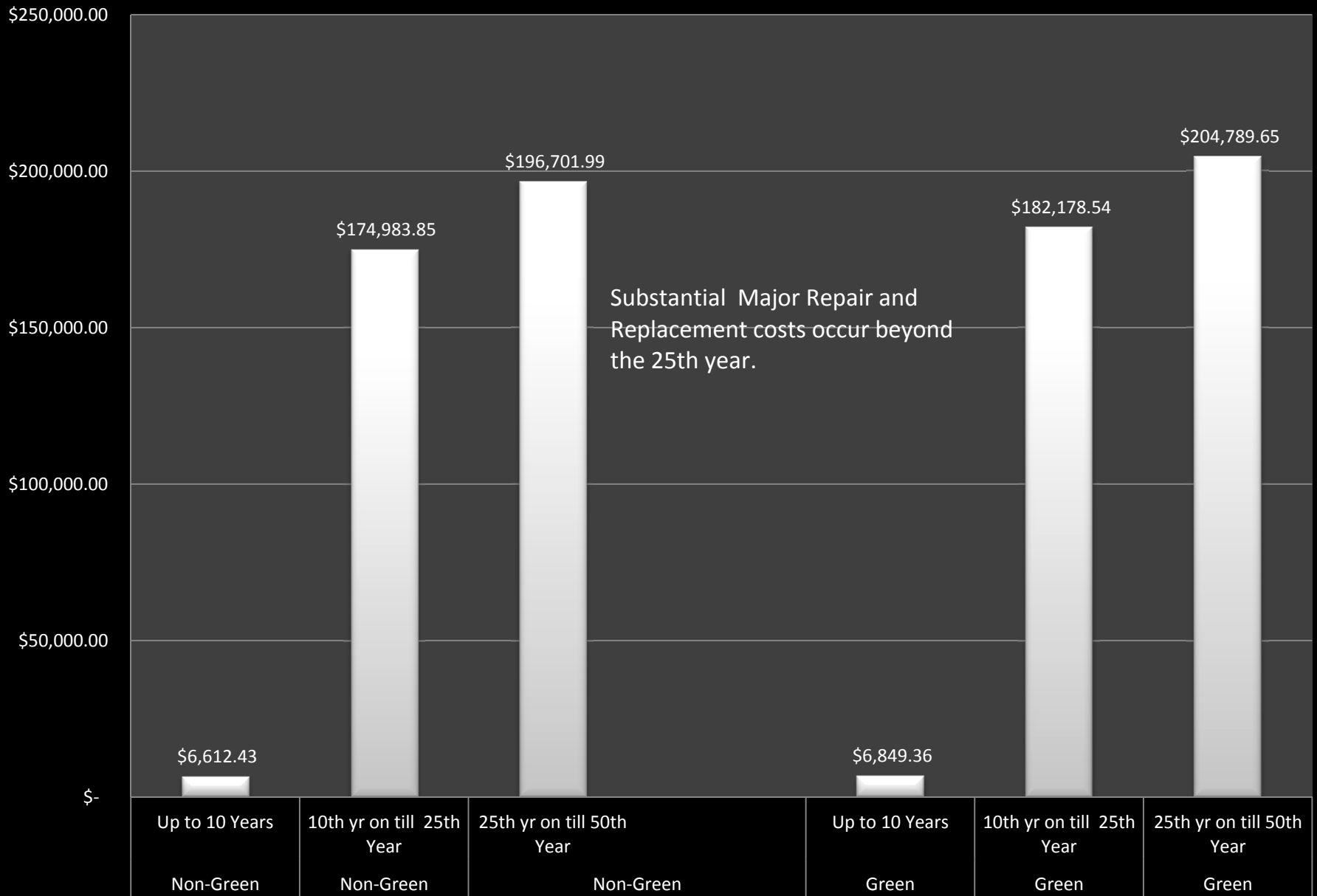
The Green roof is installed above the built up roofing there for the area below the green roof is also added in as the built up roofing
 Some costs have been adjusted using the Green Factor (20%) due to new and more specialized work

FOOTNOTES:

¹
 RS Means CostWorks 2010 Operations and Maintenance

Appendix D-R4 Graph: Frequency and Magnitude of Maintenance Repair and
Replacement Costs

Frequency and Magnitude of Major Repair and Replacement Costs



Appendix D-R5 RS Means Crew Lists

CREWS

CostWorks 2010 - [No Active Project]

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour		
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P
Crew ROFC (FMR)									
2 Roofers, Composition	\$35.40	\$566.40	\$51.40	\$822.40	\$62.35	\$997.60	\$35.40	\$51.40	\$62.35
16 L.H., Daily Totals		\$566.40		\$822.40		\$997.60	\$35.40	\$51.40	\$62.35

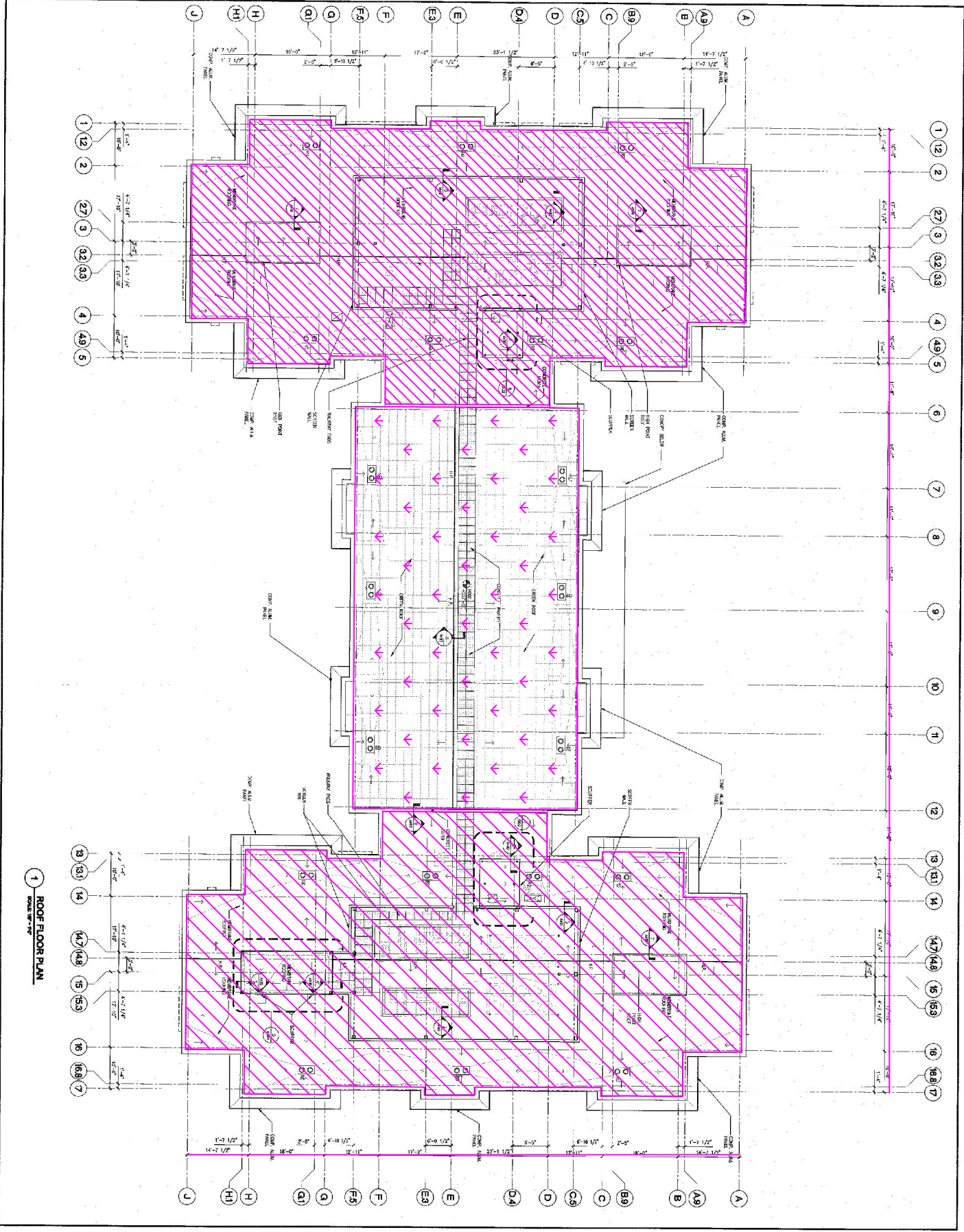
CostWorks 2010 - [No Active Project]

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour		
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P
Crew G5 (FMR)									
1 Roofer Foreman	\$37.40	\$299.20	\$54.30	\$434.43	\$65.87	\$526.98	\$32.12	\$46.64	\$56.57
2 Roofers, Composition	\$35.40	\$566.40	\$51.40	\$822.40	\$62.35	\$997.60			
2 Roofer Helpers	\$26.20	\$419.20	\$38.05	\$608.80	\$46.15	\$738.40			
1 Application Equipment		\$188.40		\$188.40		\$207.25	\$4.71	\$4.71	\$5.18
40 L.H., Daily Totals		\$1,473.20		\$2,054.03		\$2,470.23	\$36.83	\$51.35	\$61.76

CostWorks 2010 - [No Active Project]

Crew No.	Bare Costs		In-house Costs		Incl. Subs O&P		Cost Per Labor-Hour		
	Hr.	Daily	Hr.	Daily	Hr.	Daily	Bare Costs	In-house	Incl. O&P
Crew G1 (FMR)									
1 Roofer Foreman	\$37.40	\$299.20	\$54.30	\$434.43	\$65.87	\$526.98	\$33.06	\$48.00	\$58.22
4 Roofers, Composition	\$35.40	\$1,132.80	\$51.40	\$1,644.80	\$62.35	\$1,995.20			
2 Roofer Helpers	\$26.20	\$419.20	\$38.05	\$608.80	\$46.15	\$738.40			
1 Application Equipment		\$188.40		\$188.40		\$207.25			
1 Tar Kettle/Pot		\$85.45		\$85.45		\$94.00			
1 Crew Truck		\$202.40		\$202.40		\$222.65	\$8.50	\$8.50	\$9.36
56 L.H., Daily Totals		\$2,327.45		\$3,164.28		\$3,784.48	\$41.56	\$56.51	\$67.58

Appendix D-R6 Drawing: Roof Area Model



1 ROOF FLOOR PLAN
 SCALE: 1/8" = 1'-0"

<p>A106</p> <p>DATE: 11/14/17 DRAWN BY: [Name] CHECKED BY: [Name] PROJECT: NEW RESIDENCE HALL</p>	<p>NO. OF SHEETS: 762 SHEET NO.: 407</p>	<p>CANNON DESIGN</p> <p>NEW RESIDENCE HALL</p> <p>WPI</p>
	<p>PROJECT: NEW RESIDENCE HALL</p>	
	<p>DATE: 11/14/17</p>	
	<p>SCALE: 1/8" = 1'-0"</p>	

Page 407 of 762

Appendix D-NR1 Neutralized Roof Cost Comparison

Neutralized Roof Costs (Non-Green Scenario Comparison)										
Project: East Hall 232 Residents										
Gilbane Building Company Information										
Project Cost Update-For Comparison Purposes										
1/9/2008										
Escalation Factor per year										
	6.00%	6.00%								
EAST HALL CONSTRUCTION COST ESTIMATE										
	Escalated GMP Amount (July 2009)	Escalated GMP Amount (July 2009) W/ADD ONS	Escalated Current Amount	Escalated Current Amount (July 2009) W/ADD ONS	Variance between GMP Current and Current Amount	% of Total GMP Construction Amount	% Total of Current Construction Amount	% Total of GMP W/OH&P	% Total of Current W/OH&P	
BID PACKAGE DESCRIPTIONS										
DEMOLITION	\$ 255,263.68	\$ 293,532.56	\$ 255,263.68	\$ 296,428.58	(2,896.02)	0.78%	0.79%	0.78%	0.79%	
SITE PREP	\$ 1,282,320.73	\$ 1,474,565.03	\$ 1,282,320.73	\$ 1,489,113.22	(14,548.18)	3.94%	3.99%	3.94%	3.99%	
SITE IMPROVEMENTS/LANDSCAPING	\$ 378,146.02	\$ 434,837.31	\$ 392,717.55	\$ 456,048.84	(21,211.54)	1.16%	1.22%	1.16%	1.22%	
CONCRETE	\$ 2,035,013.54	\$ 2,340,100.83	\$ 2,035,013.54	\$ 2,363,188.45	(23,087.63)	6.26%	6.33%	6.26%	6.33%	
STRUCTURAL PRECAST	\$ 2,539,104.19	\$ 2,919,764.26	\$ 2,539,104.19	\$ 2,948,570.90	(28,806.64)	7.81%	7.90%	7.81%	7.90%	
ARCHITECTURAL PRECAST	\$ 310,485.32	\$ 357,032.98	\$ 310,485.32	\$ 360,555.50	(3,522.52)	0.95%	0.97%	0.95%	0.97%	
MASONRY	\$ 1,638,561.44	\$ 1,884,213.01	\$ 1,638,561.44	\$ 1,902,802.81	(18,589.80)	5.04%	5.10%	5.04%	5.10%	
HARDWARE ALLOWANCE	\$ 7,639.36	\$ 8,784.64	\$ 7,639.36	\$ 8,871.31	(86.67)	0.02%	0.02%	0.02%	0.02%	
STRUCTURAL STEEL	\$ 2,421,676.35	\$ 2,784,731.76	\$ 2,421,676.35	\$ 2,812,206.15	(27,474.39)	7.45%	7.54%	7.45%	7.54%	
MISC METALS	\$ 476,870.53	\$ 548,362.50	\$ 476,870.53	\$ 553,772.69	(5,410.19)	1.47%	1.48%	1.47%	1.48%	
PRECAST SUPPORT ALLOWANCE	\$ 64,956.37	\$ 74,694.56	\$ 64,956.37	\$ 75,431.51	(736.94)	0.20%	0.20%	0.20%	0.20%	
COMPACTOR ALLOWANCE	\$ 16,370.05	\$ 18,824.23	\$ 16,370.05	\$ 19,009.96	(185.72)	0.05%	0.05%	0.05%	0.05%	
MILLWORK ALLOWANCE	\$ 1,091,336.79	\$ 1,254,948.97	\$ 971,289.75	\$ 1,127,924.05	127,024.91	3.36%	3.02%	3.36%	3.02%	
RE. MILLWORK ALLOW			\$ 120,047.05	\$ 139,406.34	(139,406.34)	0.00%	0.37%	0.00%	0.37%	
ROOF/WATERPROOF	\$ 423,634.68	\$ 423,634.68	\$ 423,634.68	\$ 423,634.68	0.00	1.30%	1.32%	1.13%	1.14%	
SPRAY WATERPROOF	\$ 122,993.66	\$ 141,432.75	\$ 122,993.66	\$ 142,828.14	(1,395.39)	0.38%	0.38%	0.38%	0.38%	
CURTAIN WALL	\$ 3,847,507.87	\$ 4,424,322.58	\$ 3,847,507.87	\$ 4,467,973.31	(43,650.73)	11.83%	11.97%	11.83%	11.97%	
GENERAL TRADES	\$ 300,128.53	\$ 345,123.52	\$ 129,541.68	\$ 150,432.12	194,691.40	0.92%	0.40%	0.92%	0.40%	
WINDOW BLINDS	\$ 54,785.11	\$ 62,998.44	\$ 54,785.11	\$ 63,619.99	(621.55)	0.17%	0.17%	0.17%	0.17%	
DRYWALL	\$ 3,105,944.52	\$ 3,571,584.76	\$ 3,105,944.52	\$ 3,606,822.31	(35,237.55)	9.55%	9.67%	9.55%	9.67%	
DOORS AND HARDWARE	\$ 526,624.57	\$ 605,575.62	\$ 526,624.57	\$ 611,550.28	(5,974.66)	1.62%	1.64%	1.62%	1.64%	
FLOORING	\$ 962,411.72	\$ 1,106,695.57	\$ 962,411.72	\$ 1,117,614.32	(10,918.75)	2.96%	2.99%	2.96%	2.99%	
PAINTING	\$ 517,788.02	\$ 595,414.30	\$ 365,270.43	\$ 424,175.48	171,238.82	1.59%	1.14%	1.59%	1.14%	
APPLIANCES	\$ 146,566.53	\$ 168,539.65	\$ 146,566.53	\$ 170,202.47	(1,662.83)	0.45%	0.46%	0.45%	0.46%	
SIGNAGE ALLOWANCE	\$ 60,023.52	\$ 69,022.19	\$ 60,023.52	\$ 69,703.17	(680.98)	0.18%	0.19%	0.18%	0.19%	
ELEVATOR	\$ 321,234.99	\$ 369,394.23	\$ 321,234.99	\$ 373,038.70	(3,644.47)	0.99%	1.00%	0.99%	1.00%	
FIRE PROTECTION	\$ 523,186.86	\$ 601,622.53	\$ 523,186.86	\$ 607,558.19	(5,935.66)	1.61%	1.63%	1.61%	1.63%	
MECHANICAL	\$ 5,799,401.93	\$ 6,668,842.73	\$ 5,799,401.93	\$ 6,734,638.08	(65,795.35)	17.83%	18.05%	17.83%	18.05%	
ELECTRICAL	\$ 2,685,779.85	\$ 3,088,429.40	\$ 2,685,779.85	\$ 3,118,900.10	(30,470.70)	8.26%	8.36%	8.26%	8.36%	
UNDERGROUND ELECTRICAL	\$ 63,779.90	\$ 73,341.73	\$ 63,779.90	\$ 74,065.32	(723.60)	0.20%	0.20%	0.20%	0.20%	
CONTAMINATED SOILS ALLOWANCE	\$ 141,873.78	\$ 163,143.37	\$ 141,873.78	\$ 164,752.95	(1,609.59)	0.44%	0.44%	0.44%	0.44%	
TEMP VENTILATION FILTER CHANGE ALLOWANCE	\$ 122,229.72	\$ 140,554.28	\$ 122,229.72	\$ 141,941.00	(1,386.72)	0.38%	0.38%	0.38%	0.38%	
CHANGE REQUIREMENT LOG	\$ 274,586.89	\$ 315,752.69	\$ 199,347.94	\$ 231,495.64	84,257.05	0.84%	0.62%	0.84%	0.62%	
						100.00%	100.00%	99.83%	99.82%	
TOTAL CONSTRUCTION COSTS	\$ 32,518,227.00	\$ 37,329,817.66	\$ 32,134,455.14	\$ 37,248,276.57						
TOTAL CONSTRUCTION COSTS INCLUDING ALL ADD-ONS¹ (2010) 14.99% (GMP Amount)	\$ 37,393,328.56									
TOTAL CONSTRUCTION COSTS INCLUDING ALL ADD-ONS² (2010) 16.13% (GMP Amount)			\$ 37,316,593.69							
COST PER SF OF BUILDING-2010	162,404.00	Total SF of bldg.	\$ 229.36	July 2009 Pricing Current Amount						
			\$ 229.86	July 2009 Pricing GMP Amount						

				\$ 229.36	Non-Green Assumption East Hall				
FOOTNOTES:				\$ 217.04	RS Means SF cost				
				-5.67%	Percent Difference				
1					For every Green dollar				
The Add-ons are based on the below the line items as indicated in the GMP Amount construction cost estimate column provided by Gilbane Building Company as follows:						Non-Green spent \$0.94			
				\$ 230.72	Green Roof-Current Amount				
	Below the line items	\$ 4,485,205.00		\$ 217.04	RS Means-High End Dormitory				
	Add-on based on provided information	14.99%		-6.30%	Percent Difference				
2									
The Add-ons are based on the below the line items as indicated in the Current Amount construction cost estimate column provided by Gilbane Building Company as follows:									
	Below the line items	\$ 4,767,916.00							
	Add-on based on provided information	16.13%							

Appendix D-LR1 LCCA Yearly Preventative Maintenance and Frequency Maintenance

Repair and Replacement

LIFE CYCLE COST (Present Worth Method)							
LCC -Roof Maintenance		Green				Non-Green	
		Not East Hall Specific				RS Means CostWorks	
PROJECT LIFE CYCLE (YEARS)	25						
DISCOUNT RATE (% in decimals)	7.00%						
				Est.	PW	Est.	PW
Base Cost					\$ -		\$ -
Interface Cost							
A)					\$ -		\$ -
B)					\$ -		\$ -
C)					\$ -		\$ -
D)					\$ -		\$ -
Other Initial Costs							
A)					\$ -		\$ -
B)					\$ -		\$ -
Total Initial Cost Impact (IC)					\$ -		\$ -
Initial Cost PW Savings							\$ -
		Year	Factor				
	FMRRC Roof Items	0.5	0.9667	\$ 849.91	\$ 821.00	\$ 849.91	\$ 821.00
		1	0.9346	\$ 2,569.29	\$ 2,401.00	\$ 2,467.83	\$ 2,306.00
		5	0.7130	\$ 3,430.16	\$ 2,445.00	\$ 3,294.69	\$ 2,349.00
		15	0.3624	\$ 54,406.26	\$ 19,719.00	\$ 52,257.62	\$ 18,940.00
		20	0.2584	\$ 127,772.28	\$ 33,018.00	\$ 122,726.24	\$ 31,714.00
				1.0000		\$ -	
Total Replacement/Salvage PW Costs					\$ 58,404.00		\$ 56,130.00
		Type of Annual Expense	Escl..00 %	PWA			
A		YPM-Roof	6.00%	22.178	\$ 7,766.83	\$ 172,252.70	\$ 6,229.92
A				22.178		\$ -	\$ -
Total Operation/Maintenance (PW) Costs					\$ 172,252.70		\$ 138,167.16
Total Present Worth Life Cycle Costs					\$ 230,656.70		\$ 194,297.16
Life Cycle (PW) Savings							\$ 36,359.54
PW - Present Worth		PWA - Present Worth of Annuity					
Summary-YPM & FMRR per SF							
				East Hall SF		162,404.00	
				Non Green Costs per SF-YPM		\$ 0.85	
				Green Costs per SF-YPM		\$ 1.06	
				Non Green Costs per SF-FMRRC		\$ 0.35	
				Green Costs per SF-FMRRC		\$ 0.36	
				Non-Green Total Costs per SF-YPM& FMRRC		\$ 1.20	
				Green-Total Costs per SF-YPM& FMRRC		\$ 1.42	

Appendix D-LR2 LCCA Yearly Preventative Maintenance, Frequency Maintenance Repair
and Replacement and Operations

LIFE CYCLE COST (Present Worth Method)							
LCC -Roof Operations & Maintenance		Green				Non-Green	
		Not East Hall Specific				RS Means CostWorks	
PROJECT LIFE CYCLE (YEARS)	25						
DISCOUNT RATE (% in decimals)	7.00%						
				Est.	PW	Est.	PW
Base Cost					\$ -		\$ -
Interface Cost							
A)					\$ -		\$ -
B)					\$ -		\$ -
C)					\$ -		\$ -
D)					\$ -		\$ -
Other Initial Costs							
A)					\$ -		\$ -
B)					\$ -		\$ -
Total Initial Cost Impact (IC)					\$ -		\$ -
Initial Cost PW Savings							\$ -
		Year	Factor				
	FMRRC Roof Items	0.5	0.9667	\$ 849.91	\$ 821.00	\$ 849.91	\$ 821.00
		1	0.9346	\$ 2,569.29	\$ 2,401.00	\$ 2,467.83	\$ 2,306.00
		5	0.7130	\$ 3,430.16	\$ 2,445.00	\$ 3,294.69	\$ 2,349.00
		15	0.3624	\$ 54,406.26	\$ 19,719.00	\$ 52,257.62	\$ 18,940.00
		20	0.2584	\$ 127,772.28	\$ 33,018.00	\$ 122,726.24	\$ 31,714.00
				1.0000		\$ -	
Total Replacement/Salvage PW Costs					\$ 58,404.00		\$ 56,130.00
	Type of Annual Expense	Escl..00 %	PWA				
A	YPM-Roof	6.00%	22.178	\$ 7,766.83	\$ 172,252.70	\$ 6,229.92	\$ 138,167.16
A	Operations-1/4 Employee ¹	6.00%	22.178	\$ 12,500.00	\$ 277,224.91	\$ 12,500.00	\$ 277,224.91
Total Operation/Maintenance (PW) Costs					\$ 449,477.61		\$ 415,392.08
Total Present Worth Life Cycle Costs					\$ 507,881.61		\$ 471,522.08
Life Cycle (PW) Savings							\$ 36,359.54
PW - Present Worth	PWA - Present Worth of Annuity						
Summary-O&M per SF							
							162,404.00
						\$	2.56
						\$	2.77
						\$	0.35
						\$	0.36
						\$	2.90
						\$	3.13
Footnotes:							
1							
Assumed an employee would spend 1/4 of their time per year strictly on the operations of the green roof.							
\$50,000/year							

Survey Data

Appendix E-S1 Survey Introductory Letter

Dear East Hall Residents,

I am a graduate student developing my M.Sc. Thesis on the Life Cycle Cost Analysis of WPI Sustainable Facilities Projects-East Hall Dormitory.

Please take the time to fill this survey which poses questions with regards to your opinions and consumption of various utilities within East Hall.

Please ensure you only account for the portions of your utility consumption with in **East Hall**.

Please exclude all other utility uses in other buildings from your answers.

Thank you for taking the time to answer these questions! Your opinions matter!

Best wishes

Niki Alborzfard

Appendix E-S2 East Hall LCCA Survey Questions

East Hall LCCA

1. Questions 1-10

Dear East Hall Residents all questions posed in this survey are with regards to your opinions and consumption in East Hall.

Please do not include anything that you consume in other buildings.

Thank you for taking this survey!

* **1. How Long have you lived in East Hall?**

1-3 months

3-6 months

6-10 months

Longer than 10 months

* **2. Do you consider East Hall to be an energy efficient building?**

yes

no

* **3. Are you a**

Sophomore

Junior

Senior

* **4. On average how much of your time do you spend in East Hall per day?**

Less than 25% of my time

25% of my time

50% of my time

75% of my time

All of my time

* **5. During the summer months do you normally run the AC in your room?**

Yes

No

6. If you answered Yes to the above questions, how many hours a day do you run the AC in the summer in your room?

5 hours

8 hours

12 hours

All day

7. When you turn on the Air Conditioning is it noisy?

yes

no

sometimes

*** 8. At what temperature do you feel cool in the summer?**

60

62

64

66

*** 9. Is your space sufficiently heated/warm in the winter?**

yes

no

sometimes

Additional Comments

*** 10. At what temperature do you feel warm in the winter?**

68

70

72

74

76

East Hall LCCA

* **11. When you turn on the heat is it noisy?**

yes

no

sometimes

I dont turn on the heat

* **12. Do you wish to have better control of the temperature in your space (better thermostat temperature variations instead of the 2 degrees up or down)?**

Yes

No

I don't care!

* **13. Does the water heat up sufficiently to the temperature which you desire?**

Yes

No

Sometimes

* **14. How long does it take for the water to heat up to your desired temperature?**

up to 3 minutes

between 3-5 minutes

more than 5 minutes

2. Questions 11-20

Dear East Hall Residents all questions posed in this survey are with regards to your opinions and consumption in East Hall.

Please do not include anything that you consume in other buildings.

Thank you for taking this survey!

* **1. Is there sufficient interior lighting in your room?**

Yes

No

* **2. Do you feel the need to use additional lighting (i.e: plug in additional lighting devices into the receptacles)in your room?**

Yes

No

Sometimes

3. Is the lighting in the garage adequate? (Please skip this question if it does not apply to you!)

Yes

No

* **4. How many appliances do you plug into the receptacles (in your room and common areas)?**

1-3

4-6

Too many to count!

* **5. What type of appliances do you plug into the receptacles?**

Computer related

Hair styling tools

Stereo equipment related

Misc. Electronics

Kitchen Appliances

other

Other (please specify)

* **6. How many times do you wash your hands per day?**

2 Times

4 Times

More Than 4 Times

* 7. How Long Do You Run The Water While Washing Your Hands in East Hall?

Less Than 2 Minutes

More Than 2 Minutes

other

Other (please specify)

3. Questions 21-28

Dear East Hall Residents all questions posed in this survey are with regards to your opinions and consumption in East Hall.

Please do not include anything that you consume in other buildings.

Thank you for taking this survey!

* 1. Do You Shave Everyday?

Yes

No

* 2. How Long Do You Run The Water When You Are Shaving?

More Than 10 Minutes

Less Than 10 Minutes

Other

Other (please specify)

* 3. How Many Times Do You Shower?

Everyday

Every Other Day

Twice A Week

* 4. How Long Do you Take In The Shower?

5 Minutes

15 Minutes

30 Minutes

Other

Other (please specify)

*** 5. How Many Times Do You Use The Watercloset (Toilet)?**

- Once A Day
- Twice A Day
- Three Times A Day
- Four Times A Day

*** 6. How Many Times Do You Use The Full Flush Of The Toilet?**

- Once A Day
- Twice A Day
- Three Times A Day
- Four Times A Day

*** 7. How Frequently Do You Wash Dishes?**

- Everyday
- Every Other Day
- Twice A Week
- Never

*** 8. How Long Does It Take You To Wash Dishes?**

- More Than 15 Minutes
- Less Than 15 Minutes

*** 9. Are you more aware of your electrical, mechanical and water consumption because you live in an energy efficient building?**

- Yes
- No
- Sometimes
- other

Other (please specify)

	5
	6

* 10. If you could view your consumption in real time would it aid in minimizing your energy consumption?

Yes

No

Maybe

other

Other (please specify)

Appendix E-S3 Survey Follow-Up Letter

Dear East Hall Residents,

I would like to thank everyone who has already responded to the survey (East Hall LCCA) request, if you have already taken the survey please ignore this email; If not please take the time to answer the brief survey.

Please ensure you only account for the portions of your utility consumption with in **East Hall**.

It is greatly appreciated if you can take the survey prior to the Thanksgiving break.





Your opinions matter...so please do take the time to provide feedback.

Best wishes and enjoy the break!



Niki Alborzfard

Appendix E-S4 Summary of Survey Responses




1. How Long have you lived in East Hall?

		Response Percent	Response Count
1-3 months		40.0%	24
3-6 months		16.7%	10
6-10 months		1.7%	1
Longer than 10 months		41.7%	25
answered question			60
skipped question			0



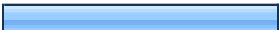

2. Do you consider East Hall to be an energy efficient building?

		Response Percent	Response Count
yes		75.0%	45
no		25.0%	15
answered question			60
skipped question			0



3. Are you a

		Response Percent	Response Count
Sophomore		5.0%	3
Junior		35.0%	21
Senior		60.0%	36
		answered question	60
		skipped question	0

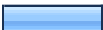



4. On average how much of your time do you spend in East Hall per day?

		Response Percent	Response Count
Less than 25% of my time		1.7%	1
25% of my time		13.3%	8
50% of my time		41.7%	25
75% of my time		43.3%	26
All of my time		0.0%	0
		answered question	60
		skipped question	0

5. During the summer months do you normally run the AC in your room?

		Response Percent	Response Count
Yes		78.3%	47
No		21.7%	13
answered question			60
skipped question			0

6. If you answered Yes to the above questions, how many hours a day do you run the AC in the summer in your room?

		Response Percent	Response Count
5 hours		14.6%	7
8 hours		16.7%	8
12 hours		8.3%	4
All day		60.4%	29
answered question			48
skipped question			12

7. When you turn on the Air Conditioning is it noisy?

		Response Percent	Response Count
yes		18.5%	10
no		50.0%	27
sometimes		31.5%	17
answered question			54
skipped question			6

8. At what temperature do you feel cool in the summer?

		Response Percent	Response Count
60		10.0%	6
62		3.3%	2
64		25.0%	15
66		61.7%	37
answered question			60
skipped question			0

9. Is your space sufficiently heated/warm in the winter?

		Response Percent	Response Count
yes		53.3%	32
no		10.0%	6
sometimes		36.7%	22
Additional Comments			19
answered question			60
skipped question			0

10. At what temperature do you feel warm in the winter?

		Response Percent	Response Count
68		16.7%	10
70		21.7%	13
72		35.0%	21
74		15.0%	9
76		11.7%	7
answered question			60
skipped question			0




11. When you turn on the heat is it noisy?

		Response Percent	Response Count
yes		8.3%	5
no		61.7%	37
sometimes		20.0%	12
I dont turn on the heat		10.0%	6
answered question			60
skipped question			0



12. Do you wish to have better control of the temperature in your space (better thermostat temperature variations instead of the 2 degrees up or down)?

		Response Percent	Response Count
Yes		83.3%	50
No		6.7%	4
I don't care!		10.0%	6
answered question			60
skipped question			0



13. Does the water heat up sufficiently to the temperature which you desire?

		Response Percent	Response Count
Yes		81.7%	49
No		3.3%	2
Sometimes		15.0%	9
answered question			60
skipped question			0




14. How long does it take for the water to heat up to your desired temperature?

		Response Percent	Response Count
up to 3 minutes		86.7%	52
between 3-5 minutes		13.3%	8
more than 5 minutes		0.0%	0
answered question			60
skipped question			0



15. Is there sufficient interior lighting in your room?

		Response Percent	Response Count
Yes		76.3%	45
No		23.7%	14
answered question			59
skipped question			1




16. Do you feel the need to use additional lighting (i.e: plug in additional lighting devices into the receptacles)in your room?

		Response Percent	Response Count
Yes		25.4%	15
No		44.1%	26
Sometimes		30.5%	18
answered question			59
skipped question			1






17. Is the lighting in the garage adequate? (Please skip this question if it does not apply to you!)

		Response Percent	Response Count
Yes		77.8%	21
No		22.2%	6
answered question			27
skipped question			33




18. How many appliances do you plug into the receptacles (in your room and common areas)?

		Response Percent	Response Count
1-3		10.2%	6
4-6		45.8%	27
Too many to count!		44.1%	26
answered question			59
skipped question			1




19. What type of appliances do you plug into the receptacles?

		Response Percent	Response Count
Computer related		52.5%	31
Hair styling tools		1.7%	1
Stereo equipment related		0.0%	0
Misc. Electronics		18.6%	11
Kitchen Appliances		6.8%	4
other		20.3%	12
Other (please specify)			21
answered question			59
skipped question			1



20. How many times do you wash your hands per day?

		Response Percent	Response Count
2 Times		18.6%	11
4 Times		35.6%	21
More Than 4 Times		45.8%	27
answered question			59
skipped question			1




21. How Long Do You Run The Water While Washing Your Hands in East Hall?

		Response Percent	Response Count
Less Than 2 Minutes		89.8%	53
More Than 2 Minutes		5.1%	3
other		5.1%	3
Other (please specify)			3
answered question			59
skipped question			1




22. Do You Shave Everyday?

		Response Percent	Response Count
Yes		10.2%	6
No		89.8%	53
answered question			59
skipped question			1





23. How Long Do You Run The Water When You Are Shaving?

		Response Percent	Response Count
More Than 10 Minutes		15.3%	9
Less Than 10 Minutes		52.5%	31
Other		32.2%	19
Other (please specify)			17
answered question			59
skipped question			1





24. How Many Times Do You Shower?

		Response Percent	Response Count
Everyday		71.2%	42
Every Other Day		23.7%	14
Twice A Week		5.1%	3
answered question			59
skipped question			1





25. How Long Do you Take In The Shower?

		Response Percent	Response Count
5 Minutes		13.6%	8
15 Minutes		62.7%	37
30 Minutes		13.6%	8
Other		10.2%	6
	Other (please specify)		6
answered question			59
skipped question			1





26. How Many Times Do You Use The Watercloset (Toilet)?

		Response Percent	Response Count
Once A Day		3.4%	2
Twice A Day		13.6%	8
Three Times A Day		45.8%	27
Four Times A Day		37.3%	22
answered question			59
skipped question			1



27. How Many Times Do You Use The Full Flush Of The Toilet?

		Response Percent	Response Count
Once A Day		49.2%	29
Twice A Day		20.3%	12
Three Times A Day		16.9%	10
Four Times A Day		13.6%	8
answered question			59
skipped question			1




28. How Frequently Do You Wash Dishes?

		Response Percent	Response Count
Everyday		54.2%	32
Every Other Day		25.4%	15
Twice A Week		15.3%	9
Never		5.1%	3
answered question			59
skipped question			1





29. How Long Does It Take You To Wash Dishes?

		Response Percent	Response Count
More Than 15 Minutes		32.2%	19
Less Than 15 Minutes		67.8%	40
answered question			59
skipped question			1

30. Are you more aware of your electrical, mechanical and water consumption because you live in an energy efficient building?

		Response Percent	Response Count
Yes		15.3%	9
No		49.2%	29
Sometimes		35.6%	21
other		0.0%	0
Other (please specify)			2
answered question			59
skipped question			1

31. If you could view your consumption in real time would it aid in minimizing your energy consumption?

		Response Percent	Response Count
Yes		35.6%	21
No		23.7%	14
Maybe		37.3%	22
other		3.4%	2
Other (please specify)			5
answered question			59
skipped question			1

9. Is your space sufficiently heated/warm in the winter?

Additional Comments		
1	Sometimes the heat is way too high	Nov 15, 2010 3:40 PM
2	The heat comes on too soon.	Nov 15, 2010 3:44 PM
3	I hate how opening the windows means the heat/AC shuts off. I know it's energy efficient, but this is a college dorm. If my roommates open their windows, I don't want to freeze or boil because of that. If that could be changed, that would be great.	Nov 15, 2010 3:49 PM
4	Often too warm	Nov 15, 2010 3:49 PM
5	our room the heat won't go off, and its been 2 weeks, and res services still hasn't fixed it, Windows open, heat on, all day long... really green building	Nov 15, 2010 3:49 PM
6	I'd like it warmer.	Nov 15, 2010 3:50 PM
7	Too warm (5th floor)	Nov 15, 2010 3:52 PM
8	Heat seems to turn off at night; gets very very cold.	Nov 15, 2010 3:54 PM
9	The wall heat dial is on a schedule independent of room holders for heat, AC, or any attempted change in temperature	Nov 15, 2010 3:57 PM
10	the heating is always messed up. sometimes it's way too hot and other days the ac is on when it's 35 degrees outside	Nov 15, 2010 4:13 PM
11	it is way too warm sometimes. and there is no way to control it besides opening windows, but there are no windows in the living room. it gets up to 77 degrees when its 49 degrees outside, even when we have it to the lowest setting.	Nov 15, 2010 4:20 PM
12	I get very cold during the winter months and this affects my studies and health, especially last year. Winter hasn't fully come this year yet but I expect to get sick.	Nov 15, 2010 4:57 PM
13	The building does not let me set the heat lower than 70 which i dont like. I would be happier if i could set the heat to about 67 and our room is usual above 76 degrees if not closer to 80	Nov 15, 2010 5:13 PM
14	We have no control over it! The heat obeys the whim of an occupancy sensor and nobody else.	Nov 15, 2010 5:34 PM

9. Is your space sufficiently heated/warm in the winter?

Additional Comments		
15	this survey does not allow for accurate answers btw	Nov 15, 2010 5:55 PM
16	Sometimes it can get too hot, so I have to open up a window.	Nov 15, 2010 6:43 PM
17	I never want ac to be on in the winter and would love to be able to control this	Nov 15, 2010 7:19 PM
18	havent had winter yet... and air conditioner did not work for the first month i was here when it was still hot. when it cooled down ambient temperature was fine	Nov 15, 2010 7:25 PM
19	Windows have poor insulation. Shouldn't have walls made of glass.	Nov 16, 2010 2:05 AM

5. What type of appliances do you plug into the receptacles?

Other (please specify)		
1	All of the above	Nov 15, 2010 3:43 PM
2	Computers, electronics, tools	Nov 15, 2010 3:46 PM
3	Computer, phone, hair, lamp, speakers, printer, fan, kitchen (rice cooker, microwave, blender)	Nov 15, 2010 3:50 PM
4	computer, kitchen appliances, TV	Nov 15, 2010 3:51 PM
5	& Electronics & Kitchen Appliances	Nov 15, 2010 3:54 PM
6	Computer related, hair styling tools & electric razor, kitchen appliances, alarm clock, cell phone charger	Nov 15, 2010 3:57 PM
7	computer related, stereo, misc electronics, kitchen	Nov 15, 2010 3:59 PM
8	all of the above	Nov 15, 2010 4:14 PM
9	(all of the above?)	Nov 15, 2010 4:21 PM
10	All of the above	Nov 15, 2010 5:09 PM
11	and hair styling tools	Nov 15, 2010 5:20 PM
12	All Above	Nov 15, 2010 5:25 PM
13	computer and kitchen (it would not let me pick both)	Nov 15, 2010 5:36 PM
14	you should allow for more than one selection btw	Nov 15, 2010 5:56 PM
15	Computer related, hair styling tools, stereo equipment, misc. electronics, kitchen appliances	Nov 15, 2010 6:44 PM
16	All of the above	Nov 15, 2010 7:19 PM
17	Phone charger, alarm clock, desk fan, desk lamp rarely used, computer speakers	Nov 15, 2010 8:03 PM
18	You should have let people choose more than one option here.	Nov 16, 2010 2:06 AM
19	Most of the above	Nov 16, 2010 3:00 AM
20	all of the above	Nov 16, 2010 8:33 PM
21	all?	Nov 17, 2010 1:53 AM

7. How Long Do You Run The Water While Washing Your Hands in East Hall?

Other (please specify)		
1	15, 20 secs	Nov 15, 2010 3:51 PM
2	10 seconds then 10 seconds	Nov 15, 2010 3:54 PM
3	Less Than 1 Minute	Nov 15, 2010 4:23 PM

2. How Long Do You Run The Water When You Are Shaving?

Other (please specify)		
1	I fill the sink with hot water, then empty when I am done	Nov 15, 2010 3:53 PM
2	~3 minutes	Nov 15, 2010 3:55 PM
3	Haven't shaved since August, so I don't know	Nov 15, 2010 3:55 PM
4	I shave while taking a shower.	Nov 15, 2010 3:58 PM
5	while in shower	Nov 15, 2010 4:09 PM
6	sexist question	Nov 15, 2010 4:15 PM
7	Shaving in the shower	Nov 15, 2010 4:24 PM
8	Less than 3 Minutes	Nov 15, 2010 4:25 PM
9	I dont	Nov 15, 2010 5:00 PM
10	I shave in the shower	Nov 15, 2010 5:11 PM
11	I dont shave	Nov 15, 2010 5:16 PM
12	NONE!	Nov 15, 2010 5:20 PM
13	shave in shower	Nov 15, 2010 5:49 PM
14	during shower	Nov 15, 2010 6:11 PM
15	Don't use water	Nov 15, 2010 6:14 PM
16	Electric Razer...no water used	Nov 15, 2010 10:32 PM
17	i am a girl so i shave in the shower	Nov 16, 2010 8:34 PM

4. How Long Do you Take In The Shower?

Other (please specify)		
1	15 minutes on weekdays, 30 minutes on weekends	Nov 15, 2010 3:52 PM
2	10 min	Nov 15, 2010 3:53 PM
3	7min	Nov 15, 2010 5:00 PM
4	10	Nov 15, 2010 5:49 PM
5	10	Nov 15, 2010 6:44 PM
6	10 minutes	Nov 17, 2010 1:54 AM

9. Are you more aware of your electrical, mechanical and water consumption

Other (please specify)		
1	I often find the energy-saving measures extremely frustrating, and have taken steps to defeat or modify them where possible, such as replacing the or removing flow restrictors on sinks and the shower and bypassing the occupancy sensor on the light and HVAC system.	Nov 15, 2010 3:48 PM
2	I imagine we consume less because there's not enough light, the temperature controls suck, and all the taps are low flow.	Nov 15, 2010 3:52 PM

10. If you could view your consumption in real time would it aid in minimizing

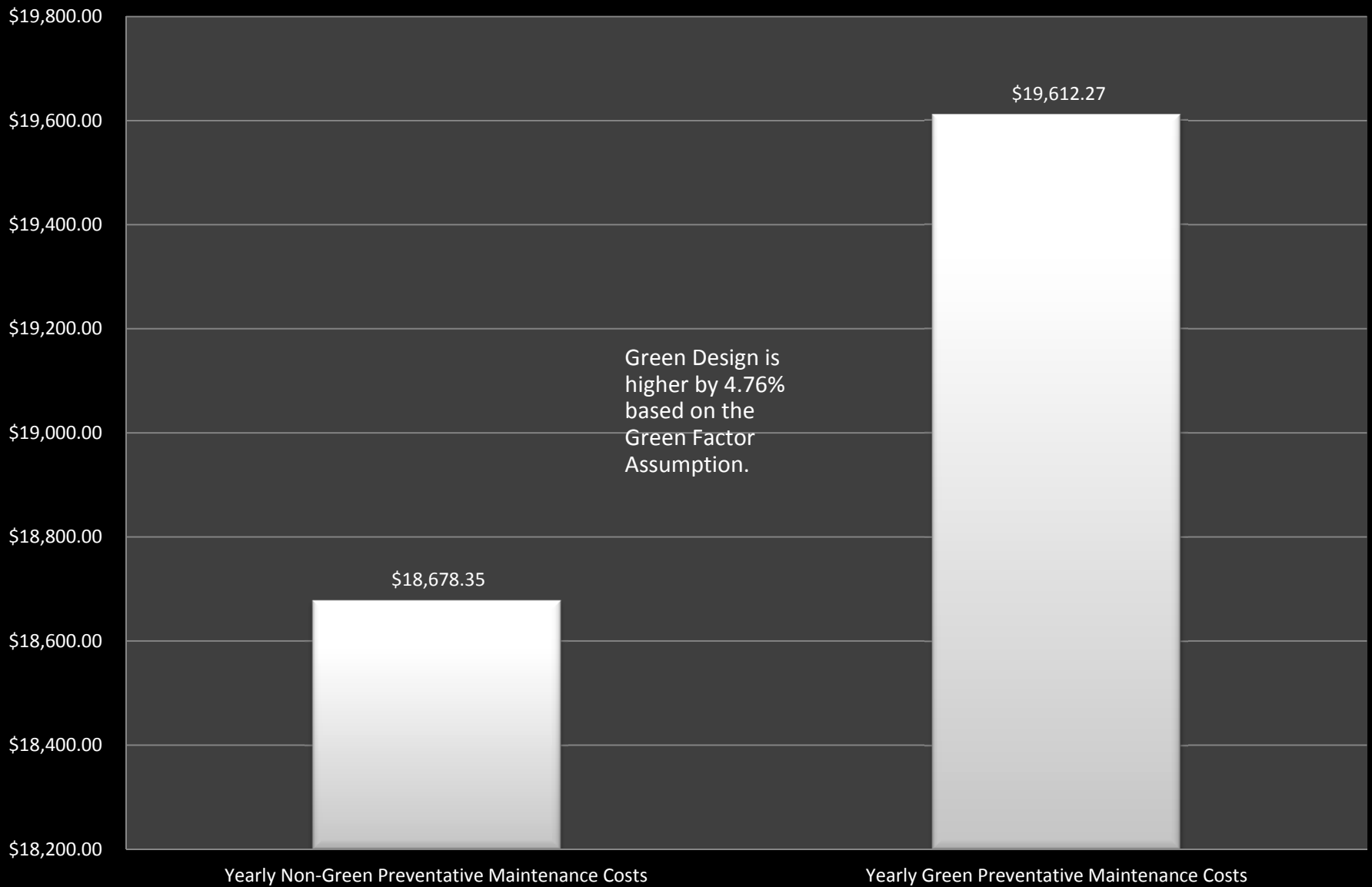
Other (please specify)

- | | | |
|---|---|----------------------|
| 1 | I'm willing to cut down on some consumption (water, light), but I would really like to be able to use electrical and heat/AC more. | Nov 15, 2010 3:52 PM |
| 2 | Maximize - challenge to see how high it could get | Nov 15, 2010 3:53 PM |
| 3 | I know about how much I consume. Having a meter to quantify it however would be interesting and amusing to track. That said, it'd probably result in my running little experiments with it so I'd end up continually plugging/unplugging things and consuming more energy. | Nov 15, 2010 3:54 PM |
| 4 | I pay a flat rate so I'm not really concerned about my energy consumption living in East Hall. | Nov 15, 2010 5:11 PM |
| 5 | next time you send a survey out make sure that people can put in answers that they want to for instance i would say it takes the water 10 secs for it to heat up but i must say it take 3 mins because your survey is not flexible enough also i plug in more that computer things into the wall but you would never know that because you do not allow more than one selection. please think about the survey before you spam it to everyone | Nov 15, 2010 5:59 PM |

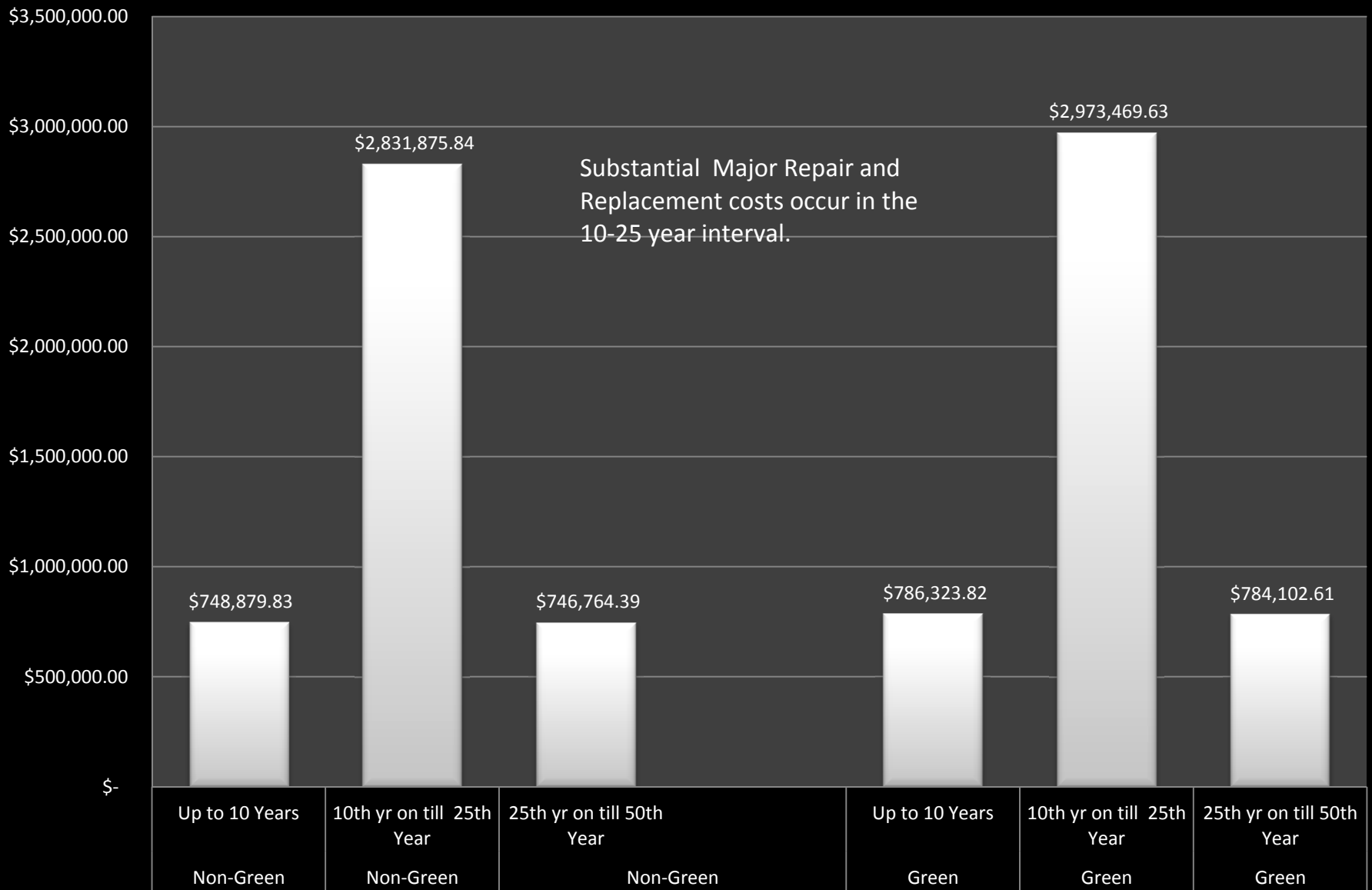
Green Factor Sensitivity Analysis (Maintenance Portion Only)

Appendix C-SM1 Graph: 5% Frequency Maintenance Repair and Replacement Costs and
Yearly Preventative Maintenance Costs (Mechanical)

HVAC & FP: Green v. Non-Green Yearly Preventative Maintenance Costs (5% Green Factor)

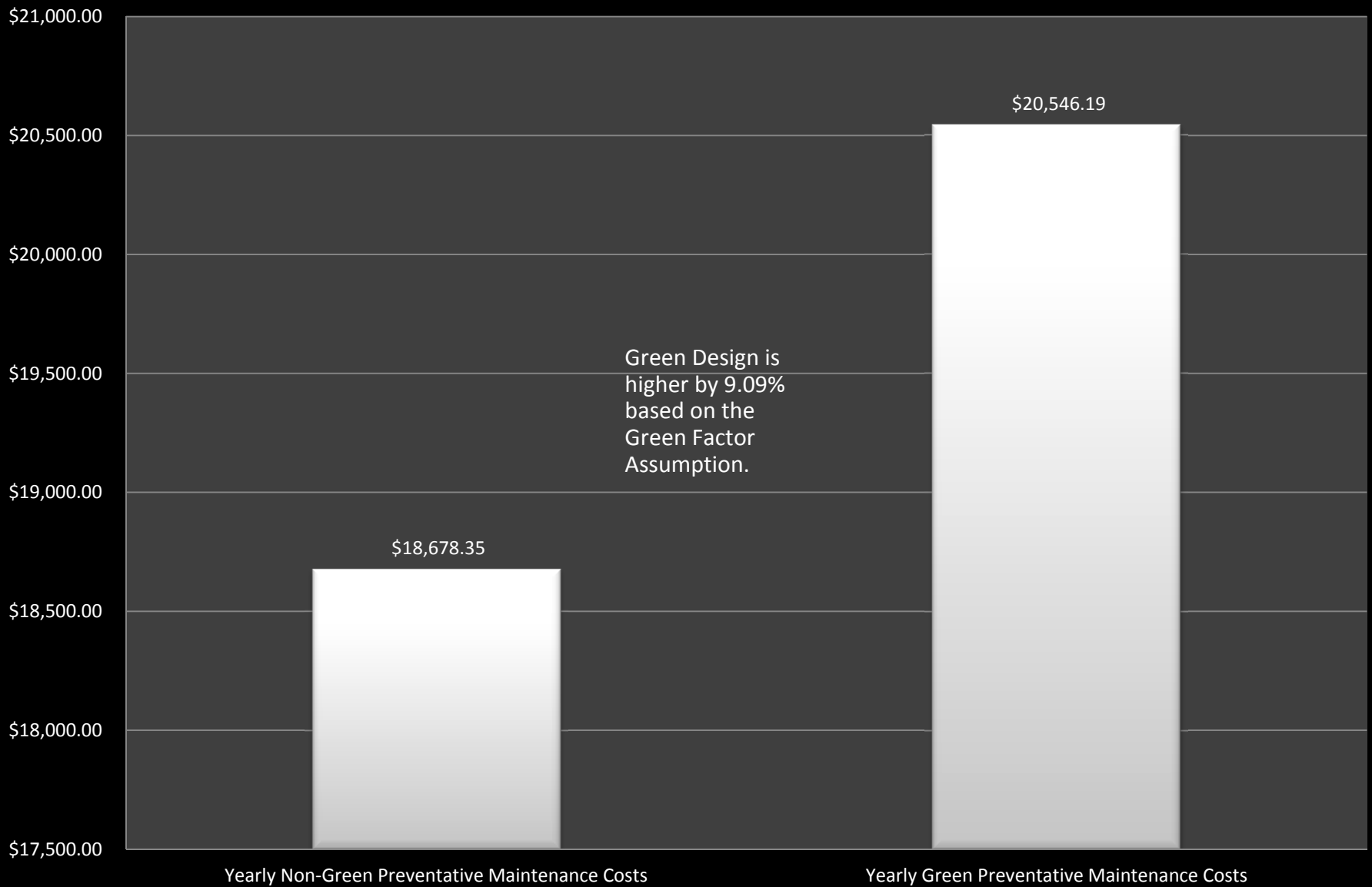


Frequency and Magnitude of Major Repair and Replacement Costs (5% Green Factor)

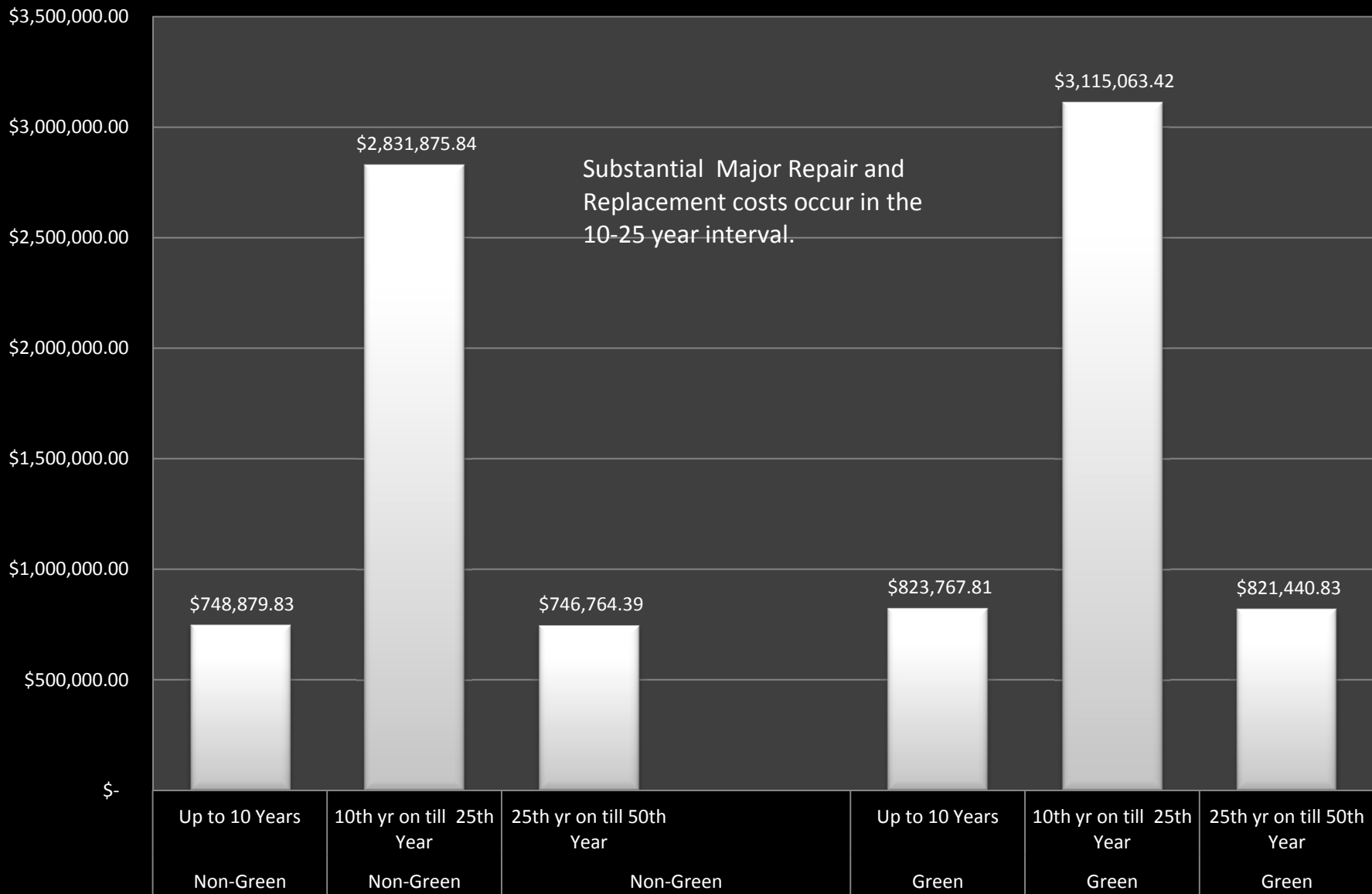


Appendix C-SM2 Graph: 10% Frequency Maintenance Repair and Replacement Costs
and Yearly Preventative Maintenance Costs (Mechanical)

HVAC & FP: Green v. Non-Green Yearly Preventative Maintenance Costs (10% Green Factor)

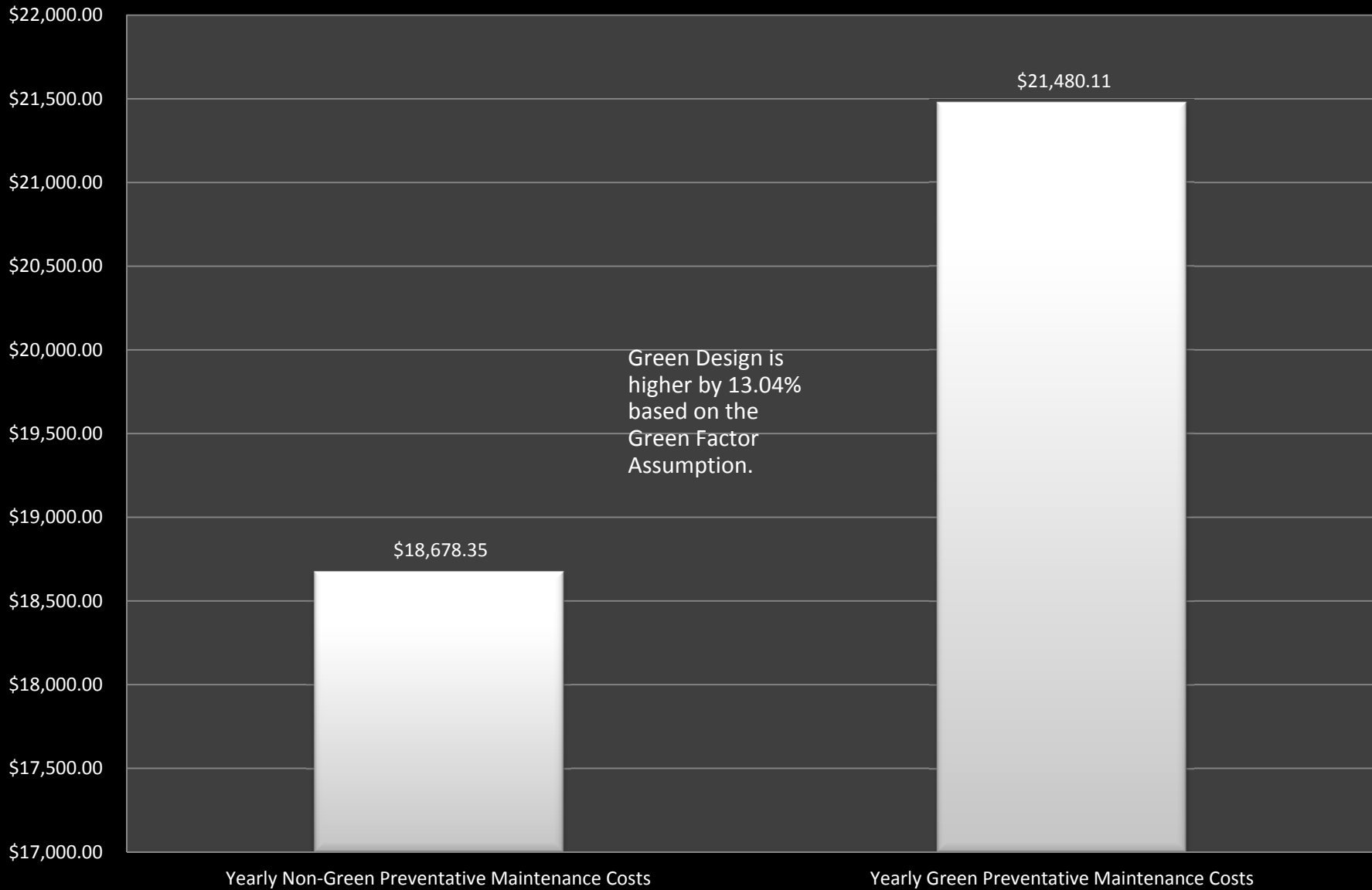


Frequency and Magnitude of Major Repair and Replacement Costs (10% Green Factor)

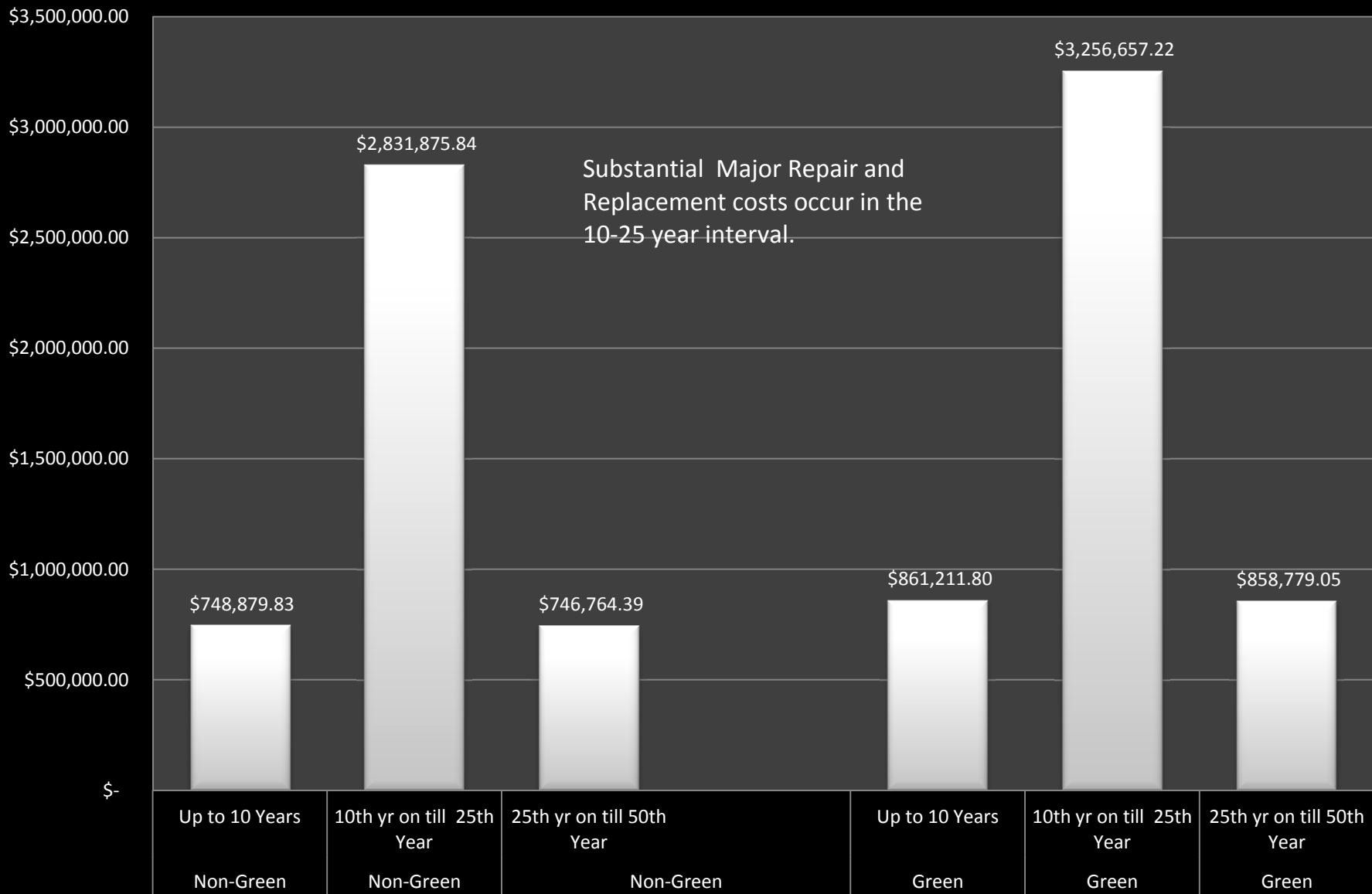


Appendix C-SM3 Graph: 15% Frequency Maintenance Repair and Replacement Costs
and Yearly Preventative Maintenance Costs (Mechanical)

HVAC & FP: Green v. Non-Green Yearly Preventative Maintenance Costs (15% Green Factor)



Frequency and Magnitude of Major Repair and Replacement Costs (15% Green Factor)



Appendix C-SM4 15% GF Analysis of YPM

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹									
ANNUALIZED-15% GF									
PROJECT:	EAST HALL								
LOCATION:	US NATIONAL AVERAGES								
Escalation	6%								
De-Escalation to July 2009	1.03								
De-Escalation Factor to be Applied	0.97								
Green Factor	1.15	Assumed Value							
Qty	Assembly Number	Description	Labor Hours	Total In-House	Total Incl. O&P	Location Factor	Location Adjusted Total O&P	De-Escalation Factor to July 2009 Costs	
1.000	D3 02 5130 1950	Boiler, hot water, oil, gas, or comb. fired, up to 120 MBH, annualized	12.53	\$ 885.00	\$ 1,100.00	1.095	\$ 1,204.50	0.97	
1.000	D3 02 5110 1950	Boiler, electric, to 1500 gal., annualized	3.83	\$ 315.00	\$ 390.00	1.095	\$ 427.05	0.97	
1.000	D3 02 5130 2950	Boiler, hot water, oil, gas, or comb. fired, 120 - 500 MBH, annualized	15.45	\$ 1,100.00	\$ 1,375.00	1.095	\$ 1,505.63	0.97	
1.000	D3 02 5130 3950	Boiler, hot water, oil, gas, or comb. fired, 500 -1000 MBH, annualized	17.38	\$ 1,225.00	\$ 1,525.00	1.095	\$ 1,669.88	0.97	
1.000	D3 02 5130 4950	Boiler, hot water, oil, gas, or comb. fired, over 1000 MBH, annualized	19.70	\$ 1,400.00	\$ 1,725.00	1.095	\$ 1,888.88	0.97	
1.000	D3 02 5140 1950	Boiler, steam, oil, gas, or comb. fired, up to 120 MBH, annualized	16.19	\$ 1,200.00	\$ 1,475.00	1.095	\$ 1,615.13	0.97	
1.000	D3 02 5140 2950	Boiler, steam, oil, gas, or comb. fired, 120 to 500 MBH, annualized	18.98	\$ 1,425.00	\$ 1,750.00	1.095	\$ 1,916.25	0.97	
1.000	D3 02 5140 3950	Boiler, steam, oil, gas, or comb. fired, 500 to 1000 MBH, annualized	20.70	\$ 1,550.00	\$ 1,925.00	1.095	\$ 2,107.88	0.97	
1.000	D3 02 5140 4950	Boiler, steam, oil, gas, or comb. fired, over 1000 MBH, annualized	22.45	\$ 1,675.00	\$ 2,075.00	1.095	\$ 2,272.13	0.97	
1.000	D3 02 5210 1950	Deaerator tank, annualized	1.51	\$ 138.00	\$ 167.00	1.095	\$ 182.87	0.97	
1.000	D3 02 5310 1950	Pump, boiler fuel oil, annualized	1.23	\$ 132.00	\$ 159.00	1.095	\$ 174.11	0.97	
1.000	D3 02 5310 2950	Pump, condensate return, over 1 H.P., annualized	1.12	\$ 125.00	\$ 151.00	1.095	\$ 165.35	0.97	
1.000	D3 02 5310 3950	Pump, condensate return unit, 2 pumps, annualized	1.14	\$ 180.00	\$ 212.00	1.095	\$ 232.14	0.97	
1.000	D3 03 5110 1950	Water cooling tower, up to 50 tons, annualized	4.55	\$ 330.00	\$ 410.00	1.095	\$ 448.95	0.97	
1.000	D3 03 5110 2950	Water cooling tower, 50 thru 500 tons, annualized	9.91	\$ 705.00	\$ 870.00	1.095	\$ 952.65	0.97	
1.000	D3 03 5110 3950	Water cooling tower, 500 thru 1000 tons, annualized	17.73	\$ 1,300.00	\$ 1,600.00	1.095	\$ 1,752.00	0.97	
1.000	D3 03 5130 1950	Chiller, recip., air cooled, up to 25 tons, annualized	9.71	\$ 680.00	\$ 840.00	1.095	\$ 919.80	0.97	
1.000	D3 03 5130 2950	Chiller, recip., air cooled, over 25 tons, annualized	12.89	\$ 905.00	\$ 1,100.00	1.095	\$ 1,204.50	0.97	
1.000	D3 03 5135 1950	Chiller, recip., water cooled, up to 50 tons, annualized	7.94	\$ 570.00	\$ 700.00	1.095	\$ 766.50	0.97	
1.000	D3 03 5135 2950	Chiller, recip., water cooled, over 50 tons, annualized	10.91	\$ 760.00	\$ 945.00	1.095	\$ 1,034.78	0.97	
1.000	D3 03 5140 1950	Chiller, centrif., water cooled, up to 100 tons, annualized	26.76	\$ 1,975.00	\$ 2,425.00	1.095	\$ 2,655.38	0.97	
1.000	D3 03 5140 2950	Chiller, centrif., water cooled, over 100 tons, annualized	33.36	\$ 2,425.00	\$ 3,000.00	1.095	\$ 3,285.00	0.97	
1.000	D3 03 5150 1950	Chiller, absorption unit, up to 500 tons, annualized	6.22	\$ 490.00	\$ 600.00	1.095	\$ 657.00	0.97	
1.000	D3 03 5150 2950	Chiller, absorption unit, 500 to 5000 tons, annualized	9.42	\$ 835.00	\$ 1,025.00	1.095	\$ 1,122.38	0.97	
1.000	D3 03 5160 1950	Chiller, screw, water cooled, up to 100 tons, annualized	14.77	\$ 1,200.00	\$ 1,475.00	1.095	\$ 1,615.13	0.97	
1.000	D3 03 5160 2950	Chiller, screw, water cooled, over 100 tons, annualized	16.72	\$ 1,350.00	\$ 1,675.00	1.095	\$ 1,834.13	0.97	
1.000	D3 03 5170 1950	Evaporative cooler, annualized	1.25	\$ 110.00	\$ 134.00	1.095	\$ 146.73	0.97	
1.000	D3 03 5180 1950	Evaporative cooler, rotating drum, annualized	1.31	\$ 122.00	\$ 148.00	1.095	\$ 162.06	0.97	
1.000	D3 03 5210 1950	Condenser, air cooled, 3 tons to 25 tons, annualized	1.76	\$ 152.00	\$ 185.00	1.095	\$ 202.58	0.97	

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹							
ANNUALIZED-15% GF							
PROJECT:	EAST HALL						
LOCATION:	US NATIONAL AVERAGES						
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green	GREEN FACTOR	Adjusted Total with Green Factor OH&P	De-Escalation Factor to July 2009 Costs	Total with All Adjustments
1.000	D3 02 5130 1950	Boiler, hot water, oil, gas, or comb. fired, up to 120 MBH, annualized	\$ 1,168.89	1.15	\$ 1,385.18	0.97	\$ 1,344.23
1.000	D3 02 5110 1950	Boiler, electric, to 1500 gal., annualized	\$ 414.43	1.15	\$ 491.11	0.97	\$ 476.59
1.000	D3 02 5130 2950	Boiler, hot water, oil, gas, or comb. fired, 120 - 500 MBH, annualized	\$ 1,461.11	1.15	\$ 1,731.47	0.97	\$ 1,680.28
1.000	D3 02 5130 3950	Boiler, hot water, oil, gas, or comb. fired, 500 -1000 MBH, annualized	\$ 1,620.51	1.15	\$ 1,920.36	0.97	\$ 1,863.58
1.000	D3 02 5130 4950	Boiler, hot water, oil, gas, or comb. fired, over 1000 MBH, annualized	\$ 1,833.03	1.15	\$ 2,172.21	0.97	\$ 2,107.99
1.000	D3 02 5140 1950	Boiler, steam, oil, gas, or comb. fired, up to 120 MBH, annualized	\$ 1,567.38	1.15	\$ 1,857.39	0.97	\$ 1,802.48
1.000	D3 02 5140 2950	Boiler, steam, oil, gas, or comb. fired, 120 to 500 MBH, annualized	\$ 1,859.60	1.15	\$ 2,203.69	0.97	\$ 2,138.54
1.000	D3 02 5140 3950	Boiler, steam, oil, gas, or comb. fired, 500 to 1000 MBH, annualized	\$ 2,045.56	1.15	\$ 2,424.06	0.97	\$ 2,352.39
1.000	D3 02 5140 4950	Boiler, steam, oil, gas, or comb. fired, over 1000 MBH, annualized	\$ 2,204.95	1.15	\$ 2,612.94	0.97	\$ 2,535.70
1.000	D3 02 5210 1950	Deaerator tank, annualized	\$ 177.46	1.15	\$ 210.29	0.97	\$ 204.08
1.000	D3 02 5310 1950	Pump, boiler fuel oil, annualized	\$ 168.96	1.15	\$ 200.22	0.97	\$ 194.30
1.000	D3 02 5310 2950	Pump, condensate return, over 1 H.P., annualized	\$ 160.46	1.15	\$ 190.15	0.97	\$ 184.53
1.000	D3 02 5310 3950	Pump, condensate return unit, 2 pumps, annualized	\$ 225.28	1.15	\$ 266.96	0.97	\$ 259.07
1.000	D3 03 5110 1950	Water cooling tower, up to 50 tons, annualized	\$ 435.68	1.15	\$ 516.29	0.97	\$ 501.03
1.000	D3 03 5110 2950	Water cooling tower, 50 thru 500 tons, annualized	\$ 924.49	1.15	\$ 1,095.55	0.97	\$ 1,063.16
1.000	D3 03 5110 3950	Water cooling tower, 500 thru 1000 tons, annualized	\$ 1,700.21	1.15	\$ 2,014.80	0.97	\$ 1,955.24
1.000	D3 03 5130 1950	Chiller, recip., air cooled, up to 25 tons, annualized	\$ 892.61	1.15	\$ 1,057.77	0.97	\$ 1,026.50
1.000	D3 03 5130 2950	Chiller, recip., air cooled, over 25 tons, annualized	\$ 1,168.89	1.15	\$ 1,385.18	0.97	\$ 1,344.23
1.000	D3 03 5135 1950	Chiller, recip., water cooled, up to 50 tons, annualized	\$ 743.84	1.15	\$ 881.48	0.97	\$ 855.42
1.000	D3 03 5135 2950	Chiller, recip., water cooled, over 50 tons, annualized	\$ 1,004.18	1.15	\$ 1,189.99	0.97	\$ 1,154.81
1.000	D3 03 5140 1950	Chiller, centrif., water cooled, up to 100 tons, annualized	\$ 2,576.87	1.15	\$ 3,053.68	0.97	\$ 2,963.41
1.000	D3 03 5140 2950	Chiller, centrif., water cooled, over 100 tons, annualized	\$ 3,187.89	1.15	\$ 3,777.75	0.97	\$ 3,666.07
1.000	D3 03 5150 1950	Chiller, absorption unit, up to 500 tons, annualized	\$ 637.58	1.15	\$ 755.55	0.97	\$ 733.21
1.000	D3 03 5150 2950	Chiller, absorption unit, 500 to 5000 tons, annualized	\$ 1,089.19	1.15	\$ 1,290.73	0.97	\$ 1,252.57
1.000	D3 03 5160 1950	Chiller, screw, water cooled, up to 100 tons, annualized	\$ 1,567.38	1.15	\$ 1,857.39	0.97	\$ 1,802.48
1.000	D3 03 5160 2950	Chiller, screw, water cooled, over 100 tons, annualized	\$ 1,779.90	1.15	\$ 2,109.24	0.97	\$ 2,046.89
1.000	D3 03 5170 1950	Evaporative cooler, annualized	\$ 142.39	1.15	\$ 168.74	0.97	\$ 163.75
1.000	D3 03 5180 1950	Evaporative cooler, rotating drum, annualized	\$ 157.27	1.15	\$ 186.37	0.97	\$ 180.86
1.000	D3 03 5210 1950	Condenser, air cooled, 3 tons to 25 tons, annualized	\$ 196.59	1.15	\$ 232.96	0.97	\$ 226.07

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹								
ANNUALIZED-15% GF								
PROJECT:	EAST HALL							
LOCATION:	US NATIONAL AVERAGES							
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.15	Assumed Value						
Qty	Assembly Number	Description	Labor Hours	Total In-House	Total Incl. O&P	Location Factor	Location Adjusted Total O&P	De-Escalation Factor to July 2009 Costs
1.000	D3 03 5210 2950	Condenser, air cooled, 26 tons through 100 tons, annualized	1.99	\$ 200.00	\$ 242.00	1.095	\$ 264.99	0.97
1.000	D3 03 5210 3950	Condenser, air cooled, over 100 tons, annualized	2.19	\$ 245.00	\$ 294.00	1.095	\$ 321.93	0.97
1.000	D3 03 5220 1950	Condensing unit, air cooled, 3 to 25 tons, annualized	2.56	\$ 254.00	\$ 310.00	1.095	\$ 339.45	0.97
1.000	D3 03 5220 2950	Condensing unit, air cooled, 26 to 100 tons, annualized	2.98	\$ 310.00	\$ 375.00	1.095	\$ 410.63	0.97
1.000	D3 03 5220 3950	Condensing unit, air cooled, over 100 tons, annualized	3.51	\$ 375.00	\$ 450.00	1.095	\$ 492.75	0.97
1.000	D3 03 5240 1950	Condensing unit, water cooled, 3 to 24 tons, annualized	1.32	\$ 115.00	\$ 140.00	1.095	\$ 153.30	0.97
1.000	D3 03 5240 2950	Condensing unit, water cooled, 25 to 100 tons, annualized	2.85	\$ 258.00	\$ 315.00	1.095	\$ 344.93	0.97
1.000	D3 03 5240 3950	Condensing unit, water cooled, over 100 tons, annualized	2.85	\$ 305.00	\$ 365.00	1.095	\$ 399.68	0.97
1.000	D3 03 5260 1950	Compressor, DX Refrigeration, to 25 tons, annualized	2.44	\$ 173.00	\$ 214.00	1.095	\$ 234.33	0.97
1.000	D3 03 5260 2950	Compressor, DX refrigeration, 25 to 100 tons, annualized	3.14	\$ 216.00	\$ 269.00	1.095	\$ 294.56	0.97
1.000	D3 03 5290 1950	Fluid cooler, annualized	1.12	\$ 87.00	\$ 108.00	1.095	\$ 118.26	0.97
1.000	D3 04 5110 1950	Air handling unit, 3 thru 24 tons, annualized	2.06	\$ 232.00	\$ 279.00	1.095	\$ 305.51	0.97
1.000	D3 04 5110 2950	Air handling unit, 25 thru 50 tons, annualized	2.14	\$ 530.00	\$ 615.00	1.095	\$ 673.43	0.97
1.000	D3 04 5110 3950	Air handling unit, over 50 tons, annualized	3.27	\$ 715.00	\$ 840.00	1.095	\$ 919.80	0.97
1.000	D3 04 5112 1950	Air handling unit, computer room, annualized	3.42	\$ 281.00	\$ 345.00	1.095	\$ 377.78	0.97
1.000	D3 04 5120 1950	Fan coil unit, annualized	3.34	\$ 242.00	\$ 299.00	1.095	\$ 327.41	0.97
1.000	D3 04 5150 1950	Air filter, electrostatic, annualized	8.77	\$ 515.00	\$ 635.00	1.095	\$ 695.33	0.97
1.000	D3 04 5160 1950	VAV Boxes, annualized	0.93	\$ 68.00	\$ 84.00	1.095	\$ 91.98	0.97
1.000	D3 04 5170 1950	Fire dampers, annualized	1.16	\$ 80.50	\$ 100.00	1.095	\$ 109.50	0.97
1.000	D3 04 5210 1950	Fan, axial, up to 5,000 CFM, annualized	1.24	\$ 77.00	\$ 94.00	1.095	\$ 102.93	0.97

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹							
ANNUALIZED-15% GF							
PROJECT:	EAST HALL						
LOCATION:	US NATIONAL AVERAGES						
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green	GREEN FACTOR	Adjusted Total with Green Factor OH&P	De-Escalation Factor to July 2009 Costs	Total with All Adjustments
1.000	D3 03 5210 2950	Condenser, air cooled, 26 tons through 100 tons, annualized	\$ 257.16	1.15	\$ 304.74	0.97	\$ 295.73
1.000	D3 03 5210 3950	Condenser, air cooled, over 100 tons, annualized	\$ 312.41	1.15	\$ 370.22	0.97	\$ 359.27
1.000	D3 03 5220 1950	Condensing unit, air cooled, 3 to 25 tons, annualized	\$ 329.41	1.15	\$ 390.37	0.97	\$ 378.83
1.000	D3 03 5220 2950	Condensing unit, air cooled, 26 to 100 tons, annualized	\$ 398.49	1.15	\$ 472.22	0.97	\$ 458.26
1.000	D3 03 5220 3950	Condensing unit, air cooled, over 100 tons, annualized	\$ 478.18	1.15	\$ 566.66	0.97	\$ 549.91
1.000	D3 03 5240 1950	Condensing unit, water cooled, 3 to 24 tons, annualized	\$ 148.77	1.15	\$ 176.30	0.97	\$ 171.08
1.000	D3 03 5240 2950	Condensing unit, water cooled, 25 to 100 tons, annualized	\$ 334.73	1.15	\$ 396.66	0.97	\$ 384.94
1.000	D3 03 5240 3950	Condensing unit, water cooled, over 100 tons, annualized	\$ 387.86	1.15	\$ 459.63	0.97	\$ 446.04
1.000	D3 03 5260 1950	Compressor, DX Refrigeration, to 25 tons, annualized	\$ 227.40	1.15	\$ 269.48	0.97	\$ 261.51
1.000	D3 03 5260 2950	Compressor, DX refrigeration, 25 to 100 tons, annualized	\$ 285.85	1.15	\$ 338.74	0.97	\$ 328.72
1.000	D3 03 5290 1950	Fluid cooler, annualized	\$ 114.76	1.15	\$ 136.00	0.97	\$ 131.98
1.000	D3 04 5110 1950	Air handling unit, 3 thru 24 tons, annualized	\$ 296.47	1.15	\$ 351.33	0.97	\$ 340.94
1.000	D3 04 5110 2950	Air handling unit, 25 thru 50 tons, annualized	\$ 653.52	1.15	\$ 774.44	0.97	\$ 751.54
1.000	D3 04 5110 3950	Air handling unit, over 50 tons, annualized	\$ 892.61	1.15	\$ 1,057.77	0.97	\$ 1,026.50
1.000	D3 04 5112 1950	Air handling unit, computer room, annualized	\$ 366.61	1.15	\$ 434.44	0.97	\$ 421.60
1.000	D3 04 5120 1950	Fan coil unit, annualized	\$ 317.73	1.15	\$ 376.52	0.97	\$ 365.38
1.000	D3 04 5150 1950	Air filter, electrostatic, annualized	\$ 674.77	1.15	\$ 799.62	0.97	\$ 775.98
1.000	D3 04 5160 1950	VAV Boxes, annualized	\$ 89.26	1.15	\$ 105.78	0.97	\$ 102.65
1.000	D3 04 5170 1950	Fire dampers, annualized	\$ 106.26	1.15	\$ 125.93	0.97	\$ 122.20
1.000	D3 04 5210 1950	Fan, axial, up to 5,000 CFM, annualized	\$ 99.89	1.15	\$ 118.37	0.97	\$ 114.87

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹									
ANNUALIZED-15% GF									
PROJECT:	EAST HALL								
LOCATION:	US NATIONAL AVERAGES								
Escalation	6%								
De-Escalation to July 2009	1.03								
De-Escalation Factor to be Applied	0.97								
Green Factor	1.15	Assumed Value							
Qty	Assembly Number	Description	Labor Hours	Total In-House	Total Incl. O&P	Location Factor	Location Adjusted Total O&P	De-Escalation Factor to July 2009 Costs	
1.000	D3 04 5210 2950	Fan, axial, 5,000 to 10,000 CFM, annualized	1.29	\$ 79.50	\$ 97.50	1.095	\$ 106.76	0.97	
1.000	D3 04 5210 3950	Fan, axial, over 10,000 CFM, annualized	1.39	\$ 85.00	\$ 105.00	1.095	\$ 114.98	0.97	
1.000	D3 04 5220 1950	Fan, centrifugal, up to 5,000 CFM, annualized	1.08	\$ 67.50	\$ 83.00	1.095	\$ 90.89	0.97	
1.000	D3 04 5220 2950	Fan, centrifugal, 5,000 to 10,000 CFM, annualized	1.14	\$ 71.00	\$ 87.00	1.095	\$ 95.27	0.97	
1.000	D3 04 5220 3950	Fan, centrifugal, over 10,000 CFM, annualized	1.18	\$ 73.50	\$ 90.00	1.095	\$ 98.55	0.97	
1.000	D3 04 5250 1950	Hood and blower, annualized	2.32	\$ 218.00	\$ 259.00	1.095	\$ 283.61	0.97	
1.000	D3 04 5410 1950	Centrifugal, over 1 HP, annualized	1.20	\$ 92.50	\$ 114.00	1.095	\$ 124.83	0.97	
1.000	D3 04 5410 2950	Centrifugal, w/ reduction gear, over 1 H.P., annualized	1.28	\$ 98.00	\$ 121.00	1.095	\$ 132.50	0.97	
1.000	D3 04 5420 1950	Pump w/ oil reservoir, electric, annualized	1.20	\$ 92.50	\$ 114.00	1.095	\$ 124.83	0.97	
1.000	D3 04 5600 1950	Heat exchanger, steam, annualized	0.92	\$ 85.50	\$ 104.00	1.095	\$ 113.88	0.97	
1.000	D3 05 5110 1950	Unit heater, gas radiant, annualized	1.01	\$ 68.00	\$ 84.50	1.095	\$ 92.53	0.97	
1.000	D3 05 5110 2950	Unit heater, gas infrared, annualized	1.50	\$ 128.00	\$ 156.00	1.095	\$ 170.82	0.97	
1.000	D3 05 5110 3950	Unit heater, steam, annualized	0.84	\$ 85.00	\$ 103.00	1.095	\$ 112.79	0.97	
1.000	D3 05 5122 1950	Forced air heater, oil or gas fired, up to 120 MBH, annualized	5.80	\$ 490.00	\$ 600.00	1.095	\$ 657.00	0.97	
1.000	D3 05 5122 2950	Forced air heater, oil or gas fired, over 120 MBH, annualized	7.41	\$ 635.00	\$ 775.00	1.095	\$ 848.63	0.97	
1.000	D3 05 5210 1950	Package unit, air cooled, 3 thru 24 ton, annualized	2.40	\$ 229.00	\$ 278.00	1.095	\$ 304.41	0.97	
1.000	D3 05 5210 2950	Package unit, air cooled, 25 thru 50 ton, annualized	3.25	\$ 315.00	\$ 380.00	1.095	\$ 416.10	0.97	
1.000	D3 05 5220 1950	Package unit, water cooled, 3 thru 24 ton, annualized	2.40	\$ 229.00	\$ 278.00	1.095	\$ 304.41	0.97	
1.000	D3 05 5220 2950	Package unit, water cooled, 25 thru 50 ton, annualized	3.25	\$ 315.00	\$ 380.00	1.095	\$ 416.10	0.97	
1.000	D3 05 5230 1950	Package unit, computer room, annualized	4.34	\$ 340.00	\$ 420.00	1.095	\$ 459.90	0.97	
1.000	D3 05 5240 1950	Package unit with duct gas heater, annualized	4.96	\$ 385.00	\$ 475.00	1.095	\$ 520.13	0.97	
1.000	D3 05 5250 1950	Air conditioning, split system, DX air cooled, to 10 tons, annualized	3.54	\$ 305.00	\$ 370.00	1.095	\$ 405.15	0.97	
1.000	D3 05 5250 2950	Air conditioning, split system, DX air cooled, over 10 tons, annualized	3.57	\$ 335.00	\$ 410.00	1.095	\$ 448.95	0.97	
1.000	D3 05 5310 1950	Heat pump, air cooled, up to 5 ton, annualized	3.20	\$ 251.00	\$ 310.00	1.095	\$ 339.45	0.97	
1.000	D3 05 5310 2950	Heat pump, air cooled, over 5 ton, annualized	3.59	\$ 305.00	\$ 375.00	1.095	\$ 410.63	0.97	
1.000	D3 05 5320 1950	Heat pump, water cooled, up to 5 ton, annualized	3.56	\$ 274.00	\$ 335.00	1.095	\$ 366.83	0.97	
1.000	D3 05 5320 2950	Heat pump, water cooled, over 5 ton, annualized	3.23	\$ 283.00	\$ 345.00	1.095	\$ 377.78	0.97	
1.000	D3 06 5100 1950	Controls, central system, electro/pneumatic, annualized	1.92	\$ 168.00	\$ 205.00	1.095	\$ 224.48	0.97	
1.000	D3 09 5110 1950	Air compressor, gas engine powered, annualized	16.57	\$ 1,325.00	\$ 1,600.00	1.095	\$ 1,752.00	0.97	

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹							
ANNUALIZED-15% GF							
PROJECT:	EAST HALL						
LOCATION:	US NATIONAL AVERAGES						
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green	GREEN FACTOR	Adjusted Total with Green Factor OH&P	De-Escalation Factor to July 2009 Costs	Total with All Adjustments
1.000	D3 04 5210 2950	Fan, axial, 5,000 to 10,000 CFM, annualized	\$ 103.61	1.15	\$ 122.78	0.97	\$ 119.15
1.000	D3 04 5210 3950	Fan, axial, over 10,000 CFM, annualized	\$ 111.58	1.15	\$ 132.22	0.97	\$ 128.31
1.000	D3 04 5220 1950	Fan, centrifugal, up to 5,000 CFM, annualized	\$ 88.20	1.15	\$ 104.52	0.97	\$ 101.43
1.000	D3 04 5220 2950	Fan, centrifugal, 5,000 to 10,000 CFM, annualized	\$ 92.45	1.15	\$ 109.55	0.97	\$ 106.32
1.000	D3 04 5220 3950	Fan, centrifugal, over 10,000 CFM, annualized	\$ 95.64	1.15	\$ 113.33	0.97	\$ 109.98
1.000	D3 04 5250 1950	Hood and blower, annualized	\$ 275.22	1.15	\$ 326.15	0.97	\$ 316.50
1.000	D3 04 5410 1950	Centrifugal, over 1 HP, annualized	\$ 121.14	1.15	\$ 143.55	0.97	\$ 139.31
1.000	D3 04 5410 2950	Centrifugal, w/ reduction gear, over 1 H.P., annualized	\$ 128.58	1.15	\$ 152.37	0.97	\$ 147.86
1.000	D3 04 5420 1950	Pump w/ oil reservoir, electric, annualized	\$ 121.14	1.15	\$ 143.55	0.97	\$ 139.31
1.000	D3 04 5600 1950	Heat exchanger, steam, annualized	\$ 110.51	1.15	\$ 130.96	0.97	\$ 127.09
1.000	D3 05 5110 1950	Unit heater, gas radiant, annualized	\$ 89.79	1.15	\$ 106.41	0.97	\$ 103.26
1.000	D3 05 5110 2950	Unit heater, gas infrared, annualized	\$ 165.77	1.15	\$ 196.44	0.97	\$ 190.64
1.000	D3 05 5110 3950	Unit heater, steam, annualized	\$ 109.45	1.15	\$ 129.70	0.97	\$ 125.87
1.000	D3 05 5122 1950	Forced air heater, oil or gas fired, up to 120 MBH, annualized	\$ 637.58	1.15	\$ 755.55	0.97	\$ 733.21
1.000	D3 05 5122 2950	Forced air heater, oil or gas fired, over 120 MBH, annualized	\$ 823.54	1.15	\$ 975.92	0.97	\$ 947.07
1.000	D3 05 5210 1950	Package unit, air cooled, 3 thru 24 ton, annualized	\$ 295.41	1.15	\$ 350.07	0.97	\$ 339.72
1.000	D3 05 5210 2950	Package unit, air cooled, 25 thru 50 ton, annualized	\$ 403.80	1.15	\$ 478.52	0.97	\$ 464.37
1.000	D3 05 5220 1950	Package unit, water cooled, 3 thru 24 ton, annualized	\$ 295.41	1.15	\$ 350.07	0.97	\$ 339.72
1.000	D3 05 5220 2950	Package unit, water cooled, 25 thru 50 ton, annualized	\$ 403.80	1.15	\$ 478.52	0.97	\$ 464.37
1.000	D3 05 5230 1950	Package unit, computer room, annualized	\$ 446.30	1.15	\$ 528.89	0.97	\$ 513.25
1.000	D3 05 5240 1950	Package unit with duct gas heater, annualized	\$ 504.75	1.15	\$ 598.14	0.97	\$ 580.46
1.000	D3 05 5250 1950	Air conditioning, split system, DX air cooled, to 10 tons, annualized	\$ 393.17	1.15	\$ 465.92	0.97	\$ 452.15
1.000	D3 05 5250 2950	Air conditioning, split system, DX air cooled, over 10 tons, annualized	\$ 435.68	1.15	\$ 516.29	0.97	\$ 501.03
1.000	D3 05 5310 1950	Heat pump, air cooled, up to 5 ton, annualized	\$ 329.41	1.15	\$ 390.37	0.97	\$ 378.83
1.000	D3 05 5310 2950	Heat pump, air cooled, over 5 ton, annualized	\$ 398.49	1.15	\$ 472.22	0.97	\$ 458.26
1.000	D3 05 5320 1950	Heat pump, water cooled, up to 5 ton, annualized	\$ 355.98	1.15	\$ 421.85	0.97	\$ 409.38
1.000	D3 05 5320 2950	Heat pump, water cooled, over 5 ton, annualized	\$ 366.61	1.15	\$ 434.44	0.97	\$ 421.60
1.000	D3 06 5100 1950	Controls, central system, electro/pneumatic, annualized	\$ 217.84	1.15	\$ 258.15	0.97	\$ 250.51
1.000	D3 09 5110 1950	Air compressor, gas engine powered, annualized	\$ 1,700.21	1.15	\$ 2,014.80	0.97	\$ 1,955.24

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE¹
ANNUALIZED-15% GF

PROJECT:	EAST HALL							
LOCATION:	US NATIONAL AVERAGES							
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.15	Assumed Value						
Qty	Assembly Number	Description	Labor Hours	Total In-House	Total Incl. O&P	Location Factor	Location Adjusted Total O&P	De-Escalation Factor to July 2009 Costs
1.000	D3 09 5114 1950	Air compressor, centrifugal, to 40 H.P., annualized	3.41	\$ 286.00	\$ 350.00	1.095	\$ 383.25	0.97
1.000	D3 09 5114 2950	Air compressor, centrifugal, over 40 H.P., annualized	14.89	\$ 1,175.00	\$ 1,425.00	1.095	\$ 1,560.38	0.97
1.000	D3 09 5118 1950	Air compressor, reciprocating, less than 5 H.P., annualized	4.80	\$ 395.00	\$ 485.00	1.095	\$ 531.08	0.97
1.000	D3 09 5118 2950	Air compressor, reciprocating, 5 to 40 H.P., annualized	4.86	\$ 400.00	\$ 490.00	1.095	\$ 536.55	0.97
1.000	D3 09 5118 3950	Air compressor, reciprocating, over 40 H.P., annualized	5.72	\$ 455.00	\$ 560.00	1.095	\$ 613.20	0.97
1.000	D3 09 5210 1950	Steam humidification system, annualized	2.54	\$ 208.00	\$ 255.00	1.095	\$ 279.23	0.97
1.000	D3 09 5210 2950	Evaporative pan with heating coil humidification system, annualized	1.89	\$ 151.00	\$ 186.00	1.095	\$ 203.67	0.97
1.000	D3 09 5220 1950	Dehumidifier, desiccant wheel, annualized	5.06	\$ 430.00	\$ 515.00	1.095	\$ 563.93	0.97
1.000	D4 01 5100 1950	Backflow prevention device, up to 4", annualized	0.33	\$ 21.50	\$ 27.00	1.095	\$ 29.57	0.97
1.000	D4 01 5100 2950	Backflow prevention device, over 4", annualized	0.49	\$ 32.00	\$ 40.00	1.095	\$ 43.80	0.97
1.000	D4 01 5150 1950	Extinguishing system, wet pipe, annualized	11.34	\$ 870.00	\$ 1,075.00	1.095	\$ 1,177.13	0.97
1.000	D4 01 5180 1950	Extinguishing system, deluge / preaction, annualized	11.57	\$ 885.00	\$ 1,075.00	1.095	\$ 1,177.13	0.97
1.000	D4 01 5210 1950	Fire pump, electric motor driven, annualized	47.74	\$ 3,100.00	\$ 3,875.00	1.095	\$ 4,243.13	0.97
1.000	D4 01 5250 1950	Fire pump, motor/engine driven, annualized	69.88	\$ 4,575.00	\$ 5,700.00	1.095	\$ 6,241.50	0.97
1.000	D4 01 5310 1950	Extinguishing system, dry pipe, annualized	13.02	\$ 1,025.00	\$ 1,250.00	1.095	\$ 1,368.75	0.97
1.000	D4 09 5100 1950	Extinguishing system, CO2, annualized	9.47	\$ 795.00	\$ 975.00	1.095	\$ 1,067.63	0.97
1.000	D4 09 5200 1950	Extinguishing system, foam bottle, annualized	3.71	\$ 231.00	\$ 289.00	1.095	\$ 316.46	0.97
1.000	D4 09 5210 1950	Extinguishing system, foam pump electric, annualized	17.76	\$ 1,275.00	\$ 1,575.00	1.095	\$ 1,724.63	0.97
1.000	D4 09 5220 1950	Extinguishing system, foam pump diesel, annualized	22.16	\$ 1,625.00	\$ 2,000.00	1.095	\$ 2,190.00	0.97
1.000	D4 09 5400 1950	Extinguishing system, dry chemical, annualized	5.61	\$ 555.00	\$ 670.00	1.095	\$ 733.65	0.97
1.000	D4 09 5450 1950	Extinguishing system, FM200, annualized	9.26	\$ 740.00	\$ 905.00	1.095	\$ 990.98	0.97

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹							
ANNUALIZED-15% GF							
PROJECT:	EAST HALL						
LOCATION:	US NATIONAL AVERAGES						
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green	GREEN FACTOR	Adjusted Total with Green Factor OH&P	De-Escalation Factor to July 2009 Costs	Total with All Adjustments
1.000	D3 09 5114 1950	Air compressor, centrifugal, to 40 H.P., annualized	\$ 371.92	1.15	\$ 440.74	0.97	\$ 427.71
1.000	D3 09 5114 2950	Air compressor, centrifugal, over 40 H.P., annualized	\$ 1,514.25	1.15	\$ 1,794.43	0.97	\$ 1,741.38
1.000	D3 09 5118 1950	Air compressor, reciprocating, less than 5 H.P., annualized	\$ 515.37	1.15	\$ 610.74	0.97	\$ 592.68
1.000	D3 09 5118 2950	Air compressor, reciprocating, 5 to 40 H.P., annualized	\$ 520.69	1.15	\$ 617.03	0.97	\$ 598.79
1.000	D3 09 5118 3950	Air compressor, reciprocating, over 40 H.P., annualized	\$ 595.07	1.15	\$ 705.18	0.97	\$ 684.33
1.000	D3 09 5210 1950	Steam humidification system, annualized	\$ 270.97	1.15	\$ 321.11	0.97	\$ 311.62
1.000	D3 09 5210 2950	Evaporative pan with heating coil humidification system, annualized	\$ 197.65	1.15	\$ 234.22	0.97	\$ 227.30
1.000	D3 09 5220 1950	Dehumidifier, desiccant wheel, annualized	\$ 547.25	1.15	\$ 648.51	0.97	\$ 629.34
1.000	D4 01 5100 1950	Backflow prevention device, up to 4", annualized	\$ 28.69	1.15	\$ 34.00	0.97	\$ 32.99
1.000	D4 01 5100 2950	Backflow prevention device, over 4", annualized	\$ 42.51	1.15	\$ 50.37	0.97	\$ 48.88
1.000	D4 01 5150 1950	Extinguishing system, wet pipe, annualized	\$ 1,142.33	1.15	\$ 1,353.69	0.97	\$ 1,313.67
1.000	D4 01 5180 1950	Extinguishing system, deluge / preaction, annualized	\$ 1,142.33	1.15	\$ 1,353.69	0.97	\$ 1,313.67
1.000	D4 01 5210 1950	Fire pump, electric motor driven, annualized	\$ 4,117.69	1.15	\$ 4,879.59	0.97	\$ 4,735.34
1.000	D4 01 5250 1950	Fire pump, motor/engine driven, annualized	\$ 6,056.98	1.15	\$ 7,177.73	0.97	\$ 6,965.53
1.000	D4 01 5310 1950	Extinguishing system, dry pipe, annualized	\$ 1,328.29	1.15	\$ 1,574.06	0.97	\$ 1,527.53
1.000	D4 09 5100 1950	Extinguishing system, CO2, annualized	\$ 1,036.06	1.15	\$ 1,227.77	0.97	\$ 1,191.47
1.000	D4 09 5200 1950	Extinguishing system, foam bottle, annualized	\$ 307.10	1.15	\$ 363.92	0.97	\$ 353.16
1.000	D4 09 5210 1950	Extinguishing system, foam pump electric, annualized	\$ 1,673.64	1.15	\$ 1,983.32	0.97	\$ 1,924.69
1.000	D4 09 5220 1950	Extinguishing system, foam pump diesel, annualized	\$ 2,125.26	1.15	\$ 2,518.50	0.97	\$ 2,444.05
1.000	D4 09 5400 1950	Extinguishing system, dry chemical, annualized	\$ 711.96	1.15	\$ 843.70	0.97	\$ 818.76
1.000	D4 09 5450 1950	Extinguishing system, FM200, annualized	\$ 961.68	1.15	\$ 1,139.62	0.97	\$ 1,105.93
			\$ 74,713.41				\$ 85,920.42
			\$ 18,678.35	Assumed 25%		Assumed 25%	\$ 21,480.11
			Non-Green	Of Total per year		Of Total per year	Green

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹								
ANNUALIZED-15% GF								
PROJECT:	EAST HALL							
LOCATION:	US NATIONAL AVERAGES							
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.15	Assumed Value						
Qty	Assembly Number	Description	Labor Hours	Total In-House	Total Incl. O&P	Location Factor	Location Adjusted Total O&P	De-Escalation Factor to July 2009 Costs
SUMMARY OF FINDINGS								
		Description	Cost	% Difference	Comments			
		Yearly Non-Green Preventative Maintenance Costs	\$ 18,678.35					
		Yearly Green Preventative Maintenance Costs	\$ 21,480.11	13.04%	Green Costs are 13.04% higher than Non-Green based on this analysis			
FOOTNOTES:								
1	RS Means CostWorks 2010 Operations and Maintenance							

Appendix C-SM5 15% GF Analysis of FMRRC

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
15% GF												
CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation 6%												
De-Escalation to July 2009 1.03												
De-Escalation Factor to be Applied 0.97												
Green Factor 1.15 Assumed Value												
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 04 3140 0020	Maintenance and inspection duct heater	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
1.000	D3 05 3112 0020	Maintenance and inspection infrared heater suspended, commercial	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
1.000	D3 05 3114 0020	Maintenance and inspection standard suspended heater	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
1.000	D3 05 3116 0020	Maintenance and inspection explosionproof industrial heater	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
1.000	D3 05 3160 0020	Maintenance and inspection convector suspended, commercial	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
1.000	D3 05 3410 0020	Maintenance and inspection baseboard heating units	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
							\$ 411.00	\$ 516.00				
1.000	D3 01 3160 0010	Preventive maintenance oil filter	1	1 Stpi	Ea.	0.05	\$ 5.45	\$ 6.60	1.095	\$ 7.23	0.97	
1.000	D3 05 3112 0010	Maintenance and repair infrared heater suspended, commercial	1	1 Elec	Ea.	0.62	\$ 37.00	\$ 46.50	1.095	\$ 50.92	0.97	
1.000	D3 05 3150 0020	Maintenance and inspection wall mounted/recessed heater, with fan	1	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
1.000	D4 01 3310 1020	Inspect sprinkler system	1	1 Plum	Ea.	0.47	\$ 30.20	\$ 37.80	1.095	\$ 41.39	0.97	
1.000	D4 01 3310 1040	Rebuild double check 3" backflow preventer sprinkler system	1	1 Plum	Ea.	5.21	\$ 694.00	\$ 825.00	1.095	\$ 903.38	0.97	
1.000	D4 01 3310 1050	Rebuild double check 4" backflow preventer sprinkler system	1	1 Plum	Ea.	5.86	\$ 864.00	\$ 1,025.00	1.095	\$ 1,122.38	0.97	
1.000	D4 01 3310 1060	Rebuild double check 6" backflow preventer sprinkler system	1	1 Plum	Ea.	6.50	\$ 994.00	\$ 1,180.00	1.095	\$ 1,292.10	0.97	
1.000	D4 01 3310 1070	Rebuild reduced pressure 3" backflow preventer sprinkler system	1	1 Plum	Ea.	5.21	\$ 694.00	\$ 825.00	1.095	\$ 903.38	0.97	
1.000	D4 01 3310 1080	Rebuild reduced pressure 4" backflow preventer sprinkler system	1	1 Plum	Ea.	5.86	\$ 864.00	\$ 1,025.00	1.095	\$ 1,122.38	0.97	
1.000	D4 01 3310 1090	Rebuild reduced pressure 6" backflow preventer sprinkler system	1	1 Plum	Ea.	6.50	\$ 994.00	\$ 1,180.00	1.095	\$ 1,292.10	0.97	
							\$ 5,245.15	\$ 6,236.90				
1.000	D3 04 3310 0020	Inspect for leaks steam converter	2	1 Stpi	Ea.	0.09	\$ 5.94	\$ 7.42	1.095	\$ 8.12	0.97	
1.000	D3 05 3114 0010	Maintenance and repair standard suspended heater	2	1 Elec	Ea.	0.60	\$ 94.55	\$ 111.35	1.095	\$ 121.93	0.97	
1.000	D3 05 3116 0010	Maintenance and repair explosionproof industrial heater	2	1 Elec	Ea.	0.82	\$ 132.00	\$ 156.05	1.095	\$ 170.87	0.97	
1.000	D3 05 3160 0010	Maintenance and repair convector suspended, commercial	2	1 Elec	Ea.	0.62	\$ 37.00	\$ 46.50	1.095	\$ 50.92	0.97	
1.000	D3 05 3410 0010	Maintenance and repair baseboard heating units	2	1 Elec	Ea.	0.62	\$ 37.00	\$ 46.50	1.095	\$ 50.92	0.97	
							\$ 306.49	\$ 367.82				
1.000	D3 04 3520 3010	Repack drain valve gland, 3/4" valves	3	1 Stpi	Ea.	0.22	\$ 23.00	\$ 27.50	1.095	\$ 30.11	0.97	
							\$ 23.00	\$ 27.50				

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹								
15% GF								
CostWorks 2010 - EAST HALL								
Based on National Averages								
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN								
Escalation								
	6%							
De-Escalation to July 2009								
	1.03							
De-Escalation Factor to be Applied								
	0.97							
Green Factor								
	1.15	Assumed Value						
GREEN								
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments	
1.000	D3 04 3140 0020	Maintenance and inspection duct heater	\$ 91.39	1.15	\$ 108.30	0.97	\$ 105.09	
1.000	D3 05 3112 0020	Maintenance and inspection infrared heater suspended, commercial	\$ 91.39	1.15	\$ 108.30	0.97	\$ 105.09	
1.000	D3 05 3114 0020	Maintenance and inspection standard suspended heater	\$ 91.39	1.15	\$ 108.30	0.97	\$ 105.09	
1.000	D3 05 3116 0020	Maintenance and inspection explosionproof industrial heater	\$ 91.39	1.15	\$ 108.30	0.97	\$ 105.09	
1.000	D3 05 3160 0020	Maintenance and inspection convector suspended, commercial	\$ 91.39	1.15	\$ 108.30	0.97	\$ 105.09	
1.000	D3 05 3410 0020	Maintenance and inspection baseboard heating units	\$ 91.39	1.15	\$ 108.30	0.97	\$ 105.09	
			\$ 548.32				\$ 630.56	
			\$ 274.16	Assume 50% required		Assume 50% required	\$ 315.28	
				PER 0.5 YEAR		PER 0.5 YEAR		
1.000	D3 01 3160 0010	Preventive maintenance oil filter	\$ 7.01	1.15	\$ 8.31	0.97	\$ 8.07	
1.000	D3 05 3112 0010	Maintenance and repair infrared heater suspended, commercial	\$ 49.41	1.15	\$ 58.56	0.97	\$ 56.82	
1.000	D3 05 3150 0020	Maintenance and inspection wall mounted/recessed heater, with fan	\$ 91.39	1.15	\$ 108.30	0.97	\$ 105.09	
1.000	D4 01 3310 1020	Inspect sprinkler system	\$ 40.17	1.15	\$ 47.60	0.97	\$ 46.19	
1.000	D4 01 3310 1040	Rebuild double check 3" backflow preventer sprinkler system	\$ 876.67	1.15	\$ 1,038.88	0.97	\$ 1,008.17	
1.000	D4 01 3310 1050	Rebuild double check 4" backflow preventer sprinkler system	\$ 1,089.19	1.15	\$ 1,290.73	0.97	\$ 1,252.57	
1.000	D4 01 3310 1060	Rebuild double check 6" backflow preventer sprinkler system	\$ 1,253.90	1.15	\$ 1,485.92	0.97	\$ 1,441.99	
1.000	D4 01 3310 1070	Rebuild reduced pressure 3" backflow preventer sprinkler system	\$ 876.67	1.15	\$ 1,038.88	0.97	\$ 1,008.17	
1.000	D4 01 3310 1080	Rebuild reduced pressure 4" backflow preventer sprinkler system	\$ 1,089.19	1.15	\$ 1,290.73	0.97	\$ 1,252.57	
1.000	D4 01 3310 1090	Rebuild reduced pressure 6" backflow preventer sprinkler system	\$ 1,253.90	1.15	\$ 1,485.92	0.97	\$ 1,441.99	
			\$ 6,627.51				\$ 7,621.63	
			\$ 3,313.75	Assume 50% required		Assume 50% required	\$ 3,810.82	
				PER YEAR		PER YEAR		
1.000	D3 04 3310 0020	Inspect for leaks steam converter	\$ 7.88	1.15	\$ 9.34	0.97	\$ 9.07	
1.000	D3 05 3114 0010	Maintenance and repair standard suspended heater	\$ 118.32	1.15	\$ 140.22	0.97	\$ 136.07	
1.000	D3 05 3116 0010	Maintenance and repair explosionproof industrial heater	\$ 165.82	1.15	\$ 196.51	0.97	\$ 190.70	
1.000	D3 05 3160 0010	Maintenance and repair convector suspended, commercial	\$ 49.41	1.15	\$ 58.56	0.97	\$ 56.82	
1.000	D3 05 3410 0010	Maintenance and repair baseboard heating units	\$ 49.41	1.15	\$ 58.56	0.97	\$ 56.82	
			\$ 390.86				\$ 449.48	
			\$ 195.43	Assume 50% required		Assume 50% required	\$ 224.74	
				PER 2 YEARS		PER 2 YEARS		
1.000	D3 04 3520 3010	Repack drain valve gland, 3/4" valves	\$ 29.22	1.15	\$ 34.63	0.97	\$ 33.61	
			\$ 29.22				\$ 33.61	
			\$ 14.61	Assume 50% required		Assume 50% required	\$ 16.80	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
15% GF												
CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation	6%											
De-Escalation to July 2009	1.03											NON-GREEN
De-Escalation Factor to be Applied	0.97											
Green Factor	1.15	Assumed Value										
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 01 3150 0010	Preventive maintenance fuel level meter	5	1 Stpi	Ea.	0.50	\$ 32.00	\$ 40.00	1.095	\$ 43.80	0.97	
1.000	D3 01 3240 0010	Check gas pressure natural gas, pressure reducing valve	5	1 Stpi	Ea.	0.13	\$ 8.35	\$ 10.45	1.095	\$ 11.44	0.97	
1.000	D3 04 3310 0010	Repair steam converter	5	1 Stpi	Ea.	5.94	\$ 380.00	\$ 480.00	1.095	\$ 525.60	0.97	
1.000	D3 04 3320 0010	Repair flash tank 24 gallon	5	1 Stpi	Ea.	5.94	\$ 380.00	\$ 480.00	1.095	\$ 525.60	0.97	
1.000	D3 04 3530 1010	Repair circulator pump, 1/12 - 3/4 H.P.	5	1 Stpi	Ea.	0.51	\$ 80.33	\$ 94.55	1.095	\$ 103.53	0.97	
1.000	D3 04 3530 2010	Repair circulator pump, 1 H.P.	5	1 Stpi	Ea.	0.51	\$ 80.53	\$ 94.80	1.095	\$ 103.81	0.97	
1.000	D3 04 3540 0010	Refill expansion tank	5	1 Stpi	Ea.	0.20	\$ 12.85	\$ 16.10	1.095	\$ 17.63	0.97	
1.000	D3 04 3550 1010	Repair damaged pipe insulation, fiberglass 1/2"	5	Q14	Ea.	0.26	\$ 15.88	\$ 19.50	1.095	\$ 21.35	0.97	
1.000	D3 04 3550 1110	Repair damaged pipe insulation, fiberglass 3/4"	5	Q14	Ea.	0.27	\$ 16.70	\$ 20.45	1.095	\$ 22.39	0.97	
1.000	D3 04 3550 1120	Repair damaged pipe insulation, fiberglass 1"	5	Q14	Ea.	0.28	\$ 17.50	\$ 21.40	1.095	\$ 23.43	0.97	
1.000	D3 04 3550 1130	Repair damaged pipe insulation, fbgs 1-1/4"	5	Q14	Ea.	0.30	\$ 18.35	\$ 22.55	1.095	\$ 24.69	0.97	
1.000	D3 04 3550 1140	Repair damaged pipe insulation, fbgs 1-1/2"	5	Q14	Ea.	0.30	\$ 18.65	\$ 22.80	1.095	\$ 24.97	0.97	
1.000	D3 04 3550 1150	Repair damaged pipe insulation, fiberglass 2"	5	Q14	Ea.	0.31	\$ 19.60	\$ 24.10	1.095	\$ 26.39	0.97	
1.000	D3 04 3550 1160	Repair damaged pipe insulation, fiberglass 3"	5	Q14	Ea.	0.35	\$ 22.25	\$ 27.10	1.095	\$ 29.67	0.97	
1.000	D3 04 3550 1170	Repair damaged pipe insulation, fiberglass 4"	5	Q14	Ea.	0.42	\$ 27.20	\$ 33.15	1.095	\$ 36.30	0.97	
1.000	D3 04 3550 1180	Repair damaged pipe insulation, fiberglass 6"	5	Q14	Ea.	0.52	\$ 33.70	\$ 40.90	1.095	\$ 44.79	0.97	
1.000	D3 04 3550 1220	Replace pipe insulation, fiberglass 1/2"	5	Q14	M.L.F.	100.00	\$ 6,375.00	\$ 7,775.00	1.095	\$ 8,513.63	0.97	
1.000	D3 04 3550 1230	Replace pipe insulation, fiberglass 3/4"	5	Q14	M.L.F.	104.35	\$ 6,675.00	\$ 8,175.00	1.095	\$ 8,951.63	0.97	
1.000	D3 04 3550 1240	Replace pipe insulation, fiberglass 1"	5	Q14	M.L.F.	109.09	\$ 7,025.00	\$ 8,575.00	1.095	\$ 9,389.63	0.97	
1.000	D3 04 3550 1250	Replace pipe insulation, fiberglass 1-1/4"	5	Q14	M.L.F.	114.29	\$ 7,375.00	\$ 9,025.00	1.095	\$ 9,882.38	0.97	
1.000	D3 04 3550 1260	Replace pipe insulation, fiberglass 1-1/2"	5	Q14	M.L.F.	114.29	\$ 7,525.00	\$ 9,150.00	1.095	\$ 10,019.25	0.97	
1.000	D3 04 3550 1270	Replace pipe insulation, fiberglass 2"	5	Q14	M.L.F.	120.00	\$ 7,925.00	\$ 9,650.00	1.095	\$ 10,566.75	0.97	
1.000	D3 04 3550 1280	Replace pipe insulation, fiberglass 3"	5	Q14	M.L.F.	133.33	\$ 8,950.00	\$ 10,925.00	1.095	\$ 11,962.88	0.97	
1.000	D3 04 3550 1290	Replace pipe insulation, fiberglass 4"	5	Q14	M.L.F.	160.00	\$ 10,975.00	\$ 13,350.00	1.095	\$ 14,618.25	0.97	
1.000	D3 04 3550 1300	Replace pipe insulation, fiberglass 6"	5	Q14	M.L.F.	200.00	\$ 13,650.00	\$ 16,575.00	1.095	\$ 18,149.63	0.97	
1.000	D3 04 3550 1410	Repair damaged pipe insulation rubber 1/2"	5	1 Asbe	Ea.	0.35	\$ 22.90	\$ 28.20	1.095	\$ 30.88	0.97	
1.000	D3 04 3550 1420	Repair damaged pipe insulation rubber 3/4"	5	1 Asbe	Ea.	0.35	\$ 23.40	\$ 28.55	1.095	\$ 31.26	0.97	
1.000	D3 04 3550 1430	Repair damaged pipe insulation rubber 1"	5	1 Asbe	Ea.	0.36	\$ 23.95	\$ 29.65	1.095	\$ 32.47	0.97	
1.000	D3 04 3550 1440	Repair damaged pipe insulation rubber 1-1/4"	5	1 Asbe	Ea.	0.36	\$ 25.35	\$ 31.25	1.095	\$ 34.22	0.97	
1.000	D3 04 3550 1450	Repair damaged pipe insulation rubber 1-1/2"	5	1 Asbe	Ea.	0.36	\$ 25.85	\$ 31.75	1.095	\$ 34.77	0.97	
1.000	D3 04 3550 1460	Repair damaged pipe insulation rubber 2"	5	1 Asbe	Ea.	0.36	\$ 26.95	\$ 32.85	1.095	\$ 35.97	0.97	
1.000	D3 04 3550 1470	Repair damaged pipe insulation rubber 3"	5	1 Asbe	Ea.	0.37	\$ 30.20	\$ 36.45	1.095	\$ 39.91	0.97	
1.000	D3 04 3550 1480	Repair damaged pipe insulation rubber 4"	5	1 Asbe	Ea.	0.39	\$ 33.65	\$ 40.50	1.095	\$ 44.35	0.97	
1.000	D3 04 3550 1490	Repair damaged pipe insulation rubber 6"	5	1 Asbe	Ea.	0.39	\$ 38.65	\$ 46.50	1.095	\$ 50.92	0.97	
1.000	D3 04 3550 1510	Replace pipe insulation foam rubber 1/2"	5	1 Asbe	L.F.	0.27	\$ 18.10	\$ 22.20	1.095	\$ 24.31	0.97	
1.000	D3 04 3550 1520	Replace pipe insulation foam rubber 3/4"	5	1 Asbe	L.F.	0.27	\$ 18.60	\$ 22.75	1.095	\$ 24.91	0.97	
1.000	D3 04 3550 1530	Replace pipe insulation foam rubber 1"	5	1 Asbe	L.F.	0.27	\$ 19.15	\$ 23.50	1.095	\$ 25.73	0.97	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
15% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor PER 3 YEARS	GREEN Total Adjusted Green OH&P Location	De-Escalation Factor PER 3 YEARS	Total Green with All Adjustments
1.000	D3 01 3150 0010	Preventive maintenance fuel level meter	\$ 42.51	1.15	\$ 50.37	0.97	\$ 48.88
1.000	D3 01 3240 0010	Check gas pressure natural gas, pressure reducing valve	\$ 11.10	1.15	\$ 13.16	0.97	\$ 12.77
1.000	D3 04 3310 0010	Repair steam converter	\$ 510.06	1.15	\$ 604.44	0.97	\$ 586.57
1.000	D3 04 3320 0010	Repair flash tank 24 gallon	\$ 510.06	1.15	\$ 604.44	0.97	\$ 586.57
1.000	D3 04 3530 1010	Repair circulator pump, 1/12 - 3/4 H.P.	\$ 100.47	1.15	\$ 119.06	0.97	\$ 115.54
1.000	D3 04 3530 2010	Repair circulator pump, 1 H.P.	\$ 100.74	1.15	\$ 119.38	0.97	\$ 115.85
1.000	D3 04 3540 0010	Refill expansion tank	\$ 17.11	1.15	\$ 20.27	0.97	\$ 19.67
1.000	D3 04 3550 1010	Repair damaged pipe insulation, fiberglass 1/2"	\$ 20.72	1.15	\$ 24.56	0.97	\$ 23.83
1.000	D3 04 3550 1110	Repair damaged pipe insulation, fiberglass 3/4"	\$ 21.73	1.15	\$ 25.75	0.97	\$ 24.99
1.000	D3 04 3550 1120	Repair damaged pipe insulation, fiberglass 1"	\$ 22.74	1.15	\$ 26.95	0.97	\$ 26.15
1.000	D3 04 3550 1130	Repair damaged pipe insulation, fbgs 1-1/4"	\$ 23.96	1.15	\$ 28.40	0.97	\$ 27.56
1.000	D3 04 3550 1140	Repair damaged pipe insulation, fbgs 1-1/2"	\$ 24.23	1.15	\$ 28.71	0.97	\$ 27.86
1.000	D3 04 3550 1150	Repair damaged pipe insulation, fiberglass 2"	\$ 25.61	1.15	\$ 30.35	0.97	\$ 29.45
1.000	D3 04 3550 1160	Repair damaged pipe insulation, fiberglass 3"	\$ 28.80	1.15	\$ 34.13	0.97	\$ 33.12
1.000	D3 04 3550 1170	Repair damaged pipe insulation, fiberglass 4"	\$ 35.23	1.15	\$ 41.74	0.97	\$ 40.51
1.000	D3 04 3550 1180	Repair damaged pipe insulation, fiberglass 6"	\$ 43.46	1.15	\$ 51.50	0.97	\$ 49.98
1.000	D3 04 3550 1220	Replace pipe insulation, fiberglass 1/2"	\$ 8,261.94	1.15	\$ 9,790.67	0.97	\$ 9,501.23
1.000	D3 04 3550 1230	Replace pipe insulation, fiberglass 3/4"	\$ 8,686.99	1.15	\$ 10,294.37	0.97	\$ 9,990.04
1.000	D3 04 3550 1240	Replace pipe insulation, fiberglass 1"	\$ 9,112.04	1.15	\$ 10,798.07	0.97	\$ 10,478.85
1.000	D3 04 3550 1250	Replace pipe insulation, fiberglass 1-1/4"	\$ 9,590.22	1.15	\$ 11,364.73	0.97	\$ 11,028.76
1.000	D3 04 3550 1260	Replace pipe insulation, fiberglass 1-1/2"	\$ 9,723.05	1.15	\$ 11,522.14	0.97	\$ 11,181.51
1.000	D3 04 3550 1270	Replace pipe insulation, fiberglass 2"	\$ 10,254.37	1.15	\$ 12,151.76	0.97	\$ 11,792.52
1.000	D3 04 3550 1280	Replace pipe insulation, fiberglass 3"	\$ 11,609.22	1.15	\$ 13,757.31	0.97	\$ 13,350.60
1.000	D3 04 3550 1290	Replace pipe insulation, fiberglass 4"	\$ 14,186.09	1.15	\$ 16,810.99	0.97	\$ 16,314.00
1.000	D3 04 3550 1300	Replace pipe insulation, fiberglass 6"	\$ 17,613.07	1.15	\$ 20,872.07	0.97	\$ 20,255.03
1.000	D3 04 3550 1410	Repair damaged pipe insulation rubber 1/2"	\$ 29.97	1.15	\$ 35.51	0.97	\$ 34.46
1.000	D3 04 3550 1420	Repair damaged pipe insulation rubber 3/4"	\$ 30.34	1.15	\$ 35.95	0.97	\$ 34.89
1.000	D3 04 3550 1430	Repair damaged pipe insulation rubber 1"	\$ 31.51	1.15	\$ 37.34	0.97	\$ 36.23
1.000	D3 04 3550 1440	Repair damaged pipe insulation rubber 1-1/4"	\$ 33.21	1.15	\$ 39.35	0.97	\$ 38.19
1.000	D3 04 3550 1450	Repair damaged pipe insulation rubber 1-1/2"	\$ 33.74	1.15	\$ 39.98	0.97	\$ 38.80
1.000	D3 04 3550 1460	Repair damaged pipe insulation rubber 2"	\$ 34.91	1.15	\$ 41.37	0.97	\$ 40.14
1.000	D3 04 3550 1470	Repair damaged pipe insulation rubber 3"	\$ 38.73	1.15	\$ 45.90	0.97	\$ 44.54
1.000	D3 04 3550 1480	Repair damaged pipe insulation rubber 4"	\$ 43.04	1.15	\$ 51.00	0.97	\$ 49.49
1.000	D3 04 3550 1490	Repair damaged pipe insulation rubber 6"	\$ 49.41	1.15	\$ 58.56	0.97	\$ 56.82
1.000	D3 04 3550 1510	Replace pipe insulation foam rubber 1/2"	\$ 23.59	1.15	\$ 27.96	0.97	\$ 27.13
1.000	D3 04 3550 1520	Replace pipe insulation foam rubber 3/4"	\$ 24.17	1.15	\$ 28.65	0.97	\$ 27.80
1.000	D3 04 3550 1530	Replace pipe insulation foam rubber 1"	\$ 24.97	1.15	\$ 29.59	0.97	\$ 28.72

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹													
15% GF													
CostWorks 2010 - EAST HALL													
Based on National Averages													
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN													
Escalation 6%													
De-Escalation to July 2009 1.03													
De-Escalation Factor to be Applied 0.97													
Green Factor 1.15 Assumed Value													
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor		
1.000	D3 04 3550 1540	Replace pipe insulation foam rubber 1-1/4"	5	1 Asbe	L.F.	0.28	\$ 20.40	\$ 24.85	1.095	\$ 27.21	0.97		
1.000	D3 04 3550 1550	Replace pipe insulation foam rubber 1-1/2"	5	1 Asbe	L.F.	0.28	\$ 21.00	\$ 25.50	1.095	\$ 27.92	0.97		
1.000	D3 04 3550 1560	Replace pipe insulation foam rubber 2"	5	1 Asbe	L.F.	0.28	\$ 22.00	\$ 26.70	1.095	\$ 29.24	0.97		
1.000	D3 04 3550 1570	Replace pipe insulation foam rubber 3"	5	1 Asbe	L.F.	0.28	\$ 25.15	\$ 30.40	1.095	\$ 33.29	0.97		
1.000	D3 04 3550 1580	Replace pipe insulation foam rubber 4"	5	1 Asbe	L.F.	0.30	\$ 28.40	\$ 34.30	1.095	\$ 37.56	0.97		
1.000	D3 04 3550 1590	Replace pipe insulation foam rubber 6"	5	1 Asbe	L.F.	0.30	\$ 33.40	\$ 39.80	1.095	\$ 43.58	0.97		
1.000	D3 05 3150 0010	Maintenance and repair wall mounted/recessed heater, with fan	5	1 Elec	Ea.	0.98	\$ 136.05	\$ 161.85	1.095	\$ 177.23	0.97		
							\$ 78,232.04	\$ 95,365.40					
1.000	D3 04 3330 0010	Replace steam regulator valve 1-1/2" diameter	6	1 Stpi	Ea.	1.20	\$ 2,200.50	\$ 2,507.00	1.095	\$ 2,745.17	0.97		
1.000	D3 04 3330 0110	Replace steam regulator valve 2" diameter	6	1 Stpi	Ea.	1.42	\$ 2,680.50	\$ 3,063.00	1.095	\$ 3,353.99	0.97		
1.000	D3 04 3330 0210	Replace steam regulator valve 2-1/2" diameter	6	Q5	Ea.	2.60	\$ 3,400.00	\$ 3,887.50	1.095	\$ 4,256.81	0.97		
1.000	D3 04 3330 0310	Replace steam regulator valve 3" diameter	6	Q5	Ea.	2.84	\$ 4,229.50	\$ 4,818.50	1.095	\$ 5,276.26	0.97		
							\$ 12,510.50	\$ 14,276.00					
1.000	D3 02 3180 1010	Repair boiler, gas, 250 MBH	7	1 Stpi	Ea.	9.87	\$ 1,724.80	\$ 2,035.70	1.095	\$ 2,229.09	0.97		
1.000	D3 02 3180 2010	Repair boiler, gas, 2000 MBH	7	Q5	Ea.	19.53	\$ 4,553.55	\$ 5,294.20	1.095	\$ 5,797.15	0.97		
1.000	D3 02 3180 3010	Repair boiler, gas, 10,000 MBH	7	Q5	Ea.	38.04	\$ 14,628.05	\$ 16,867.20	1.095	\$ 18,469.58	0.97		
1.000	D3 02 3184 1010	Repair boiler, oil, 250 MBH	7	Q5	Ea.	10.49	\$ 1,325.20	\$ 1,585.70	1.095	\$ 1,736.34	0.97		
1.000	D3 02 3184 2010	Repair boiler, oil, 2000 MBH	7	1 Stpi	Ea.	10.78	\$ 1,337.45	\$ 1,597.70	1.095	\$ 1,749.48	0.97		
1.000	D3 02 3184 3010	Repair boiler, oil, 10,000 MBH	7	1 Stpi	Ea.	11.16	\$ 1,494.10	\$ 1,778.20	1.095	\$ 1,947.13	0.97		
1.000	D3 02 3186 1010	Repair boiler, gas/oil, 2000 MBH	7	Q5	Ea.	22.94	\$ 4,958.60	\$ 5,780.20	1.095	\$ 6,329.32	0.97		
1.000	D3 02 3186 2010	Repair boiler, gas/oil, 20,000 MBH	7	Q5	Ea.	43.27	\$ 15,233.40	\$ 17,587.60	1.095	\$ 19,258.42	0.97		
1.000	D3 04 3350 1030	Replace steam trap, 15 PSIG, 3/4" threaded	7	1 Stpi	Ea.	0.98	\$ 178.00	\$ 210.00	1.095	\$ 229.95	0.97		
1.000	D3 04 3350 1040	Replace steam trap, 15 PSIG, 1" threaded	7	1 Stpi	Ea.	1.04	\$ 206.50	\$ 243.00	1.095	\$ 266.09	0.97		
1.000	D3 04 3350 1050	Replace steam trap, 15 PSIG, 1-1/4" threaded	7	1 Stpi	Ea.	1.20	\$ 246.50	\$ 289.00	1.095	\$ 316.46	0.97		
1.000	D3 04 3350 1060	Replace steam trap, 15 PSIG, 1-1/2" threaded	7	1 Stpi	Ea.	1.73	\$ 357.00	\$ 416.50	1.095	\$ 456.07	0.97		
1.000	D3 04 3350 1070	Replace steam trap, 15 PSIG, 2" threaded	7	1 Stpi	Ea.	2.60	\$ 615.50	\$ 719.50	1.095	\$ 787.85	0.97		
							\$ 46,858.65	\$ 54,404.50					

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹								
15% GF								
CostWorks 2010 - EAST HALL								
Based on National Averages								
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN								
Escalation								
	6%							
De-Escalation to July 2009								
	1.03							
De-Escalation Factor to be Applied								
	0.97							
Green Factor								
	1.15	Assumed Value						
GREEN								
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments	
1.000	D3 04 3550 1540	Replace pipe insulation foam rubber 1-1/4"	\$ 26.41	1.15	\$ 31.29	0.97	\$ 30.37	
1.000	D3 04 3550 1550	Replace pipe insulation foam rubber 1-1/2"	\$ 27.10	1.15	\$ 32.11	0.97	\$ 31.16	
1.000	D3 04 3550 1560	Replace pipe insulation foam rubber 2"	\$ 28.37	1.15	\$ 33.62	0.97	\$ 32.63	
1.000	D3 04 3550 1570	Replace pipe insulation foam rubber 3"	\$ 32.30	1.15	\$ 38.28	0.97	\$ 37.15	
1.000	D3 04 3550 1580	Replace pipe insulation foam rubber 4"	\$ 36.45	1.15	\$ 43.19	0.97	\$ 41.92	
1.000	D3 04 3550 1590	Replace pipe insulation foam rubber 6"	\$ 42.29	1.15	\$ 50.12	0.97	\$ 48.64	
1.000	D3 05 3150 0010	Maintenance and repair wall mounted/recessed heater, with fan	\$ 171.99	1.15	\$ 203.81	0.97	\$ 197.78	
			\$ 101,337.99				\$ 116,538.69	
			\$ 50,669.00	Assume 50% required		Assume 50% required	\$ 58,269.35	
				PER 5 YEARS		PER 5 YEARS		
1.000	D3 04 3330 0010	Replace steam regulator valve 1-1/2" diameter	\$ 2,664.01	1.15	\$ 3,156.94	0.97	\$ 3,063.61	
1.000	D3 04 3330 0110	Replace steam regulator valve 2" diameter	\$ 3,254.83	1.15	\$ 3,857.08	0.97	\$ 3,743.06	
1.000	D3 04 3330 0210	Replace steam regulator valve 2-1/2" diameter	\$ 4,130.97	1.15	\$ 4,895.33	0.97	\$ 4,750.61	
1.000	D3 04 3330 0310	Replace steam regulator valve 3" diameter	\$ 5,120.28	1.15	\$ 6,067.70	0.97	\$ 5,888.32	
			\$ 15,170.08				\$ 17,445.60	
			\$ 7,585.04	Assume 50% required		Assume 50% required	\$ 8,722.80	
				PER 6 YEARS		PER 6 YEARS		
1.000	D3 02 3180 1010	Repair boiler, gas, 250 MBH	\$ 2,163.19	1.15	\$ 2,563.46	0.97	\$ 2,487.67	
1.000	D3 02 3180 2010	Repair boiler, gas, 2000 MBH	\$ 5,625.77	1.15	\$ 6,666.72	0.97	\$ 6,469.63	
1.000	D3 02 3180 3010	Repair boiler, gas, 10,000 MBH	\$ 17,923.57	1.15	\$ 21,240.02	0.97	\$ 20,612.10	
1.000	D3 02 3184 1010	Repair boiler, oil, 250 MBH	\$ 1,685.01	1.15	\$ 1,996.79	0.97	\$ 1,937.76	
1.000	D3 02 3184 2010	Repair boiler, oil, 2000 MBH	\$ 1,697.76	1.15	\$ 2,011.90	0.97	\$ 1,952.43	
1.000	D3 02 3184 3010	Repair boiler, oil, 10,000 MBH	\$ 1,889.57	1.15	\$ 2,239.20	0.97	\$ 2,173.00	
1.000	D3 02 3186 1010	Repair boiler, gas/oil, 2000 MBH	\$ 6,142.21	1.15	\$ 7,278.72	0.97	\$ 7,063.54	
1.000	D3 02 3186 2010	Repair boiler, gas/oil, 20,000 MBH	\$ 18,689.08	1.15	\$ 22,147.19	0.97	\$ 21,492.45	
1.000	D3 04 3350 1030	Replace steam trap, 15 PSIG, 3/4" threaded	\$ 223.15	1.15	\$ 264.44	0.97	\$ 256.62	
1.000	D3 04 3350 1040	Replace steam trap, 15 PSIG, 1" threaded	\$ 258.22	1.15	\$ 306.00	0.97	\$ 296.95	
1.000	D3 04 3350 1050	Replace steam trap, 15 PSIG, 1-1/4" threaded	\$ 307.10	1.15	\$ 363.92	0.97	\$ 353.16	
1.000	D3 04 3350 1060	Replace steam trap, 15 PSIG, 1-1/2" threaded	\$ 442.58	1.15	\$ 524.48	0.97	\$ 508.97	
1.000	D3 04 3350 1070	Replace steam trap, 15 PSIG, 2" threaded	\$ 764.56	1.15	\$ 906.03	0.97	\$ 879.25	
			\$ 57,811.77				\$ 66,483.54	
			\$ 28,905.89	Assume 50% required		Assume 50% required	\$ 33,241.77	
				PER 7 YEARS		PER 7 YEARS		

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
15% GF												
CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation												
	6%											
De-Escalation to July 2009												
	1.03											NON-GREEN
De-Escalation Factor to be Applied												
	0.97											
Green Factor												
	1.15	Assumed Value										
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 04 3520 3020	Replace drain valve stem assembly, 3/4" valves	8	1 Stpi	Ea.	0.55	\$ 45.74	\$ 56.37	1.095	\$ 61.73	0.97	
1.000	D3 05 3265 1010	Repair air conditioner, window, 1 ton	8	1 Stpi	Ea.	1.07	\$ 75.75	\$ 93.65	1.095	\$ 102.55	0.97	
1.000	D3 05 3266 2010	Repair air conditioner, window, 2 ton	8	1 Stpi	Ea.	1.13	\$ 87.00	\$ 107.00	1.095	\$ 117.17	0.97	
							\$ 208.49	\$ 257.02				
1.000	D3 01 3170 0010	Remake flare type joint fuel oil storage: pipe & fittings, copper	10	1 Stpi	M.L.F.	0.29	\$ 18.35	\$ 23.00	1.095	\$ 25.19	0.97	
1.000	D3 02 3198 1010	Repair boiler blowoff system	10	1 Stpi	Ea.	1.00	\$ 64.50	\$ 80.50	1.095	\$ 88.15	0.97	
1.000	D3 02 3296 1010	Repair deaerator	10	1 Stpi	Ea.	1.00	\$ 64.50	\$ 80.50	1.095	\$ 88.15	0.97	
1.000	D3 02 3388 1010	Repair spreader, pneumatic coal	10	2 Stpi	Ea.	22.33	\$ 4,949.50	\$ 5,776.00	1.095	\$ 6,324.72	0.97	
1.000	D3 02 3390 1010	Repair fuel oil equipment, pump	10	1 Stpi	Ea.	5.42	\$ 392.05	\$ 485.50	1.095	\$ 531.62	0.97	
1.000	D3 03 3115 1010	Repair cooling tower, 50 ton	10	2 Stpi	Ea.	8.17	\$ 960.00	\$ 1,148.00	1.095	\$ 1,257.06	0.97	
1.000	D3 03 3115 2010	Repair cooling tower, 100 ton	10	2 Stpi	Ea.	28.25	\$ 3,491.00	\$ 4,170.50	1.095	\$ 4,566.70	0.97	
1.000	D3 03 3115 3010	Repair cooling tower, 300 ton	10	2 Stpi	Ea.	43.58	\$ 5,947.50	\$ 7,097.50	1.095	\$ 7,771.76	0.97	
1.000	D3 03 3115 4010	Repair cooling tower, 1000 ton	10	2 Stpi	Ea.	76.41	\$ 13,669.50	\$ 16,111.50	1.095	\$ 17,642.09	0.97	
1.000	D3 03 3130 1010	Repair water cooled chiller, 20 ton, reciprocating	10	Q6	Ea.	79.24	\$ 21,967.50	\$ 25,490.50	1.095	\$ 27,912.10	0.97	
1.000	D3 03 3130 2010	Repair water cooled chiller, 50 ton, reciprocating	10	Q6	Ea.	190.33	\$ 53,667.50	\$ 62,505.50	1.095	\$ 68,443.52	0.97	
1.000	D3 03 3130 3010	Repair water cooled chiller, 100 ton, reciprocating	10	Q6	Ea.	484.44	\$ 69,624.50	\$ 82,555.50	1.095	\$ 90,398.27	0.97	
1.000	D3 03 3130 5010	Repair water cooled chiller, 200 ton, reciprocating	10	Q7	Ea.	489.03	\$ 71,339.50	\$ 84,655.50	1.095	\$ 92,697.77	0.97	
1.000	D3 03 3135 1010	Repair recip. chiller, air cooled, 20 ton	10	2 Stpi	Ea.	95.12	\$ 23,680.50	\$ 27,565.50	1.095	\$ 30,184.22	0.97	
1.000	D3 03 3135 2010	Repair recip. chiller, air cooled, 50 ton	10	Q6	Ea.	215.43	\$ 56,231.50	\$ 65,533.50	1.095	\$ 71,759.18	0.97	
1.000	D3 03 3135 3010	Repair chiller, air cooled, 100 ton chiller	10	Q6	Ea.	425.64	\$ 55,498.50	\$ 66,039.50	1.095	\$ 72,313.25	0.97	
1.000	D3 03 3137 4010	Repair water cooled chiller, 5 ton, reciprocating	10	1 Stpi	Ea.	11.80	\$ 1,379.00	\$ 1,654.50	1.095	\$ 1,811.68	0.97	
1.000	D3 03 3137 5010	Repair water cooled chiller, 10 ton, reciprocating	10	2 Stpi	Ea.	26.79	\$ 3,025.50	\$ 3,633.50	1.095	\$ 3,978.68	0.97	
1.000	D3 03 3137 6010	Repair water cooled chiller, 15 ton, reciprocating	10	Q5	Ea.	53.80	\$ 5,714.50	\$ 6,850.50	1.095	\$ 7,501.30	0.97	
1.000	D3 03 3140 1010	Repair hermetic centrifugal chiller, 100 ton	10	Q7	Ea.	242.03	\$ 41,653.00	\$ 48,961.00	1.095	\$ 53,612.30	0.97	
1.000	D3 03 3140 2010	Repair hermetic centrifugal chiller, 300 ton	10	Q7	Ea.	560.26	\$ 96,365.00	\$ 113,192.50	1.095	\$ 123,945.79	0.97	
1.000	D3 03 3140 3010	Repair hermetic centrifugal chiller, 1000 ton	10	Q7	Ea.	1,767.34	\$ 303,562.50	\$ 356,854.50	1.095	\$ 390,755.68	0.97	
1.000	D3 03 3142 1010	Repair open centrifugal chiller, 300 ton	10	Q7	Ea.	578.94	\$ 97,404.50	\$ 114,460.50	1.095	\$ 125,334.25	0.97	
1.000	D3 03 3142 2010	Repair open centrifugal chiller, 1000 ton	10	Q7	Ea.	1,808.56	\$ 307,714.50	\$ 361,880.50	1.095	\$ 396,259.15	0.97	
1.000	D3 03 3145 1010	Repair chiller, absorption, 100 ton	10	2 Stpi	Ea.	35.51	\$ 15,938.50	\$ 18,353.50	1.095	\$ 20,097.08	0.97	
1.000	D3 03 3145 2010	Repair chiller, absorption, 350 ton	10	2 Stpi	Ea.	39.71	\$ 16,837.50	\$ 19,424.50	1.095	\$ 21,269.83	0.97	
1.000	D3 03 3145 3010	Repair chiller, absorption, 950 ton	10	4 Stpi	Ea.	54.20	\$ 20,777.50	\$ 23,959.50	1.095	\$ 26,235.65	0.97	
1.000	D3 03 3210 1010	Repair condenser, air cooled, 5 ton	10	1 Stpi	Ea.	4.61	\$ 598.00	\$ 715.00	1.095	\$ 782.93	0.97	
1.000	D3 03 3210 2010	Repair condenser, air cooled, 20 ton	10	2 Stpi	Ea.	7.93	\$ 1,213.50	\$ 1,441.50	1.095	\$ 1,578.44	0.97	
1.000	D3 03 3210 3010	Repair condenser, air cooled, 50 ton	10	2 Stpi	Ea.	11.40	\$ 1,838.50	\$ 2,159.50	1.095	\$ 2,364.65	0.97	
1.000	D3 03 3210 4010	Repair condenser, air cooled, 100 ton	10	2 Stpi	Ea.	21.80	\$ 3,609.50	\$ 4,240.50	1.095	\$ 4,643.35	0.97	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
15% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation							
	6%						
De-Escalation to July 2009							
	1.03						
De-Escalation Factor to be Applied							
	0.97						
Green Factor							
	1.15	Assumed Value					
GREEN							
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 04 3520 3020	Replace drain valve stem assembly, 3/4" valves	\$ 59.90	1.15	\$ 70.98	0.97	\$ 68.89
1.000	D3 05 3265 1010	Repair air conditioner, window, 1 ton	\$ 99.52	1.15	\$ 117.93	0.97	\$ 114.44
1.000	D3 05 3266 2010	Repair air conditioner, window, 2 ton	\$ 113.70	1.15	\$ 134.74	0.97	\$ 130.76
			\$ 273.12				\$ 314.08
			\$ 136.56	Assume 50% required		Assume 50% required	\$ 157.04
				PER 8 YEARS		PER 8 YEARS	
1.000	D3 01 3170 0010	Remake flare type joint fuel oil storage: pipe & fittings, copper	\$ 24.44	1.15	\$ 28.96	0.97	\$ 28.11
1.000	D3 02 3198 1010	Repair boiler blowoff system	\$ 85.54	1.15	\$ 101.37	0.97	\$ 98.37
1.000	D3 02 3296 1010	Repair deaerator	\$ 85.54	1.15	\$ 101.37	0.97	\$ 98.37
1.000	D3 02 3388 1010	Repair spreader, pneumatic coal	\$ 6,137.74	1.15	\$ 7,273.43	0.97	\$ 7,058.40
1.000	D3 02 3390 1010	Repair fuel oil equipment, pump	\$ 515.91	1.15	\$ 611.37	0.97	\$ 593.29
1.000	D3 03 3115 1010	Repair cooling tower, 50 ton	\$ 1,219.90	1.15	\$ 1,445.62	0.97	\$ 1,402.88
1.000	D3 03 3115 2010	Repair cooling tower, 100 ton	\$ 4,431.69	1.15	\$ 5,251.70	0.97	\$ 5,096.45
1.000	D3 03 3115 3010	Repair cooling tower, 300 ton	\$ 7,542.01	1.15	\$ 8,937.53	0.97	\$ 8,673.31
1.000	D3 03 3115 4010	Repair cooling tower, 1000 ton	\$ 17,120.54	1.15	\$ 20,288.41	0.97	\$ 19,688.62
1.000	D3 03 3130 1010	Repair water cooled chiller, 20 ton, reciprocating	\$ 27,086.93	1.15	\$ 32,098.91	0.97	\$ 31,149.97
1.000	D3 03 3130 2010	Repair water cooled chiller, 50 ton, reciprocating	\$ 66,420.13	1.15	\$ 78,710.05	0.97	\$ 76,383.14
1.000	D3 03 3130 3010	Repair water cooled chiller, 100 ton, reciprocating	\$ 87,725.83	1.15	\$ 103,958.01	0.97	\$ 100,884.70
1.000	D3 03 3130 5010	Repair water cooled chiller, 200 ton, reciprocating	\$ 89,957.35	1.15	\$ 106,602.44	0.97	\$ 103,450.95
1.000	D3 03 3135 1010	Repair recip. chiller, air cooled, 20 ton	\$ 29,291.89	1.15	\$ 34,711.86	0.97	\$ 33,685.67
1.000	D3 03 3135 2010	Repair recip. chiller, air cooled, 50 ton	\$ 69,637.76	1.15	\$ 82,523.06	0.97	\$ 80,083.43
1.000	D3 03 3135 3010	Repair chiller, air cooled, 100 ton chiller	\$ 70,175.45	1.15	\$ 83,160.24	0.97	\$ 80,701.77
1.000	D3 03 3137 4010	Repair water cooled chiller, 5 ton, reciprocating	\$ 1,758.12	1.15	\$ 2,083.43	0.97	\$ 2,021.84
1.000	D3 03 3137 5010	Repair water cooled chiller, 10 ton, reciprocating	\$ 3,861.06	1.15	\$ 4,575.48	0.97	\$ 4,440.22
1.000	D3 03 3137 6010	Repair water cooled chiller, 15 ton, reciprocating	\$ 7,279.54	1.15	\$ 8,626.49	0.97	\$ 8,371.47
1.000	D3 03 3140 1010	Repair hermetic centrifugal chiller, 100 ton	\$ 52,027.35	1.15	\$ 61,654.14	0.97	\$ 59,831.46
1.000	D3 03 3140 2010	Repair hermetic centrifugal chiller, 300 ton	\$ 120,281.58	1.15	\$ 142,537.66	0.97	\$ 138,323.81
1.000	D3 03 3140 3010	Repair hermetic centrifugal chiller, 1000 ton	\$ 379,203.76	1.15	\$ 449,369.03	0.97	\$ 436,084.33
1.000	D3 03 3142 1010	Repair open centrifugal chiller, 300 ton	\$ 121,628.99	1.15	\$ 144,134.38	0.97	\$ 139,873.34
1.000	D3 03 3142 2010	Repair open centrifugal chiller, 1000 ton	\$ 384,544.53	1.15	\$ 455,698.02	0.97	\$ 442,226.21
1.000	D3 03 3145 1010	Repair chiller, absorption, 100 ton	\$ 19,502.95	1.15	\$ 23,111.64	0.97	\$ 22,428.39
1.000	D3 03 3145 2010	Repair chiller, absorption, 350 ton	\$ 20,641.03	1.15	\$ 24,460.30	0.97	\$ 23,737.18
1.000	D3 03 3145 3010	Repair chiller, absorption, 950 ton	\$ 25,460.05	1.15	\$ 30,171.00	0.97	\$ 29,279.05
1.000	D3 03 3210 1010	Repair condenser, air cooled, 5 ton	\$ 759.78	1.15	\$ 900.36	0.97	\$ 873.75
1.000	D3 03 3210 2010	Repair condenser, air cooled, 20 ton	\$ 1,531.78	1.15	\$ 1,815.21	0.97	\$ 1,761.55
1.000	D3 03 3210 3010	Repair condenser, air cooled, 50 ton	\$ 2,294.75	1.15	\$ 2,719.35	0.97	\$ 2,638.96
1.000	D3 03 3210 4010	Repair condenser, air cooled, 100 ton	\$ 4,506.08	1.15	\$ 5,339.85	0.97	\$ 5,181.99

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹													
15% GF													
CostWorks 2010 - EAST HALL													
Based on National Averages													
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN													
Escalation	6%												
De-Escalation to July 2009	1.03												NON-GREEN
De-Escalation Factor to be Applied	0.97												
Green Factor	1.15	Assumed Value											
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor		
1.000	D3 03 3260 1010	Repair evaporative condenser, 20 ton	10	2 Stpi	Ea.	75.77	\$ 8,799.50	\$ 10,542.50	1.095	\$ 11,544.04	0.97		
1.000	D3 03 3260 2010	Repair evaporative condenser, 100 ton	10	2 Stpi	Ea.	109.64	\$ 12,635.50	\$ 15,101.50	1.095	\$ 16,536.14	0.97		
1.000	D3 03 3260 3010	Repair evaporative condenser, 300 ton	10	2 Stpi	Ea.	116.45	\$ 15,611.50	\$ 18,507.50	1.095	\$ 20,265.71	0.97		
1.000	D3 04 3120 1010	Repair fan coil unit, 1 ton	10	1 Stpi	Ea.	3.15	\$ 387.00	\$ 461.50	1.095	\$ 505.34	0.97		
1.000	D3 04 3120 2010	Repair fan coil unit, 3 ton	10	1 Stpi	Ea.	3.15	\$ 497.00	\$ 586.50	1.095	\$ 642.22	0.97		
1.000	D3 04 3120 3010	Repair fan coil unit, 5 ton	10	1 Stpi	Ea.	3.51	\$ 527.00	\$ 626.50	1.095	\$ 686.02	0.97		
1.000	D3 04 3120 4010	Repair fan coil unit, 10 ton	10	1 Stpi	Ea.	3.71	\$ 605.00	\$ 713.00	1.095	\$ 780.74	0.97		
1.000	D3 04 3120 5010	Repair fan coil unit, 20 ton	10	1 Stpi	Ea.	3.91	\$ 713.00	\$ 839.00	1.095	\$ 918.71	0.97		
1.000	D3 04 3120 6010	Repair fan coil unit, 30 ton	10	1 Stpi	Ea.	4.40	\$ 996.00	\$ 1,170.00	1.095	\$ 1,281.15	0.97		
1.000	D3 04 3122 1010	Repair fan coil, DX 1-1/2 ton, cooling only	10	1 Stpi	Ea.	13.52	\$ 1,397.30	\$ 1,692.50	1.095	\$ 1,853.29	0.97		
1.000	D3 04 3122 2010	Repair fan coil, DX 2 ton, cooling only	10	1 Stpi	Ea.	13.93	\$ 1,439.80	\$ 1,739.00	1.095	\$ 1,904.21	0.97		
1.000	D3 04 3122 3010	Repair fan coil, DX 2-1/2 ton, cooling only	10	1 Stpi	Ea.	14.40	\$ 1,637.30	\$ 1,965.00	1.095	\$ 2,151.68	0.97		
1.000	D3 04 3122 4010	Repair fan coil, DX 3 ton, cooling only	10	1 Stpi	Ea.	13.91	\$ 1,587.30	\$ 1,900.00	1.095	\$ 2,080.50	0.97		
1.000	D3 04 3122 5050	Repair fan coil, DX 5 ton, cooling only	10	1 Stpi	Ea.	15.02	\$ 1,852.30	\$ 2,215.00	1.095	\$ 2,425.43	0.97		
1.000	D3 04 3122 7070	Repair fan coil, DX 10 ton, cooling only	10	Q6	Ea.	51.44	\$ 13,478.30	\$ 15,704.00	1.095	\$ 17,195.88	0.97		
1.000	D3 04 3122 9090	Repair fan coil, DX 20 ton, cooling only	10	Q6	Ea.	74.75	\$ 20,248.30	\$ 23,539.00	1.095	\$ 25,775.21	0.97		
1.000	D3 04 3124 5010	Replace fan coil, DX 5 ton, with heat	10	Q5	Ea.	14.64	\$ 2,873.00	\$ 3,379.00	1.095	\$ 3,700.01	0.97		
1.000	D3 04 3124 6010	Replace fan coil, DX 10 ton, with heat	10	Q6	Ea.	25.33	\$ 5,800.00	\$ 6,750.00	1.095	\$ 7,391.25	0.97		
1.000	D3 04 3124 7010	Replace fan coil, DX 20 ton, with heat	10	Q6	Ea.	94.22	\$ 14,000.00	\$ 16,450.00	1.095	\$ 18,012.75	0.97		
1.000	D3 04 3128 1010	Repair unit ventilator, 750 CFM, 2 ton	10	1 Stpi	Ea.	3.96	\$ 434.35	\$ 520.60	1.095	\$ 570.06	0.97		
1.000	D3 04 3128 2010	Repair unit ventilator, 1250 CFM, 3 ton	10	1 Stpi	Ea.	3.96	\$ 544.35	\$ 645.60	1.095	\$ 706.93	0.97		
1.000	D3 04 3128 2040	Repair unit ventilator, 2000 CFM, 5 ton	10	1 Stpi	Ea.	4.42	\$ 580.80	\$ 693.50	1.095	\$ 759.38	0.97		
1.000	D3 04 3210 1010	Repair fan, induced draft, 2000 CFM	10	1 Stpi	Ea.	3.00	\$ 242.50	\$ 297.50	1.095	\$ 325.76	0.97		
1.000	D3 04 3210 2010	Repair fan, induced draft, 6700 CFM	10	1 Stpi	Ea.	3.00	\$ 242.50	\$ 297.50	1.095	\$ 325.76	0.97		
1.000	D3 04 3210 3010	Repair fan, induced draft, 17,700 CFM	10	1 Stpi	Ea.	3.22	\$ 262.50	\$ 322.50	1.095	\$ 353.14	0.97		
1.000	D3 04 3220 3010	Replace utility set, belt drive, 800 CFM exhaust fan	10	Q20	Ea.	6.50	\$ 1,222.00	\$ 1,427.00	1.095	\$ 1,562.57	0.97		
1.000	D3 04 3220 3020	Replace utility set, belt drive, 3600 CFM exhaust fan	10	Q20	Ea.	9.75	\$ 2,308.00	\$ 2,679.00	1.095	\$ 2,933.51	0.97		
1.000	D3 04 3220 3030	Replace utility set, belt drive, 11,000 CFM exhaust fan	10	Q20	Ea.	19.50	\$ 5,740.00	\$ 6,655.00	1.095	\$ 7,287.23	0.97		
1.000	D3 04 3220 3040	Replace utility set, belt drive, 3600 CFM exhaust fan	10	Q20	Ea.	48.77	\$ 8,990.00	\$ 10,550.00	1.095	\$ 11,552.25	0.97		
1.000	D3 04 3220 4010	Replace axial flow fan, 3800 CFM exhaust fan	10	Q20	Ea.	11.47	\$ 5,590.00	\$ 6,444.00	1.095	\$ 7,056.18	0.97		
1.000	D3 04 3220 4020	Replace axial flow fan, 6400 CFM exhaust fan	10	Q20	Ea.	13.93	\$ 6,312.00	\$ 7,250.00	1.095	\$ 7,938.75	0.97		
1.000	D3 04 3220 4030	Replace axial flow fan, 15,600 CFM exhaust fan	10	Q20	Ea.	24.37	\$ 10,035.00	\$ 11,570.00	1.095	\$ 12,669.15	0.97		
1.000	D3 04 3220 4040	Replace axial flow fan, 28,000 CFM exhaust fan	10	Q20	Ea.	97.46	\$ 20,325.00	\$ 23,800.00	1.095	\$ 26,061.00	0.97		
1.000	D3 04 3520 1010	Repack gate valve gland, 3/8" - 1 - 1/2" valves	10	1 Stpi	Ea.	0.22	\$ 23.00	\$ 27.50	1.095	\$ 30.11	0.97		
1.000	D3 04 3520 2010	Repack gate valve gland, 2" - 3" valves	10	1 Stpi	Ea.	0.29	\$ 30.50	\$ 36.50	1.095	\$ 39.97	0.97		
1.000	D3 05 3110 1010	Repair unit heater, 12 MBH, 2 PSI steam	10	1 Stpi	Ea.	3.13	\$ 385.35	\$ 459.60	1.095	\$ 503.26	0.97		
1.000	D3 05 3110 2010	Repair unit heater, 36 MBH, 2 PSI steam	10	1 Stpi	Ea.	3.13	\$ 485.35	\$ 574.60	1.095	\$ 629.19	0.97		
1.000	D3 05 3110 3010	Repair unit heater, 85 MBH, 2 PSI steam	10	1 Stpi	Ea.	3.13	\$ 495.35	\$ 584.60	1.095	\$ 640.14	0.97		
1.000	D3 05 3110 4010	Repair unit heater, 250 MBH, 2 PSI steam	10	1 Stpi	Ea.	3.67	\$ 532.35	\$ 633.10	1.095	\$ 693.24	0.97		

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
15% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	GREEN	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 03 3260 1010	Repair evaporative condenser, 20 ton	\$ 11,202.76	1.15	\$ 13,275.64	0.97	\$ 12,883.18
1.000	D3 03 3260 2010	Repair evaporative condenser, 100 ton	\$ 16,047.28	1.15	\$ 19,016.56	0.97	\$ 18,454.38
1.000	D3 03 3260 3010	Repair evaporative condenser, 300 ton	\$ 19,666.60	1.15	\$ 23,305.57	0.97	\$ 22,616.59
1.000	D3 04 3120 1010	Repair fan coil unit, 1 ton	\$ 490.40	1.15	\$ 581.14	0.97	\$ 563.96
1.000	D3 04 3120 2010	Repair fan coil unit, 3 ton	\$ 623.23	1.15	\$ 738.55	0.97	\$ 716.72
1.000	D3 04 3120 3010	Repair fan coil unit, 5 ton	\$ 665.74	1.15	\$ 788.92	0.97	\$ 765.60
1.000	D3 04 3120 4010	Repair fan coil unit, 10 ton	\$ 757.65	1.15	\$ 897.85	0.97	\$ 871.30
1.000	D3 04 3120 5010	Repair fan coil unit, 20 ton	\$ 891.55	1.15	\$ 1,056.51	0.97	\$ 1,025.28
1.000	D3 04 3120 6010	Repair fan coil unit, 30 ton	\$ 1,243.28	1.15	\$ 1,473.32	0.97	\$ 1,429.77
1.000	D3 04 3122 1010	Repair fan coil, DX 1-1/2 ton, cooling only	\$ 1,798.50	1.15	\$ 2,131.28	0.97	\$ 2,068.27
1.000	D3 04 3122 2010	Repair fan coil, DX 2 ton, cooling only	\$ 1,847.91	1.15	\$ 2,189.84	0.97	\$ 2,125.10
1.000	D3 04 3122 3010	Repair fan coil, DX 2-1/2 ton, cooling only	\$ 2,088.07	1.15	\$ 2,474.43	0.97	\$ 2,401.27
1.000	D3 04 3122 4010	Repair fan coil, DX 3 ton, cooling only	\$ 2,018.99	1.15	\$ 2,392.58	0.97	\$ 2,321.84
1.000	D3 04 3122 5050	Repair fan coil, DX 5 ton, cooling only	\$ 2,353.72	1.15	\$ 2,789.24	0.97	\$ 2,706.78
1.000	D3 04 3122 7070	Repair fan coil, DX 10 ton, cooling only	\$ 16,687.52	1.15	\$ 19,775.26	0.97	\$ 19,190.65
1.000	D3 04 3122 9090	Repair fan coil, DX 20 ton, cooling only	\$ 25,013.21	1.15	\$ 29,641.49	0.97	\$ 28,765.19
1.000	D3 04 3124 5010	Replace fan coil, DX 5 ton, with heat	\$ 3,590.62	1.15	\$ 4,255.01	0.97	\$ 4,129.21
1.000	D3 04 3124 6010	Replace fan coil, DX 10 ton, with heat	\$ 7,172.74	1.15	\$ 8,499.94	0.97	\$ 8,248.65
1.000	D3 04 3124 7010	Replace fan coil, DX 20 ton, with heat	\$ 17,480.24	1.15	\$ 20,714.66	0.97	\$ 20,102.27
1.000	D3 04 3128 1010	Repair unit ventilator, 750 CFM, 2 ton	\$ 553.20	1.15	\$ 655.57	0.97	\$ 636.19
1.000	D3 04 3128 2010	Repair unit ventilator, 1250 CFM, 3 ton	\$ 686.03	1.15	\$ 812.97	0.97	\$ 788.94
1.000	D3 04 3128 2040	Repair unit ventilator, 2000 CFM, 5 ton	\$ 736.93	1.15	\$ 873.29	0.97	\$ 847.47
1.000	D3 04 3210 1010	Repair fan, induced draft, 2000 CFM	\$ 316.13	1.15	\$ 374.63	0.97	\$ 363.55
1.000	D3 04 3210 2010	Repair fan, induced draft, 6700 CFM	\$ 316.13	1.15	\$ 374.63	0.97	\$ 363.55
1.000	D3 04 3210 3010	Repair fan, induced draft, 17,700 CFM	\$ 342.70	1.15	\$ 406.11	0.97	\$ 394.10
1.000	D3 04 3220 3010	Replace utility set, belt drive, 800 CFM exhaust fan	\$ 1,516.37	1.15	\$ 1,796.95	0.97	\$ 1,743.83
1.000	D3 04 3220 3020	Replace utility set, belt drive, 3600 CFM exhaust fan	\$ 2,846.78	1.15	\$ 3,373.53	0.97	\$ 3,273.80
1.000	D3 04 3220 3030	Replace utility set, belt drive, 11,000 CFM exhaust fan	\$ 7,071.79	1.15	\$ 8,380.31	0.97	\$ 8,132.56
1.000	D3 04 3220 3040	Replace utility set, belt drive, 3600 CFM exhaust fan	\$ 11,210.73	1.15	\$ 13,285.09	0.97	\$ 12,892.34
1.000	D3 04 3220 4010	Replace axial flow fan, 3800 CFM exhaust fan	\$ 6,847.58	1.15	\$ 8,114.61	0.97	\$ 7,874.71
1.000	D3 04 3220 4020	Replace axial flow fan, 6400 CFM exhaust fan	\$ 7,704.06	1.15	\$ 9,129.56	0.97	\$ 8,859.67
1.000	D3 04 3220 4030	Replace axial flow fan, 15,600 CFM exhaust fan	\$ 12,294.61	1.15	\$ 14,569.52	0.97	\$ 14,138.80
1.000	D3 04 3220 4040	Replace axial flow fan, 28,000 CFM exhaust fan	\$ 25,290.56	1.15	\$ 29,970.15	0.97	\$ 29,084.14
1.000	D3 04 3520 1010	Repack gate valve gland, 3/8" - 1 - 1/2" valves	\$ 29.22	1.15	\$ 34.63	0.97	\$ 33.61
1.000	D3 04 3520 2010	Repack gate valve gland, 2" - 3" valves	\$ 38.79	1.15	\$ 45.96	0.97	\$ 44.60
1.000	D3 05 3110 1010	Repair unit heater, 12 MBH, 2 PSI steam	\$ 488.38	1.15	\$ 578.75	0.97	\$ 561.64
1.000	D3 05 3110 2010	Repair unit heater, 36 MBH, 2 PSI steam	\$ 610.59	1.15	\$ 723.57	0.97	\$ 702.17
1.000	D3 05 3110 3010	Repair unit heater, 85 MBH, 2 PSI steam	\$ 621.21	1.15	\$ 736.16	0.97	\$ 714.39
1.000	D3 05 3110 4010	Repair unit heater, 250 MBH, 2 PSI steam	\$ 672.75	1.15	\$ 797.23	0.97	\$ 773.66

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
15% GF												
CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation												
	6%											
De-Escalation to July 2009												
	1.03											NON-GREEN
De-Escalation Factor to be Applied												
	0.97											
Green Factor												
	1.15		Assumed Value									
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 05 3110 5010	Repair unit heater, 400 MBH, 2 PSI steam	10	1	Stpi	Ea.	3.67	\$ 582.35	\$ 688.10	1.095	\$ 753.47	0.97
1.000	D3 05 3170 1010	Repair terminal reheat, 12" x 24" coil	10	1	Stpi	Ea.	1.20	\$ 77.00	\$ 96.50	1.095	\$ 105.67	0.97
1.000	D3 05 3170 2010	Repair terminal reheat, 18" x 24" coil	10	1	Stpi	Ea.	1.40	\$ 90.00	\$ 113.00	1.095	\$ 123.74	0.97
1.000	D3 05 3170 3010	Repair terminal reheat, 36" x 36" coil	10	1	Stpi	Ea.	2.20	\$ 141.00	\$ 177.00	1.095	\$ 193.82	0.97
1.000	D3 05 3170 4010	Repair terminal reheat, 48" x 126" coil	10	1	Stpi	Ea.	4.00	\$ 257.00	\$ 320.00	1.095	\$ 350.40	0.97
1.000	D3 05 3245 1010	Repair heat pump, 1.5 ton, air to air split	10	1	Stpi	Ea.	15.66	\$ 1,662.00	\$ 2,008.50	1.095	\$ 2,199.31	0.97
1.000	D3 05 3245 2010	Repair heat pump, 5 ton, air to air split	10	1	Stpi	Ea.	17.68	\$ 2,172.50	\$ 2,597.00	1.095	\$ 2,843.72	0.97
1.000	D3 05 3245 3010	Repair heat pump, 10 ton, air to air split	10	Q5	Ea.	23.74	\$ 3,525.50	\$ 4,177.00	1.095	\$ 4,573.82	0.97	
1.000	D3 05 3245 4010	Repair heat pump, 25 ton, air to air split	10	Q5	Ea.	43.48	\$ 6,931.50	\$ 8,175.50	1.095	\$ 8,952.17	0.97	
1.000	D3 05 3245 5010	Repair heat pump, 50 ton, air to air split	10	Q6	Ea.	253.91	\$ 37,759.50	\$ 44,695.00	1.095	\$ 48,941.03	0.97	
1.000	D3 05 3245 6010	Repair heat pump, thru-wall unit, 1.5 ton	10	1	Stpi	Ea.	15.66	\$ 1,662.00	\$ 2,008.50	1.095	\$ 2,199.31	0.97
1.000	D3 05 3245 7010	Repair heat pump, thru-wall unit, 5 ton	10	1	Stpi	Ea.	17.68	\$ 2,172.50	\$ 2,597.00	1.095	\$ 2,843.72	0.97
1.000	D3 05 3265 1030	Replace air conditioner, window, 1 ton	10	L2	Ea.	3.30	\$ 853.00	\$ 988.00	1.095	\$ 1,081.86	0.97	
1.000	D3 05 3266 2030	Replace air conditioner, window, 2 ton	10	L2	Ea.	7.80	\$ 1,551.00	\$ 1,806.00	1.095	\$ 1,977.57	0.97	
1.000	D3 05 3272 1010	Repair air conditioner, DX, 5 ton	10	1	Stpi	Ea.	27.64	\$ 3,668.00	\$ 4,368.00	1.095	\$ 4,782.96	0.97
1.000	D3 05 3272 2010	Repair air conditioner, DX, 20 ton	10	Q6	Ea.	97.65	\$ 25,654.00	\$ 29,831.50	1.095	\$ 32,665.49	0.97	
1.000	D3 05 3272 3010	Repair air conditioner, DX, 50 ton	10	Q6	Ea.	265.86	\$ 43,711.50	\$ 51,544.50	1.095	\$ 56,441.23	0.97	
1.000	D3 05 3274 1010	Repair computer room air conditioner, air cooled, 5 ton	10	1	Stpi	Ea.	28.44	\$ 3,779.00	\$ 4,500.00	1.095	\$ 4,927.50	0.97
1.000	D3 05 3274 1020	Repair computer room air conditioner, air cooled, 10 ton	10	1	Stpi	Ea.	66.20	\$ 15,726.50	\$ 18,367.00	1.095	\$ 20,111.87	0.97
1.000	D3 05 3274 1030	Repair computer room air conditioner, air cooled, 15 ton	10	1	Stpi	Ea.	89.56	\$ 22,293.00	\$ 25,997.00	1.095	\$ 28,466.72	0.97
1.000	D3 05 3274 1040	Repair computer room air conditioner, air cooled, 20 ton	10	1	Stpi	Ea.	99.78	\$ 25,990.00	\$ 30,225.50	1.095	\$ 33,096.92	0.97
1.000	D3 05 3276 1010	Repair computer room A/C, chilled water, 5 ton	10	1	Stpi	Ea.	34.12	\$ 6,773.00	\$ 7,931.00	1.095	\$ 8,684.45	0.97
1.000	D3 05 3276 1020	Repair computer room A/C, chilled water, 10 ton	10	1	Stpi	Ea.	34.12	\$ 6,822.50	\$ 7,986.00	1.095	\$ 8,744.67	0.97
1.000	D3 05 3276 1030	Repair computer room A/C, chilled water, 15 ton	10	1	Stpi	Ea.	34.22	\$ 6,844.00	\$ 8,009.00	1.095	\$ 8,769.86	0.97
1.000	D3 05 3276 1040	Repair computer room A/C, chilled water, 20 ton	10	1	Stpi	Ea.	54.46	\$ 18,669.00	\$ 21,559.00	1.095	\$ 23,607.11	0.97
1.000	D3 05 3278 1010	Repair multi-zone rooftop unit, 15 ton	10	Q6	Ea.	73.34	\$ 19,768.00	\$ 23,005.50	1.095	\$ 25,191.02	0.97	
1.000	D3 05 3278 2010	Repair multi-zone rooftop unit, 25 ton	10	Q6	Ea.	97.07	\$ 27,388.00	\$ 31,844.50	1.095	\$ 34,869.73	0.97	
1.000	D3 05 3278 3010	Repair multi-zone rooftop unit, 40 ton	10	Q6	Ea.	123.97	\$ 27,378.50	\$ 32,003.50	1.095	\$ 35,043.83	0.97	
1.000	D3 05 3278 4010	Repair multi-zone rooftop unit, 70 ton	10	Q7	Ea.	251.23	\$ 39,529.50	\$ 46,743.50	1.095	\$ 51,184.13	0.97	
1.000	D3 05 3278 5010	Repair multi-zone rooftop unit, 105 ton	10	Q7	Ea.	273.02	\$ 41,014.50	\$ 48,531.50	1.095	\$ 53,141.99	0.97	
1.000	D3 05 3280 1001	Repair single zone rt. unit, 3 ton	10	2	Stpi	Ea.	17.84	\$ 1,966.80	\$ 2,365.00	1.095	\$ 2,589.68	0.97
1.000	D3 05 3280 1003	Repair single zone rt. unit, 5 ton	10	2	Stpi	Ea.	18.27	\$ 2,136.80	\$ 2,565.00	1.095	\$ 2,808.68	0.97
1.000	D3 05 3280 1005	Repair single zone rt. unit, 7.5 ton	10	2	Stpi	Ea.	21.83	\$ 2,953.00	\$ 3,507.00	1.095	\$ 3,840.17	0.97
1.000	D3 05 3280 1007	Repair single zone rt. unit, 10 ton	10	2	Stpi	Ea.	54.79	\$ 13,769.00	\$ 16,062.00	1.095	\$ 17,587.89	0.97
1.000	D3 05 3280 1010	Repair single zone rooftop unit, 15 ton	10	2	Stpi	Ea.	76.72	\$ 20,010.50	\$ 23,315.00	1.095	\$ 25,529.93	0.97
1.000	D3 05 3280 2010	Repair single zone rooftop unit, 25 ton	10	Q6	Ea.	96.57	\$ 27,355.50	\$ 31,804.00	1.095	\$ 34,825.38	0.97	
1.000	D3 05 3280 3010	Repair single zone rooftop unit, 60 ton	10	Q6	Ea.	298.68	\$ 43,236.00	\$ 51,258.00	1.095	\$ 56,127.51	0.97	
1.000	D3 05 3280 4010	Repair single zone rooftop unit, 100 ton	10	Q7	Ea.	330.39	\$ 49,332.00	\$ 58,291.00	1.095	\$ 63,828.65	0.97	
1.000	D3 05 3282 1010	Repair multi-zone variable volume, 50 ton	10	Q6	Ea.	251.40	\$ 36,162.50	\$ 42,863.00	1.095	\$ 46,934.99	0.97	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹								
15% GF								
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ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN								
Escalation								
	6%							
De-Escalation to July 2009								
	1.03							
De-Escalation Factor to be Applied								
	0.97							
Green Factor								
	1.15	Assumed Value						
GREEN								
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments	
1.000	D3 05 3110 5010	Repair unit heater, 400 MBH, 2 PSI steam	\$ 731.19	1.15	\$ 866.49	0.97	\$ 840.87	
1.000	D3 05 3170 1010	Repair terminal reheat, 12" x 24" coil	\$ 102.54	1.15	\$ 121.52	0.97	\$ 117.93	
1.000	D3 05 3170 2010	Repair terminal reheat, 18" x 24" coil	\$ 120.08	1.15	\$ 142.30	0.97	\$ 138.09	
1.000	D3 05 3170 3010	Repair terminal reheat, 36" x 36" coil	\$ 188.09	1.15	\$ 222.89	0.97	\$ 216.30	
1.000	D3 05 3170 4010	Repair terminal reheat, 48" x 126" coil	\$ 340.04	1.15	\$ 402.96	0.97	\$ 391.05	
1.000	D3 05 3245 1010	Repair heat pump, 1.5 ton, air to air split	\$ 2,134.29	1.15	\$ 2,529.20	0.97	\$ 2,454.43	
1.000	D3 05 3245 2010	Repair heat pump, 5 ton, air to air split	\$ 2,759.65	1.15	\$ 3,270.27	0.97	\$ 3,173.59	
1.000	D3 05 3245 3010	Repair heat pump, 10 ton, air to air split	\$ 4,438.60	1.15	\$ 5,259.89	0.97	\$ 5,104.39	
1.000	D3 05 3245 4010	Repair heat pump, 25 ton, air to air split	\$ 8,687.52	1.15	\$ 10,295.00	0.97	\$ 9,990.65	
1.000	D3 05 3245 5010	Repair heat pump, 50 ton, air to air split	\$ 47,494.18	1.15	\$ 56,282.18	0.97	\$ 54,618.31	
1.000	D3 05 3245 6010	Repair heat pump, thru-wall unit, 1.5 ton	\$ 2,134.29	1.15	\$ 2,529.20	0.97	\$ 2,454.43	
1.000	D3 05 3245 7010	Repair heat pump, thru-wall unit, 5 ton	\$ 2,759.65	1.15	\$ 3,270.27	0.97	\$ 3,173.59	
1.000	D3 05 3265 1030	Replace air conditioner, window, 1 ton	\$ 1,049.88	1.15	\$ 1,244.14	0.97	\$ 1,207.36	
1.000	D3 05 3266 2030	Replace air conditioner, window, 2 ton	\$ 1,919.11	1.15	\$ 2,274.21	0.97	\$ 2,206.97	
1.000	D3 05 3272 1010	Repair air conditioner, DX, 5 ton	\$ 4,641.56	1.15	\$ 5,500.40	0.97	\$ 5,337.80	
1.000	D3 05 3272 2010	Repair air conditioner, DX, 20 ton	\$ 31,699.80	1.15	\$ 37,565.32	0.97	\$ 36,454.77	
1.000	D3 05 3272 3010	Repair air conditioner, DX, 50 ton	\$ 54,772.65	1.15	\$ 64,907.41	0.97	\$ 62,988.55	
1.000	D3 05 3274 1010	Repair computer room air conditioner, air cooled, 5 ton	\$ 4,781.83	1.15	\$ 5,666.63	0.97	\$ 5,499.10	
1.000	D3 05 3274 1020	Repair computer room air conditioner, air cooled, 10 ton	\$ 19,517.30	1.15	\$ 23,128.64	0.97	\$ 22,444.89	
1.000	D3 05 3274 1030	Repair computer room air conditioner, air cooled, 15 ton	\$ 27,625.15	1.15	\$ 32,736.72	0.97	\$ 31,768.93	
1.000	D3 05 3274 1040	Repair computer room air conditioner, air cooled, 20 ton	\$ 32,118.48	1.15	\$ 38,061.46	0.97	\$ 36,936.25	
1.000	D3 05 3276 1010	Repair computer room A/C, chilled water, 5 ton	\$ 8,427.71	1.15	\$ 9,987.11	0.97	\$ 9,691.86	
1.000	D3 05 3276 1020	Repair computer room A/C, chilled water, 10 ton	\$ 8,486.15	1.15	\$ 10,056.37	0.97	\$ 9,759.07	
1.000	D3 05 3276 1030	Repair computer room A/C, chilled water, 15 ton	\$ 8,510.59	1.15	\$ 10,085.33	0.97	\$ 9,787.18	
1.000	D3 05 3276 1040	Repair computer room A/C, chilled water, 20 ton	\$ 22,909.21	1.15	\$ 27,148.17	0.97	\$ 26,345.59	
1.000	D3 05 3278 1010	Repair multi-zone rooftop unit, 15 ton	\$ 24,446.30	1.15	\$ 28,969.68	0.97	\$ 28,113.24	
1.000	D3 05 3278 2010	Repair multi-zone rooftop unit, 25 ton	\$ 33,838.87	1.15	\$ 40,100.19	0.97	\$ 38,914.70	
1.000	D3 05 3278 3010	Repair multi-zone rooftop unit, 40 ton	\$ 34,007.83	1.15	\$ 40,300.41	0.97	\$ 39,109.01	
1.000	D3 05 3278 4010	Repair multi-zone rooftop unit, 70 ton	\$ 49,670.98	1.15	\$ 58,861.75	0.97	\$ 57,121.62	
1.000	D3 05 3278 5010	Repair multi-zone rooftop unit, 105 ton	\$ 51,570.96	1.15	\$ 61,113.29	0.97	\$ 59,306.60	
1.000	D3 05 3280 1001	Repair single zone rt. unit, 3 ton	\$ 2,513.12	1.15	\$ 2,978.13	0.97	\$ 2,890.08	
1.000	D3 05 3280 1003	Repair single zone rt. unit, 5 ton	\$ 2,725.64	1.15	\$ 3,229.98	0.97	\$ 3,134.49	
1.000	D3 05 3280 1005	Repair single zone rt. unit, 7.5 ton	\$ 3,726.64	1.15	\$ 4,416.19	0.97	\$ 4,285.63	
1.000	D3 05 3280 1007	Repair single zone rt. unit, 10 ton	\$ 17,067.94	1.15	\$ 20,226.07	0.97	\$ 19,628.13	
1.000	D3 05 3280 1010	Repair single zone rooftop unit, 15 ton	\$ 24,775.18	1.15	\$ 29,359.41	0.97	\$ 28,491.46	
1.000	D3 05 3280 2010	Repair single zone rooftop unit, 25 ton	\$ 33,795.84	1.15	\$ 40,049.19	0.97	\$ 38,865.21	
1.000	D3 05 3280 3010	Repair single zone rooftop unit, 60 ton	\$ 54,468.21	1.15	\$ 64,546.64	0.97	\$ 62,638.44	
1.000	D3 05 3280 4010	Repair single zone rooftop unit, 100 ton	\$ 61,941.68	1.15	\$ 73,402.94	0.97	\$ 71,232.93	
1.000	D3 05 3282 1010	Repair multi-zone variable volume, 50 ton	\$ 45,547.45	1.15	\$ 53,975.23	0.97	\$ 52,379.56	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹													
15% GF													
CostWorks 2010 - EAST HALL													
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ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN													
Escalation	6%												
De-Escalation to July 2009	1.03												NON-GREEN
De-Escalation Factor to be Applied	0.97												
Green Factor	1.15	Assumed Value											
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor		
1.000	D3 05 3282 2010	Repair multi-zone variable volume, 70 ton	10	Q7	Ea.	251.53	\$ 39,548.50	\$ 46,768.00	1.095	\$ 51,210.96	0.97		
1.000	D3 05 3282 3010	Repair multi-zone variable volume, 90 ton	10	Q7	Ea.	301.32	\$ 47,118.50	\$ 55,770.00	1.095	\$ 61,068.15	0.97		
1.000	D3 05 3282 4010	Repair multi-zone variable volume, 105 ton	10	Q7	Ea.	273.99	\$ 41,158.50	\$ 48,681.00	1.095	\$ 53,305.70	0.97		
1.000	D3 05 3282 5010	Repair multi-zone variable volume, 140 ton	10	Q7	Ea.	367.75	\$ 54,993.50	\$ 65,023.00	1.095	\$ 71,200.19	0.97		
1.000	D3 05 3284 1010	Repair single zone variable volume, 20 ton	10	Q6	Ea.	79.76	\$ 22,028.00	\$ 25,577.50	1.095	\$ 28,007.36	0.97		
1.000	D3 05 3284 1040	Replace single zone variable volume, 20 ton	10	Q7	Ea.	136.49	\$ 38,175.00	\$ 44,275.00	1.095	\$ 48,481.13	0.97		
1.000	D3 05 3284 2010	Repair single zone variable volume, 30 ton	10	Q6	Ea.	114.54	\$ 32,813.00	\$ 38,054.50	1.095	\$ 41,669.68	0.97		
1.000	D3 05 3284 2040	Replace single zone variable volume, 30 ton	10	Q7	Ea.	196.29	\$ 47,975.00	\$ 55,875.00	1.095	\$ 61,183.13	0.97		
1.000	D3 05 3284 3010	Repair single zone variable volume, 40 ton	10	Q6	Ea.	123.35	\$ 27,403.00	\$ 32,024.50	1.095	\$ 35,066.83	0.97		
1.000	D3 05 3284 3040	Replace single zone variable volume, 40 ton	10	Q7	Ea.	265.10	\$ 64,250.00	\$ 75,400.00	1.095	\$ 82,563.00	0.97		
1.000	D3 05 3284 4010	Repair single zone variable volume, 60 ton	10	Q6	Ea.	298.02	\$ 43,121.00	\$ 51,128.00	1.095	\$ 55,985.16	0.97		
1.000	D3 05 3284 4040	Replace single zone variable volume, 60 ton	10	Q7	Ea.	374.00	\$ 86,100.00	\$ 100,000.00	1.095	\$ 109,500.00	0.97		
1.000	D3 05 3286 1010	Repair central station A.H.U., 1300 CFM	10	1 Stpi	Ea.	3.45	\$ 516.30	\$ 610.50	1.095	\$ 668.50	0.97		
1.000	D3 05 3286 2010	Repair central station A.H.U., 1900 CFM	10	1 Stpi	Ea.	3.81	\$ 546.30	\$ 650.50	1.095	\$ 712.30	0.97		
1.000	D3 05 3286 3010	Repair central station A.H.U., 5400 CFM	10	1 Stpi	Ea.	4.01	\$ 624.30	\$ 737.00	1.095	\$ 807.02	0.97		
1.000	D3 05 3286 4010	Repair central station A.H.U., 8000 CFM	10	1 Stpi	Ea.	4.21	\$ 732.30	\$ 863.00	1.095	\$ 944.99	0.97		
1.000	D3 05 3286 5010	Repair central station A.H.U., 16,000 CFM	10	1 Stpi	Ea.	4.70	\$ 1,015.30	\$ 1,194.00	1.095	\$ 1,307.43	0.97		
1.000	D3 05 3286 6010	Repair central station A.H.U., 33,500 CFM	10	1 Stpi	Ea.	8.10	\$ 2,725.30	\$ 3,145.00	1.095	\$ 3,443.78	0.97		
1.000	D3 05 3286 7010	Repair central station A.H.U., 63,000 CFM	10	1 Stpi	Ea.	13.33	\$ 4,179.30	\$ 4,849.00	1.095	\$ 5,309.66	0.97		
1.000	D3 05 3310 1010	Repair furnace, gas, 25 MBH residential	10	Q1	Ea.	7.25	\$ 888.35	\$ 1,058.00	1.095	\$ 1,158.51	0.97		
1.000	D3 05 3310 2010	Repair furnace, gas, 100 MBH residential	10	Q1	Ea.	7.89	\$ 1,317.80	\$ 1,555.50	1.095	\$ 1,703.27	0.97		
1.000	D3 05 3310 3010	Repair furnace, gas, 200 MBH residential	10	Q1	Ea.	17.88	\$ 2,630.50	\$ 3,122.50	1.095	\$ 3,419.14	0.97		
1.000	D3 05 3320 1010	Repair furnace, oil, 55 MBH residential	10	Q1	Ea.	17.85	\$ 1,706.50	\$ 2,059.00	1.095	\$ 2,254.61	0.97		
1.000	D3 05 3320 2010	Repair furnace, oil, 100 MBH residential	10	Q1	Ea.	17.91	\$ 1,729.00	\$ 2,085.50	1.095	\$ 2,283.62	0.97		
1.000	D3 05 3320 3010	Repair furnace, oil, 200 MBH residential	10	Q1	Ea.	17.99	\$ 1,763.50	\$ 2,124.50	1.095	\$ 2,326.33	0.97		
1.000	D3 05 3330 1010	Repair furnace, electric, 25 MBH residential	10	Q20	Ea.	6.03	\$ 1,853.50	\$ 2,144.50	1.095	\$ 2,348.23	0.97		
1.000	D3 05 3330 2010	Repair furnace, electric, 50 MBH residential	10	Q20	Ea.	6.21	\$ 1,882.00	\$ 2,174.00	1.095	\$ 2,380.53	0.97		
1.000	D3 05 3330 3010	Repair furnace, electric, 85 MBH residential	10	Q20	Ea.	6.68	\$ 3,090.50	\$ 3,549.50	1.095	\$ 3,886.70	0.97		
1.000	D4 01 3110 3010	Rebuild 4" diameter reduced pressure backflow preventer	10	1 Plum	Ea.	2.92	\$ 509.40	\$ 598.95	1.095	\$ 655.85	0.97		
1.000	D4 01 3110 3020	Rebuild 6" diameter reduced pressure backflow preventer	10	1 Plum	Ea.	3.94	\$ 590.40	\$ 700.15	1.095	\$ 766.66	0.97		
1.000	D4 01 3110 3030	Rebuild 8" diameter reduced pressure backflow preventer	10	1 Plum	Ea.	4.95	\$ 736.55	\$ 876.65	1.095	\$ 959.93	0.97		
1.000	D4 01 3110 3040	Rebuild 10" diameter reduced pressure backflow preventer	10	1 Plum	Ea.	5.97	\$ 873.00	\$ 1,038.40	1.095	\$ 1,137.05	0.97		
							\$ 2,635,025.95	\$ 3,095,086.35					
1.000	D3 01 3210 0110	Replace 10' of buried 2" diam steel pipe/M.L.F. natural gas	12	Q4	Ea.	10.68	\$ 659.67	\$ 804.59	1.095	\$ 881.03	0.97		
1.000	D3 01 3210 0120	Replace 10' of buried 3" diam steel pipe/M.L.F. natural gas	12	Q4	Ea.	10.83	\$ 758.17	\$ 911.09	1.095	\$ 997.64	0.97		

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹								
15% GF								
CostWorks 2010 - EAST HALL								
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ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN								
Escalation								
	6%							
De-Escalation to July 2009								
	1.03							
De-Escalation Factor to be Applied								
	0.97							
Green Factor								
	1.15	Assumed Value						
GREEN								
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments	
1.000	D3 05 3282 2010	Repair multi-zone variable volume, 70 ton	\$ 49,697.01	1.15	\$ 58,892.60	0.97	\$ 57,151.56	
1.000	D3 05 3282 3010	Repair multi-zone variable volume, 90 ton	\$ 59,262.79	1.15	\$ 70,228.37	0.97	\$ 68,152.21	
1.000	D3 05 3282 4010	Repair multi-zone variable volume, 105 ton	\$ 51,729.82	1.15	\$ 61,301.55	0.97	\$ 59,489.29	
1.000	D3 05 3282 5010	Repair multi-zone variable volume, 140 ton	\$ 69,095.29	1.15	\$ 81,880.21	0.97	\$ 79,459.59	
1.000	D3 05 3284 1010	Repair single zone variable volume, 20 ton	\$ 27,179.38	1.15	\$ 32,208.47	0.97	\$ 31,256.29	
1.000	D3 05 3284 1040	Replace single zone variable volume, 20 ton	\$ 47,047.88	1.15	\$ 55,753.29	0.97	\$ 54,105.06	
1.000	D3 05 3284 2010	Repair single zone variable volume, 30 ton	\$ 40,437.80	1.15	\$ 47,920.13	0.97	\$ 46,503.47	
1.000	D3 05 3284 2040	Replace single zone variable volume, 30 ton	\$ 59,374.37	1.15	\$ 70,360.59	0.97	\$ 68,280.52	
1.000	D3 05 3284 3010	Repair single zone variable volume, 40 ton	\$ 34,030.15	1.15	\$ 40,326.85	0.97	\$ 39,134.67	
1.000	D3 05 3284 3040	Replace single zone variable volume, 40 ton	\$ 80,122.19	1.15	\$ 94,947.45	0.97	\$ 92,140.52	
1.000	D3 05 3284 4010	Repair single zone variable volume, 60 ton	\$ 54,330.07	1.15	\$ 64,382.93	0.97	\$ 62,479.58	
1.000	D3 05 3284 4040	Replace single zone variable volume, 60 ton	\$ 106,262.85	1.15	\$ 125,925.00	0.97	\$ 122,202.28	
1.000	D3 05 3286 1010	Repair central station A.H.U., 1300 CFM	\$ 648.73	1.15	\$ 768.77	0.97	\$ 746.04	
1.000	D3 05 3286 2010	Repair central station A.H.U., 1900 CFM	\$ 691.24	1.15	\$ 819.14	0.97	\$ 794.93	
1.000	D3 05 3286 3010	Repair central station A.H.U., 5400 CFM	\$ 783.16	1.15	\$ 928.07	0.97	\$ 900.63	
1.000	D3 05 3286 4010	Repair central station A.H.U., 8000 CFM	\$ 917.05	1.15	\$ 1,086.73	0.97	\$ 1,054.61	
1.000	D3 05 3286 5010	Repair central station A.H.U., 16,000 CFM	\$ 1,268.78	1.15	\$ 1,503.54	0.97	\$ 1,459.10	
1.000	D3 05 3286 6010	Repair central station A.H.U., 33,500 CFM	\$ 3,341.97	1.15	\$ 3,960.34	0.97	\$ 3,843.26	
1.000	D3 05 3286 7010	Repair central station A.H.U., 63,000 CFM	\$ 5,152.69	1.15	\$ 6,106.10	0.97	\$ 5,925.59	
1.000	D3 05 3310 1010	Repair furnace, gas, 25 MBH residential	\$ 1,124.26	1.15	\$ 1,332.29	0.97	\$ 1,292.90	
1.000	D3 05 3310 2010	Repair furnace, gas, 100 MBH residential	\$ 1,652.92	1.15	\$ 1,958.76	0.97	\$ 1,900.86	
1.000	D3 05 3310 3010	Repair furnace, gas, 200 MBH residential	\$ 3,318.06	1.15	\$ 3,932.01	0.97	\$ 3,815.77	
1.000	D3 05 3320 1010	Repair furnace, oil, 55 MBH residential	\$ 2,187.95	1.15	\$ 2,592.80	0.97	\$ 2,516.14	
1.000	D3 05 3320 2010	Repair furnace, oil, 100 MBH residential	\$ 2,216.11	1.15	\$ 2,626.17	0.97	\$ 2,548.53	
1.000	D3 05 3320 3010	Repair furnace, oil, 200 MBH residential	\$ 2,257.55	1.15	\$ 2,675.28	0.97	\$ 2,596.19	
1.000	D3 05 3330 1010	Repair furnace, electric, 25 MBH residential	\$ 2,278.81	1.15	\$ 2,700.46	0.97	\$ 2,620.63	
1.000	D3 05 3330 2010	Repair furnace, electric, 50 MBH residential	\$ 2,310.15	1.15	\$ 2,737.61	0.97	\$ 2,656.68	
1.000	D3 05 3330 3010	Repair furnace, electric, 85 MBH residential	\$ 3,771.80	1.15	\$ 4,469.71	0.97	\$ 4,337.57	
1.000	D4 01 3110 3010	Rebuild 4" diameter reduced pressure backflow preventer	\$ 636.46	1.15	\$ 754.23	0.97	\$ 731.93	
1.000	D4 01 3110 3020	Rebuild 6" diameter reduced pressure backflow preventer	\$ 744.00	1.15	\$ 881.66	0.97	\$ 855.60	
1.000	D4 01 3110 3030	Rebuild 8" diameter reduced pressure backflow preventer	\$ 931.55	1.15	\$ 1,103.92	0.97	\$ 1,071.29	
1.000	D4 01 3110 3040	Rebuild 10" diameter reduced pressure backflow preventer	\$ 1,103.43	1.15	\$ 1,307.61	0.97	\$ 1,268.95	
			\$ 3,288,926.96				\$ 3,782,266.01	
			\$ 657,785.39	Assume 20% required		Assume 20% required	\$ 756,453.20	
				PER 10 YEARS		PER 10 YEARS		
1.000	D3 01 3210 0110	Replace 10' of buried 2" diam steel pipe/M.L.F. natural gas	\$ 854.98	1.15	\$ 1,013.18	0.97	\$ 983.23	
1.000	D3 01 3210 0120	Replace 10' of buried 3" diam steel pipe/M.L.F. natural gas	\$ 968.15	1.15	\$ 1,147.29	0.97	\$ 1,113.37	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
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Escalation	6%											
De-Escalation to July 2009	1.03											NON-GREEN
De-Escalation Factor to be Applied	0.97											
Green Factor	1.15	Assumed Value										
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 01 3210 0130	Replace 10' of buried 4" diam steel pipe/M.L.F. natural gas	12	B35	Ea.	11.91	\$ 910.67	\$ 1,089.09	1.095	\$ 1,192.55	0.97	
1.000	D3 01 3210 0140	Replace 10' of buried 6" diam steel pipe/M.L.F. natural gas	12	B35	Ea.	13.20	\$ 1,215.67	\$ 1,445.09	1.095	\$ 1,582.37	0.97	
1.000	D3 01 3210 0410	Replace 10' of hung 2" diam steel pipe/M.L.F. natural gas	12	Q1	Ea.	6.79	\$ 542.53	\$ 666.29	1.095	\$ 729.59	0.97	
1.000	D3 01 3210 0420	Replace 10' of hung 3" diam steel pipe/M.L.F. natural gas	12	Q15	Ea.	8.18	\$ 629.67	\$ 769.09	1.095	\$ 842.15	0.97	
1.000	D3 01 3210 0430	Replace 10' of hung 4" diam steel pipe/M.L.F. natural gas	12	Q15	Ea.	9.36	\$ 758.67	\$ 920.09	1.095	\$ 1,007.50	0.97	
1.000	D3 01 3210 0440	Replace 10' of hung 6" diam steel pipe/M.L.F. natural gas	12	Q16	Ea.	13.93	\$ 1,179.67	\$ 1,434.09	1.095	\$ 1,570.33	0.97	
1.000	D3 01 3260 0120	Replace 10' steel pipe 1/2" diam. per M.L.F. LPG distribution	12	1 Plum	Ea.	3.40	\$ 259.17	\$ 318.59	1.095	\$ 348.86	0.97	
1.000	D3 01 3260 0220	Replace 10' steel pipe 3/4" diam. per M.L.F. LPG distribution	12	1 Plum	Ea.	3.09	\$ 246.67	\$ 303.09	1.095	\$ 331.88	0.97	
1.000	D3 01 3260 0320	Replace 10' steel pipe 1" diam. per M.L.F. LPG distribution	12	1 Plum	Ea.	3.87	\$ 319.17	\$ 390.09	1.095	\$ 427.15	0.97	
1.000	D3 01 3260 0420	Replace 10' steel pipe 1-1/4" diam. M.L.F. LPG distribution	12	Q1	Ea.	4.43	\$ 352.67	\$ 428.09	1.095	\$ 468.76	0.97	
1.000	D3 01 3260 0520	Replace 10' steel pipe 1-1/2" diam. M.L.F. LPG distribution	12	Q1	Ea.	4.83	\$ 390.17	\$ 473.59	1.095	\$ 518.58	0.97	
1.000	D3 01 3260 0620	Replace 10' section steel pipe 2" diam. M.L.F. LPG distribution	12	Q1	Ea.	5.80	\$ 479.17	\$ 587.09	1.095	\$ 642.86	0.97	
1.000	D3 02 3388 1060	Replace coal spreader pneumatic	12	4 Stpi	Ea.	195.04	\$ 19,875.00	\$ 24,125.00	1.095	\$ 26,416.88	0.97	
							\$ 28,576.74	\$ 34,664.96				
1.000	D3 01 3240 0110	Replace pressure regulator 1/2" diam. pipe natural gas	14	1 Stpi	Ea.	0.66	\$ 89.09	\$ 106.25	1.095	\$ 116.34	0.97	
1.000	D3 01 3240 0120	Replace pressure regulator 1" diam. pipe natural gas	14	1 Stpi	Ea.	0.83	\$ 148.24	\$ 174.80	1.095	\$ 191.41	0.97	
1.000	D3 01 3240 0130	Replace pressure regulator 1-1/2" diam. pipe natural gas	14	1 Stpi	Ea.	1.21	\$ 686.14	\$ 792.80	1.095	\$ 868.12	0.97	
1.000	D3 01 3240 0140	Replace pressure regulator 2" diam. pipe natural gas	14	1 Stpi	Ea.	1.43	\$ 701.14	\$ 808.80	1.095	\$ 885.64	0.97	
							\$ 1,624.61	\$ 1,882.65				
1.000	D3 01 3601 0010	Replace solar panel 3' x 8'	15	Q1	Ea.	5.67	\$ 1,285.00	\$ 1,487.00	1.095	\$ 1,628.27	0.97	
1.000	D3 02 3198 1020	Replace boiler blowoff system	15	Q5	Ea.	8.33	\$ 3,935.00	\$ 4,551.00	1.095	\$ 4,983.35	0.97	
1.000	D3 02 3292 1010	Repair chemical feed system	15	1 Stpi	Ea.	6.02	\$ 793.57	\$ 947.22	1.095	\$ 1,037.21	0.97	
1.000	D3 02 3292 1030	Replace chemical feed system	15	2 Stpi	Ea.	2.50	\$ 740.00	\$ 860.00	1.095	\$ 941.70	0.97	
1.000	D3 02 3294 1010	Repair feed water supply pump	15	1 Stpi	Ea.	9.45	\$ 2,565.00	\$ 2,974.50	1.095	\$ 3,257.08	0.97	
1.000	D3 02 3294 1030	Replace feed water pump	15	Q2	Ea.	33.33	\$ 15,170.00	\$ 17,535.00	1.095	\$ 19,200.83	0.97	
1.000	D3 02 3310 0010	Replace metal flue, all fuel SS, 6" diameter metal flue / chimney	15	Q9	L.F.	0.39	\$ 96.50	\$ 112.00	1.095	\$ 122.64	0.97	
1.000	D3 02 3310 0020	Replace metal flue, all fuel SS, 10" diameter metal flue / chimney	15	Q9	L.F.	0.48	\$ 130.00	\$ 150.00	1.095	\$ 164.25	0.97	
1.000	D3 02 3310 0030	Replace metal flue, all fuel SS, 20" diameter metal flue / chimney	15	Q10	L.F.	0.97	\$ 239.00	\$ 278.00	1.095	\$ 304.41	0.97	
1.000	D3 02 3310 0040	Replace metal flue, all fuel SS, 32" diameter metal flue / chimney	15	Q10	L.F.	1.29	\$ 380.00	\$ 440.00	1.095	\$ 481.80	0.97	
1.000	D3 02 3310 0050	Replace metal flue, all fuel SS, 48" diameter metal flue / chimney	15	Q10	L.F.	1.83	\$ 585.00	\$ 675.00	1.095	\$ 739.13	0.97	
1.000	D3 02 3390 1030	Replace fuel oil 25 GPH pump / motor set	15	Q5	Ea.	5.20	\$ 1,175.00	\$ 1,375.00	1.095	\$ 1,505.63	0.97	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
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Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value					
				GREEN			
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 01 3210 0130	Replace 10' of buried 4" diam steel pipe/M.L.F. natural gas	\$ 1,157.30	1.15	\$ 1,371.44	0.97	\$ 1,330.89
1.000	D3 01 3210 0140	Replace 10' of buried 6" diam steel pipe/M.L.F. natural gas	\$ 1,535.59	1.15	\$ 1,819.73	0.97	\$ 1,765.93
1.000	D3 01 3210 0410	Replace 10' of hung 2" diam steel pipe/M.L.F. natural gas	\$ 708.02	1.15	\$ 839.03	0.97	\$ 814.22
1.000	D3 01 3210 0420	Replace 10' of hung 3" diam steel pipe/M.L.F. natural gas	\$ 817.26	1.15	\$ 968.48	0.97	\$ 939.85
1.000	D3 01 3210 0430	Replace 10' of hung 4" diam steel pipe/M.L.F. natural gas	\$ 977.71	1.15	\$ 1,158.62	0.97	\$ 1,124.37
1.000	D3 01 3210 0440	Replace 10' of hung 6" diam steel pipe/M.L.F. natural gas	\$ 1,523.90	1.15	\$ 1,805.88	0.97	\$ 1,752.49
1.000	D3 01 3260 0120	Replace 10' steel pipe 1/2" diam. per M.L.F. LPG distribution	\$ 338.54	1.15	\$ 401.18	0.97	\$ 389.32
1.000	D3 01 3260 0220	Replace 10' steel pipe 3/4" diam. per M.L.F. LPG distribution	\$ 322.07	1.15	\$ 381.67	0.97	\$ 370.38
1.000	D3 01 3260 0320	Replace 10' steel pipe 1" diam. per M.L.F. LPG distribution	\$ 414.52	1.15	\$ 491.22	0.97	\$ 476.70
1.000	D3 01 3260 0420	Replace 10' steel pipe 1-1/4" diam. M.L.F. LPG distribution	\$ 454.90	1.15	\$ 539.07	0.97	\$ 523.14
1.000	D3 01 3260 0520	Replace 10' steel pipe 1-1/2" diam. M.L.F. LPG distribution	\$ 503.25	1.15	\$ 596.37	0.97	\$ 578.74
1.000	D3 01 3260 0620	Replace 10' section steel pipe 2" diam. M.L.F. LPG distribution	\$ 623.86	1.15	\$ 739.29	0.97	\$ 717.44
1.000	D3 02 3388 1060	Replace coal spreader pneumatic	\$ 25,635.91	1.15	\$ 30,379.41	0.97	\$ 29,481.30
			\$ 36,835.97				\$ 42,361.37
			\$ 18,417.99	Assume 50% required		Assume 50% required	\$ 21,180.69
				PER 12 YEARS		PER 12 YEARS	
1.000	D3 01 3240 0110	Replace pressure regulator 1/2" diam. pipe natural gas	\$ 112.90	1.15	\$ 133.80	0.97	\$ 129.84
1.000	D3 01 3240 0120	Replace pressure regulator 1" diam. pipe natural gas	\$ 185.75	1.15	\$ 220.12	0.97	\$ 213.61
1.000	D3 01 3240 0130	Replace pressure regulator 1-1/2" diam. pipe natural gas	\$ 842.45	1.15	\$ 998.33	0.97	\$ 968.82
1.000	D3 01 3240 0140	Replace pressure regulator 2" diam. pipe natural gas	\$ 859.45	1.15	\$ 1,018.48	0.97	\$ 988.37
			\$ 2,000.56				\$ 2,300.64
			\$ 1,000.28	Assume 50% required		Assume 50% required	\$ 1,150.32
				PER 14 YEARS		PER 14 YEARS	
1.000	D3 01 3601 0010	Replace solar panel 3' x 8'	\$ 1,580.13	1.15	\$ 1,872.50	0.97	\$ 1,817.15
1.000	D3 02 3198 1020	Replace boiler blowoff system	\$ 4,836.02	1.15	\$ 5,730.85	0.97	\$ 5,561.43
1.000	D3 02 3292 1010	Repair chemical feed system	\$ 1,006.54	1.15	\$ 1,192.79	0.97	\$ 1,157.52
1.000	D3 02 3292 1030	Replace chemical feed system	\$ 913.86	1.15	\$ 1,082.96	0.97	\$ 1,050.94
1.000	D3 02 3294 1010	Repair feed water supply pump	\$ 3,160.79	1.15	\$ 3,745.64	0.97	\$ 3,634.91
1.000	D3 02 3294 1030	Replace feed water pump	\$ 18,633.19	1.15	\$ 22,080.95	0.97	\$ 21,428.17
1.000	D3 02 3310 0010	Replace metal flue, all fuel SS, 6" diameter metal flue / chimney	\$ 119.01	1.15	\$ 141.04	0.97	\$ 136.87
1.000	D3 02 3310 0020	Replace metal flue, all fuel SS, 10" diameter metal flue / chimney	\$ 159.39	1.15	\$ 188.89	0.97	\$ 183.30
1.000	D3 02 3310 0030	Replace metal flue, all fuel SS, 20" diameter metal flue / chimney	\$ 295.41	1.15	\$ 350.07	0.97	\$ 339.72
1.000	D3 02 3310 0040	Replace metal flue, all fuel SS, 32" diameter metal flue / chimney	\$ 467.56	1.15	\$ 554.07	0.97	\$ 537.69
1.000	D3 02 3310 0050	Replace metal flue, all fuel SS, 48" diameter metal flue / chimney	\$ 717.27	1.15	\$ 849.99	0.97	\$ 824.87
1.000	D3 02 3390 1030	Replace fuel oil 25 GPH pump / motor set	\$ 1,461.11	1.15	\$ 1,731.47	0.97	\$ 1,680.28

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
15% GF												
CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation	6%											
De-Escalation to July 2009	1.03											
De-Escalation Factor to be Applied	0.97	NON-GREEN										
Green Factor	1.15	Assumed Value										
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 02 3390 1040	Replace fuel oil 45 GPH pump / motor set	15	Q5	Ea.	5.20	\$ 1,175.00	\$ 1,375.00	1.095	\$ 1,505.63	0.97	
1.000	D3 02 3390 1050	Replace fuel oil 90 GPH pump / motor set	15	Q5	Ea.	6.24	\$ 1,220.00	\$ 1,451.00	1.095	\$ 1,588.85	0.97	
1.000	D3 02 3390 1060	Replace fuel oil 160 GPH pump / motor set	15	Q5	Ea.	7.79	\$ 1,375.00	\$ 1,613.00	1.095	\$ 1,766.24	0.97	
1.000	D3 03 3115 1030	Replace cooling tower, 50 ton	15	Q6	Ea.	31.18	\$ 12,625.00	\$ 14,580.00	1.095	\$ 15,965.10	0.97	
1.000	D3 03 3115 2030	Replace cooling tower, 100 ton	15	Q6	Ea.	42.86	\$ 18,555.00	\$ 21,375.00	1.095	\$ 23,405.63	0.97	
1.000	D3 03 3115 3030	Replace cooling tower, 300 ton	15	Q6	Ea.	108.86	\$ 34,875.00	\$ 40,425.00	1.095	\$ 44,265.38	0.97	
1.000	D3 03 3115 4030	Replace cooling tower, 1000 ton	15	Q6	Ea.	313.05	\$ 87,750.00	\$ 101,850.00	1.095	\$ 111,525.75	0.97	
1.000	D3 03 3210 1030	Replace condenser, air cooled, 5 ton	15	Q5	Ea.	15.58	\$ 2,900.00	\$ 3,400.00	1.095	\$ 3,723.00	0.97	
1.000	D3 03 3210 2030	Replace condenser, air cooled, 20 ton	15	Q5	Ea.	31.17	\$ 7,125.00	\$ 8,325.00	1.095	\$ 9,115.88	0.97	
1.000	D3 03 3210 3030	Replace condenser, air cooled, 50 ton	15	Q6	Ea.	116.88	\$ 22,250.00	\$ 26,025.00	1.095	\$ 28,497.38	0.97	
1.000	D3 03 3210 4030	Replace condenser, air cooled, 100 ton	15	Q7	Ea.	207.26	\$ 43,650.00	\$ 51,000.00	1.095	\$ 55,845.00	0.97	
1.000	D3 03 3260 1030	Replace evaporative condenser, 20 ton	15	Q5	Ea.	66.33	\$ 10,425.00	\$ 12,300.00	1.095	\$ 13,468.50	0.97	
1.000	D3 03 3260 2030	Replace evaporative condenser, 100 ton	15	Q7	Ea.	172.76	\$ 28,625.00	\$ 33,825.00	1.095	\$ 37,038.38	0.97	
1.000	D3 03 3260 3030	Replace evaporative condenser, 300 ton	15	Q7	Ea.	457.03	\$ 75,850.00	\$ 89,700.00	1.095	\$ 98,221.50	0.97	
1.000	D3 04 3120 1030	Replace fan coil unit, 1 ton	15	Q5	Ea.	5.20	\$ 1,200.00	\$ 1,400.00	1.095	\$ 1,533.00	0.97	
1.000	D3 04 3120 2030	Replace fan coil unit, 3 ton	15	Q5	Ea.	7.79	\$ 2,350.00	\$ 2,713.00	1.095	\$ 2,970.74	0.97	
1.000	D3 04 3120 3030	Replace fan coil unit, 5 ton	15	Q5	Ea.	8.05	\$ 3,155.00	\$ 3,644.00	1.095	\$ 3,990.18	0.97	
1.000	D3 04 3120 4030	Replace fan coil unit, 10 ton	15	Q6	Ea.	34.62	\$ 5,515.00	\$ 6,490.00	1.095	\$ 7,106.55	0.97	
1.000	D3 04 3120 5030	Replace fan coil unit, 20 ton	15	Q6	Ea.	58.54	\$ 9,050.00	\$ 10,675.00	1.095	\$ 11,689.13	0.97	
1.000	D3 04 3120 6030	Replace fan coil unit, 30 ton	15	Q6	Ea.	77.92	\$ 13,650.00	\$ 16,050.00	1.095	\$ 17,574.75	0.97	
1.000	D3 04 3122 1040	Replace fan coil, DX 1-1/2 ton, no heat	15	Q5	Ea.	6.24	\$ 1,120.00	\$ 1,325.00	1.095	\$ 1,450.88	0.97	
1.000	D3 04 3122 2040	Replace fan coil, DX 2 ton, no heat	15	Q5	Ea.	6.50	\$ 1,200.00	\$ 1,407.00	1.095	\$ 1,540.67	0.97	
1.000	D3 04 3122 3040	Replace fan coil, DX 2-1/2 ton, no heat	15	Q5	Ea.	7.09	\$ 1,287.00	\$ 1,496.00	1.095	\$ 1,638.12	0.97	
1.000	D3 04 3122 4040	Replace fan coil, DX 3 ton, no heat	15	Q5	Ea.	8.21	\$ 1,558.00	\$ 1,823.00	1.095	\$ 1,996.19	0.97	
1.000	D3 04 3122 6060	Replace fan coil, DX 5 ton, no heat	15	Q5	Ea.	10.40	\$ 2,051.00	\$ 2,401.00	1.095	\$ 2,629.10	0.97	
1.000	D3 04 3122 8080	Replace fan coil, DX 10 ton, no heat	15	Q6	Ea.	18.00	\$ 4,135.00	\$ 4,825.00	1.095	\$ 5,283.38	0.97	
1.000	D3 04 3122 9590	Replace fan coil, DX 20 ton, no heat	15	Q6	Ea.	66.89	\$ 9,925.00	\$ 11,775.00	1.095	\$ 12,893.63	0.97	
1.000	D3 04 3124 1010	Replace fan coil, DX 1-1/2 ton, with heat	15	Q5	Ea.	8.79	\$ 1,559.00	\$ 1,842.00	1.095	\$ 2,016.99	0.97	
1.000	D3 04 3124 2010	Replace fan coil, DX 2 ton, with heat	15	Q5	Ea.	9.15	\$ 1,689.00	\$ 1,974.00	1.095	\$ 2,161.53	0.97	
1.000	D3 04 3124 3010	Replace fan coil, DX 2-1/2 ton, with heat	15	Q5	Ea.	9.98	\$ 1,802.00	\$ 2,115.00	1.095	\$ 2,315.93	0.97	
1.000	D3 04 3124 4010	Replace fan coil, DX 3 ton, with heat	15	Q5	Ea.	11.56	\$ 2,176.00	\$ 2,570.00	1.095	\$ 2,814.15	0.97	
1.000	D3 04 3128 1030	Replace unit ventilator, 750 CFM, heat/cool coils	15	Q6	Ea.	23.40	\$ 5,395.00	\$ 6,285.00	1.095	\$ 6,882.08	0.97	
1.000	D3 04 3128 2030	Replace unit ventilator, 1250 CFM, heat/cool coils	15	Q6	Ea.	33.43	\$ 6,870.00	\$ 8,035.00	1.095	\$ 8,798.33	0.97	
1.000	D3 04 3128 2050	Replace unit ventilator, 2000 CFM, heat/cool coils	15	Q6	Ea.	93.55	\$ 11,725.00	\$ 13,950.00	1.095	\$ 15,275.25	0.97	
1.000	D3 04 3140 0030	Replace duct heater	15	1 Elec	Ea.	2.67	\$ 1,965.00	\$ 2,275.00	1.095	\$ 2,491.13	0.97	
1.000	D3 04 3220 1010	Replace fan & motor, propeller exh., 375 CFM exhaust fan	15	Q20	Ea.	3.90	\$ 693.50	\$ 811.50	1.095	\$ 888.59	0.97	
1.000	D3 04 3220 1030	Replace fan & motor, propeller exh., 1000 CFM exhaust fan	15	Q20	Ea.	4.88	\$ 1,006.50	\$ 1,164.00	1.095	\$ 1,274.58	0.97	
1.000	D3 04 3220 1040	Replace fan & motor, propeller exh., 4700 CFM exhaust fan	15	Q20	Ea.	7.80	\$ 1,622.00	\$ 1,883.00	1.095	\$ 2,061.89	0.97	
1.000	D3 04 3320 0030	Replace flash tank 24 gallon	15	Q5	Ea.	2.23	\$ 738.00	\$ 854.00	1.095	\$ 935.13	0.97	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
15% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value					
				GREEN			
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 02 3390 1040	Replace fuel oil 45 GPH pump / motor set	\$ 1,461.11	1.15	\$ 1,731.47	0.97	\$ 1,680.28
1.000	D3 02 3390 1050	Replace fuel oil 90 GPH pump / motor set	\$ 1,541.87	1.15	\$ 1,827.17	0.97	\$ 1,773.16
1.000	D3 02 3390 1060	Replace fuel oil 160 GPH pump / motor set	\$ 1,714.02	1.15	\$ 2,031.17	0.97	\$ 1,971.12
1.000	D3 03 3115 1030	Replace cooling tower, 50 ton	\$ 15,493.12	1.15	\$ 18,359.87	0.97	\$ 17,817.09
1.000	D3 03 3115 2030	Replace cooling tower, 100 ton	\$ 22,713.68	1.15	\$ 26,916.47	0.97	\$ 26,120.74
1.000	D3 03 3115 3030	Replace cooling tower, 300 ton	\$ 42,956.76	1.15	\$ 50,905.18	0.97	\$ 49,400.27
1.000	D3 03 3115 4030	Replace cooling tower, 1000 ton	\$ 108,228.71	1.15	\$ 128,254.61	0.97	\$ 124,463.02
1.000	D3 03 3210 1030	Replace condenser, air cooled, 5 ton	\$ 3,612.94	1.15	\$ 4,281.45	0.97	\$ 4,154.88
1.000	D3 03 3210 2030	Replace condenser, air cooled, 20 ton	\$ 8,846.38	1.15	\$ 10,483.26	0.97	\$ 10,173.34
1.000	D3 03 3210 3030	Replace condenser, air cooled, 50 ton	\$ 27,654.91	1.15	\$ 32,771.98	0.97	\$ 31,803.14
1.000	D3 03 3210 4030	Replace condenser, air cooled, 100 ton	\$ 54,194.05	1.15	\$ 64,221.75	0.97	\$ 62,323.16
1.000	D3 03 3260 1030	Replace evaporative condenser, 20 ton	\$ 13,070.33	1.15	\$ 15,488.78	0.97	\$ 15,030.88
1.000	D3 03 3260 2030	Replace evaporative condenser, 100 ton	\$ 35,943.41	1.15	\$ 42,594.13	0.97	\$ 41,334.92
1.000	D3 03 3260 3030	Replace evaporative condenser, 300 ton	\$ 95,317.78	1.15	\$ 112,954.73	0.97	\$ 109,615.44
1.000	D3 04 3120 1030	Replace fan coil unit, 1 ton	\$ 1,487.68	1.15	\$ 1,762.95	0.97	\$ 1,710.83
1.000	D3 04 3120 2030	Replace fan coil unit, 3 ton	\$ 2,882.91	1.15	\$ 3,416.35	0.97	\$ 3,315.35
1.000	D3 04 3120 3030	Replace fan coil unit, 5 ton	\$ 3,872.22	1.15	\$ 4,588.71	0.97	\$ 4,453.05
1.000	D3 04 3120 4030	Replace fan coil unit, 10 ton	\$ 6,896.46	1.15	\$ 8,172.53	0.97	\$ 7,930.93
1.000	D3 04 3120 5030	Replace fan coil unit, 20 ton	\$ 11,343.56	1.15	\$ 13,442.49	0.97	\$ 13,045.09
1.000	D3 04 3120 6030	Replace fan coil unit, 30 ton	\$ 17,055.19	1.15	\$ 20,210.96	0.97	\$ 19,613.47
1.000	D3 04 3122 1040	Replace fan coil, DX 1-1/2 ton, no heat	\$ 1,407.98	1.15	\$ 1,668.51	0.97	\$ 1,619.18
1.000	D3 04 3122 2040	Replace fan coil, DX 2 ton, no heat	\$ 1,495.12	1.15	\$ 1,771.76	0.97	\$ 1,719.39
1.000	D3 04 3122 3040	Replace fan coil, DX 2-1/2 ton, no heat	\$ 1,589.69	1.15	\$ 1,883.84	0.97	\$ 1,828.15
1.000	D3 04 3122 4040	Replace fan coil, DX 3 ton, no heat	\$ 1,937.17	1.15	\$ 2,295.61	0.97	\$ 2,227.75
1.000	D3 04 3122 6060	Replace fan coil, DX 5 ton, no heat	\$ 2,551.37	1.15	\$ 3,023.46	0.97	\$ 2,934.08
1.000	D3 04 3122 8080	Replace fan coil, DX 10 ton, no heat	\$ 5,127.18	1.15	\$ 6,075.88	0.97	\$ 5,896.26
1.000	D3 04 3122 9590	Replace fan coil, DX 20 ton, no heat	\$ 12,512.45	1.15	\$ 14,827.67	0.97	\$ 14,389.32
1.000	D3 04 3124 1010	Replace fan coil, DX 1-1/2 ton, with heat	\$ 1,957.36	1.15	\$ 2,319.54	0.97	\$ 2,250.97
1.000	D3 04 3124 2010	Replace fan coil, DX 2 ton, with heat	\$ 2,097.63	1.15	\$ 2,485.76	0.97	\$ 2,412.27
1.000	D3 04 3124 3010	Replace fan coil, DX 2-1/2 ton, with heat	\$ 2,247.46	1.15	\$ 2,663.31	0.97	\$ 2,584.58
1.000	D3 04 3124 4010	Replace fan coil, DX 3 ton, with heat	\$ 2,730.96	1.15	\$ 3,236.27	0.97	\$ 3,140.60
1.000	D3 04 3128 1030	Replace unit ventilator, 750 CFM, heat/cool coils	\$ 6,678.62	1.15	\$ 7,914.39	0.97	\$ 7,680.41
1.000	D3 04 3128 2030	Replace unit ventilator, 1250 CFM, heat/cool coils	\$ 8,538.22	1.15	\$ 10,118.07	0.97	\$ 9,818.95
1.000	D3 04 3128 2050	Replace unit ventilator, 2000 CFM, heat/cool coils	\$ 14,823.67	1.15	\$ 17,566.54	0.97	\$ 17,047.22
1.000	D3 04 3140 0030	Replace duct heater	\$ 2,417.48	1.15	\$ 2,864.79	0.97	\$ 2,780.10
1.000	D3 04 3220 1010	Replace fan & motor, propeller exh., 375 CFM exhaust fan	\$ 862.32	1.15	\$ 1,021.88	0.97	\$ 991.67
1.000	D3 04 3220 1030	Replace fan & motor, propeller exh., 1000 CFM exhaust fan	\$ 1,236.90	1.15	\$ 1,465.77	0.97	\$ 1,422.43
1.000	D3 04 3220 1040	Replace fan & motor, propeller exh., 4700 CFM exhaust fan	\$ 2,000.93	1.15	\$ 2,371.17	0.97	\$ 2,301.07
1.000	D3 04 3320 0030	Replace flash tank 24 gallon	\$ 907.48	1.15	\$ 1,075.40	0.97	\$ 1,043.61

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ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN								
Escalation								
	6%							
De-Escalation to July 2009								
	1.03							
De-Escalation Factor to be Applied								
	0.97							
Green Factor								
	1.15	Assumed Value						
GREEN								
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments	
1.000	D3 04 3340 0010	Repair condensate meter	\$ 1,439.86	1.15	\$ 1,706.28	0.97	\$ 1,655.84	
1.000	D3 04 3530 1030	Replace circulator pump, 1/12 - 3/4 H.P.	\$ 3,521.55	1.15	\$ 4,173.15	0.97	\$ 4,049.78	
1.000	D3 04 3530 2030	Replace circulator. pump, 1 H.P.	\$ 5,328.02	1.15	\$ 6,313.88	0.97	\$ 6,127.22	
1.000	D3 05 3110 1030	Replace unit heater, 12 MBH, 2 PSI steam	\$ 645.55	1.15	\$ 764.99	0.97	\$ 742.38	
1.000	D3 05 3110 2030	Replace unit heater, 36 MBH, 2 PSI steam	\$ 971.24	1.15	\$ 1,150.95	0.97	\$ 1,116.93	
1.000	D3 05 3110 3030	Replace unit heater, 85 MBH, 2 PSI steam	\$ 1,164.64	1.15	\$ 1,380.14	0.97	\$ 1,339.34	
1.000	D3 05 3110 4030	Replace unit heater, 250 MBH, 2 PSI steam	\$ 3,028.49	1.15	\$ 3,588.86	0.97	\$ 3,482.76	
1.000	D3 05 3110 5020	Replace unit heater, 400 MBH, 2 PSI steam	\$ 4,829.65	1.15	\$ 5,723.29	0.97	\$ 5,554.09	
1.000	D3 05 3112 0030	Replace infrared heater suspended, commercial	\$ 515.37	1.15	\$ 610.74	0.97	\$ 592.68	
1.000	D3 05 3114 0030	Replace heater standard suspended heater	\$ 988.24	1.15	\$ 1,171.10	0.97	\$ 1,136.48	
1.000	D3 05 3116 0030	Replace heater explosionproof industrial heater	\$ 7,183.37	1.15	\$ 8,512.53	0.97	\$ 8,260.87	
1.000	D3 05 3160 0030	Replace heater convactor suspended, commercial	\$ 2,630.01	1.15	\$ 3,116.64	0.97	\$ 3,024.51	
1.000	D3 05 3170 1040	Replace terminal reheat, 12" x 24" coil	\$ 1,128.51	1.15	\$ 1,337.32	0.97	\$ 1,297.79	
1.000	D3 05 3170 2040	Replace terminal reheat, 18" x 24" coil	\$ 1,400.54	1.15	\$ 1,659.69	0.97	\$ 1,610.63	
1.000	D3 05 3170 3040	Replace terminal reheat, 36" x 36" coil	\$ 2,740.52	1.15	\$ 3,247.61	0.97	\$ 3,151.60	
1.000	D3 05 3170 4040	Replace terminal reheat, 48" x 126" coil	\$ 9,855.88	1.15	\$ 11,679.54	0.97	\$ 11,334.26	
1.000	D3 05 3278 1040	Replace multi-zone rooftop unit, 15 ton	\$ 88,995.14	1.15	\$ 105,462.19	0.97	\$ 102,344.41	
1.000	D3 05 3278 2040	Replace multi-zone rooftop unit, 25 ton	\$ 114,604.48	1.15	\$ 135,810.11	0.97	\$ 131,795.16	
1.000	D3 05 3278 3040	Replace multi-zone rooftop unit, 40 ton	\$ 168,639.14	1.15	\$ 199,842.98	0.97	\$ 193,935.01	
1.000	D3 05 3278 4040	Replace multi-zone rooftop unit, 70 ton	\$ 232,503.12	1.15	\$ 275,523.90	0.97	\$ 267,378.58	
1.000	D3 05 3278 5040	Replace multi-zone rooftop unit, 105 ton	\$ 313,050.36	1.15	\$ 370,975.05	0.97	\$ 360,007.91	
1.000	D3 05 3280 1002	Replace single zone rt. unit, 3 ton	\$ 7,576.54	1.15	\$ 8,978.45	0.97	\$ 8,713.02	
1.000	D3 05 3280 1004	Replace single zone rt. unit, 5 ton	\$ 10,812.24	1.15	\$ 12,812.87	0.97	\$ 12,434.08	
1.000	D3 05 3280 1006	Replace single zone rt. unit, 7.5 ton	\$ 15,381.55	1.15	\$ 18,227.64	0.97	\$ 17,688.78	
1.000	D3 05 3280 1008	Replace single zone rt. unit, 10 ton	\$ 20,668.12	1.15	\$ 24,492.41	0.97	\$ 23,768.34	
1.000	D3 05 3280 1040	Replace single zone rooftop unit, 15 ton	\$ 28,451.88	1.15	\$ 33,716.42	0.97	\$ 32,719.66	
1.000	D3 05 3280 2040	Replace single zone rooftop unit, 25 ton	\$ 45,693.03	1.15	\$ 54,147.75	0.97	\$ 52,546.98	
1.000	D3 05 3280 3040	Replace single zone rooftop unit, 60 ton	\$ 93,405.05	1.15	\$ 110,688.08	0.97	\$ 107,415.80	
1.000	D3 05 3280 4040	Replace single zone rooftop unit, 100 ton	\$ 181,922.00	1.15	\$ 215,583.60	0.97	\$ 209,210.30	
1.000	D3 05 3282 1040	Replace multi-zone variable volume, 50 ton	\$ 162,263.37	1.15	\$ 192,287.48	0.97	\$ 186,602.88	
1.000	D3 05 3282 2040	Replace multi-zone variable volume, 70 ton	\$ 227,721.29	1.15	\$ 269,857.28	0.97	\$ 261,879.48	
1.000	D3 05 3282 3040	Replace multi-zone variable volume, 90 ton	\$ 267,463.59	1.15	\$ 316,953.23	0.97	\$ 307,583.13	
1.000	D3 05 3282 4040	Replace multi-zone variable volume, 105 ton	\$ 300,830.13	1.15	\$ 356,493.68	0.97	\$ 345,954.65	
1.000	D3 05 3282 5040	Replace multi-zone variable volume, 140 ton	\$ 379,889.69	1.15	\$ 450,181.88	0.97	\$ 436,873.14	
1.000	D3 05 3286 1040	Replace central station A.H.U., 1300 CFM	\$ 8,979.21	1.15	\$ 10,640.66	0.97	\$ 10,326.09	
1.000	D3 05 3286 2040	Replace central station A.H.U., 1900 CFM	\$ 12,948.13	1.15	\$ 15,343.96	0.97	\$ 14,890.35	
1.000	D3 05 3286 3040	Replace central station A.H.U., 5400 CFM	\$ 30,683.40	1.15	\$ 36,360.84	0.97	\$ 35,285.91	
1.000	D3 05 3286 4040	Replace central station A.H.U., 8000 CFM	\$ 47,977.68	1.15	\$ 56,855.14	0.97	\$ 55,174.33	
1.000	D3 05 3286 5040	Replace central station A.H.U., 16,000 CFM	\$ 90,934.43	1.15	\$ 107,760.32	0.97	\$ 104,574.60	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹													
15% GF													
CostWorks 2010 - EAST HALL													
Based on National Averages													
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN													
Escalation		6%											
De-Escalation to July 2009		1.03											
De-Escalation Factor to be Applied		0.97											
Green Factor		1.15		Assumed Value									
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor		
1.000	D3 05 3286 6040	Replace central station A.H.U., 33,500 CFM	15	Q6	Ea.	246.19	\$ 170,925.00	\$ 196,175.00	1.095	\$ 214,811.63	0.97		
1.000	D3 05 3286 7040	Replace central station A.H.U., 63,000 CFM	15	Q7	Ea.	480.00	\$ 323,300.00	\$ 370,700.00	1.095	\$ 405,916.50	0.97		
1.000	D3 05 3310 1030	Replace furnace, gas, 25 MBH residential	15	Q9	Ea.	6.00	\$ 966.00	\$ 1,133.00	1.095	\$ 1,240.64	0.97		
1.000	D3 05 3310 2030	Replace furnace, gas, 100 MBH residential	15	Q9	Ea.	9.75	\$ 1,305.00	\$ 1,550.00	1.095	\$ 1,697.25	0.97		
1.000	D3 05 3310 3030	Replace furnace, gas, 200 MBH residential	15	Q9	Ea.	12.00	\$ 3,322.00	\$ 3,852.00	1.095	\$ 4,217.94	0.97		
1.000	D3 05 3320 1030	Replace furnace, oil, 55 MBH residential	15	Q9	Ea.	8.67	\$ 2,510.00	\$ 2,925.00	1.095	\$ 3,202.88	0.97		
1.000	D3 05 3320 2030	Replace furnace, oil, 100 MBH residential	15	Q1	Ea.	9.18	\$ 2,570.00	\$ 2,986.00	1.095	\$ 3,269.67	0.97		
1.000	D3 05 3320 3030	Replace furnace, oil, 200 MBH residential	15	Q1	Ea.	12.00	\$ 3,222.00	\$ 3,727.00	1.095	\$ 4,081.07	0.97		
1.000	D3 05 3330 1030	Replace furnace, electric, 25 MBH residential	15	Q20	Ea.	8.48	\$ 1,139.00	\$ 1,349.00	1.095	\$ 1,477.16	0.97		
1.000	D3 05 3330 2030	Replace furnace, electric, 50 MBH residential	15	Q20	Ea.	9.29	\$ 1,249.00	\$ 1,468.00	1.095	\$ 1,607.46	0.97		
1.000	D3 05 3330 3030	Replace furnace, electric, 85 MBH residential	15	Q20	Ea.	10.84	\$ 1,472.00	\$ 1,727.00	1.095	\$ 1,891.07	0.97		
							\$ 3,334,630.57	\$ 3,863,922.72					
1.000	D3 01 3150 0020	Replace remote tank fuel gauge	20	1 Stpi	Ea.	6.25	\$ 4,134.00	\$ 4,742.00	1.095	\$ 5,192.49	0.97		
1.000	D3 01 3170 0020	Install 10' sect. 3/8" type L copper per M.L.F. fuel oil storage	20	1 Plum	Ea.	1.86	\$ 145.00	\$ 178.00	1.095	\$ 194.91	0.97		
1.000	D3 01 3170 0030	Install 10' sect. 1/2" type L copper per M.L.F. fuel oil storage	20	1 Plum	Ea.	1.93	\$ 151.50	\$ 187.00	1.095	\$ 204.77	0.97		
1.000	D3 01 3170 0040	Install 10' sect. 5/8" type L copper per M.L.F. fuel oil storage	20	1 Plum	Ea.	1.98	\$ 170.50	\$ 207.00	1.095	\$ 226.67	0.97		
1.000	D3 01 3170 0050	Install 10' sect. 3/4" type L copper per M.L.F. fuel oil storage	20	1 Plum	Ea.	2.05	\$ 175.00	\$ 213.00	1.095	\$ 233.24	0.97		
1.000	D3 01 3170 0060	Install 10' section 1" type L copper per M.L.F. fuel oil storage	20	1 Plum	Ea.	2.29	\$ 213.50	\$ 259.50	1.095	\$ 284.15	0.97		
1.000	D3 02 3182 1010	Repair boiler, coal, 4600 MBH	20	4 Stpi	Ea.	109.54	\$ 28,117.50	\$ 32,790.00	1.095	\$ 35,905.05	0.97		
1.000	D3 02 3296 1030	Replace deaerator	20	4 Stpi	Ea.	186.50	\$ 41,250.00	\$ 48,365.00	1.095	\$ 52,959.68	0.97		
1.000	D3 03 3130 1030	Replace chiller, water cooled, 20 ton, reciprocating	20	Q7	Ea.	151.63	\$ 29,000.00	\$ 33,975.00	1.095	\$ 37,202.63	0.97		
1.000	D3 03 3130 2030	Replace chiller, water cooled 50 ton, reciprocating	20	Q7	Ea.	222.07	\$ 47,125.00	\$ 55,075.00	1.095	\$ 60,307.13	0.97		
1.000	D3 03 3130 3030	Replace chiller, water cooled, 100 ton, reciprocating	20	Q7	Ea.	349.00	\$ 85,600.00	\$ 99,950.00	1.095	\$ 109,445.25	0.97		
1.000	D3 03 3130 5030	Replace chiller, water cooled, 200 ton, reciprocating	20	Q7	Ea.	489.00	\$ 125,975.00	\$ 147,000.00	1.095	\$ 160,965.00	0.97		
1.000	D3 03 3135 1030	Replace chiller, air cooled, 20 ton	20	Q7	Ea.	160.86	\$ 35,775.00	\$ 41,825.00	1.095	\$ 45,798.38	0.97		
1.000	D3 03 3135 2030	Replace chiller, air cooled, 50 ton	20	Q7	Ea.	219.40	\$ 53,800.00	\$ 62,625.00	1.095	\$ 68,574.38	0.97		
1.000	D3 03 3135 3030	Replace chiller, air cooled, 100 ton	20	Q7	Ea.	252.21	\$ 94,150.00	\$ 108,950.00	1.095	\$ 119,300.25	0.97		
1.000	D3 03 3137 4030	Replace chiller, water cooled, 5 ton, reciprocating	20	Q5	Ea.	54.55	\$ 6,700.00	\$ 7,975.00	1.095	\$ 8,732.63	0.97		
1.000	D3 03 3137 5030	Replace chiller, water cooled, 10 ton, reciprocating	20	Q6	Ea.	130.44	\$ 14,600.00	\$ 17,450.00	1.095	\$ 19,107.75	0.97		
1.000	D3 03 3137 6030	Replace chiller, water cooled, 15 ton, reciprocating	20	Q6	Ea.	128.57	\$ 25,275.00	\$ 29,625.00	1.095	\$ 32,439.38	0.97		
1.000	D3 03 3140 1030	Replace hermetic centrifugal chiller, 100 ton	20	Q7	Ea.	489.00	\$ 119,975.00	\$ 140,000.00	1.095	\$ 153,300.00	0.97		
1.000	D3 03 3140 2030	Replace hermetic centrifugal chiller, 300 ton	20	Q7	Ea.	520.00	\$ 174,100.00	\$ 201,800.00	1.095	\$ 220,971.00	0.97		
1.000	D3 03 3140 3030	Replace hermetic centrifugal chiller, 1000 ton	20	Q7	Ea.	726.00	\$ 502,800.00	\$ 576,100.00	1.095	\$ 630,829.50	0.97		
1.000	D3 03 3142 1030	Replace open centrifugal chiller, 300 ton	20	Q7	Ea.	998.87	\$ 236,600.00	\$ 276,000.00	1.095	\$ 302,220.00	0.97		
1.000	D3 03 3142 2030	Replace open centrifugal chiller, 1000 ton	20	Q7	Ea.	3,417.40	\$ 810,200.00	\$ 944,000.00	1.095	\$ 1,033,680.00	0.97		

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
15% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value					
				GREEN			
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 05 3286 6040	Replace central station A.H.U., 33,500 CFM	\$ 208,461.15	1.15	\$ 247,033.37	0.97	\$ 239,730.32
1.000	D3 05 3286 7040	Replace central station A.H.U., 63,000 CFM	\$ 393,916.38	1.15	\$ 466,803.98	0.97	\$ 453,003.84
1.000	D3 05 3310 1030	Replace furnace, gas, 25 MBH residential	\$ 1,203.96	1.15	\$ 1,426.73	0.97	\$ 1,384.55
1.000	D3 05 3310 2030	Replace furnace, gas, 100 MBH residential	\$ 1,647.07	1.15	\$ 1,951.84	0.97	\$ 1,894.14
1.000	D3 05 3310 3030	Replace furnace, gas, 200 MBH residential	\$ 4,093.24	1.15	\$ 4,850.63	0.97	\$ 4,707.23
1.000	D3 05 3320 1030	Replace furnace, oil, 55 MBH residential	\$ 3,108.19	1.15	\$ 3,683.31	0.97	\$ 3,574.42
1.000	D3 05 3320 2030	Replace furnace, oil, 100 MBH residential	\$ 3,173.01	1.15	\$ 3,760.12	0.97	\$ 3,648.96
1.000	D3 05 3320 3030	Replace furnace, oil, 200 MBH residential	\$ 3,960.42	1.15	\$ 4,693.22	0.97	\$ 4,554.48
1.000	D3 05 3330 1030	Replace furnace, electric, 25 MBH residential	\$ 1,433.49	1.15	\$ 1,698.73	0.97	\$ 1,648.51
1.000	D3 05 3330 2030	Replace furnace, electric, 50 MBH residential	\$ 1,559.94	1.15	\$ 1,848.58	0.97	\$ 1,793.93
1.000	D3 05 3330 3030	Replace furnace, electric, 85 MBH residential	\$ 1,835.16	1.15	\$ 2,174.72	0.97	\$ 2,110.43
			\$ 4,105,914.40				\$ 4,721,801.56
			\$ 1,231,774.32	Assume 30% required		Assume 30% required	\$ 1,416,540.47
				PER 15 YEARS		PER 15 YEARS	
1.000	D3 01 3150 0020	Replace remote tank fuel gauge	\$ 5,038.98	1.15	\$ 5,971.36	0.97	\$ 5,794.83
1.000	D3 01 3170 0020	install 10' sect. 3/8" type L copper per M.L.F. fuel oil storage	\$ 189.15	1.15	\$ 224.15	0.97	\$ 217.52
1.000	D3 01 3170 0030	install 10' sect. 1/2" type L copper per M.L.F. fuel oil storage	\$ 198.71	1.15	\$ 235.48	0.97	\$ 228.52
1.000	D3 01 3170 0040	install 10' sect. 5/8" type L copper per M.L.F. fuel oil storage	\$ 219.96	1.15	\$ 260.66	0.97	\$ 252.96
1.000	D3 01 3170 0050	install 10' sect. 3/4" type L copper per M.L.F. fuel oil storage	\$ 226.34	1.15	\$ 268.22	0.97	\$ 260.29
1.000	D3 01 3170 0060	install 10' section 1" type L copper per M.L.F. fuel oil storage	\$ 275.75	1.15	\$ 326.78	0.97	\$ 317.11
1.000	D3 02 3182 1010	Repair boiler, coal, 4600 MBH	\$ 34,843.59	1.15	\$ 41,290.81	0.97	\$ 40,070.13
1.000	D3 02 3296 1030	Replace deaerator	\$ 51,394.03	1.15	\$ 60,903.63	0.97	\$ 59,103.13
1.000	D3 03 3130 1030	Replace chiller, water cooled, 20 ton, reciprocating	\$ 36,102.80	1.15	\$ 42,783.02	0.97	\$ 41,518.22
1.000	D3 03 3130 2030	Replace chiller, water cooled 50 ton, reciprocating	\$ 58,524.26	1.15	\$ 69,353.19	0.97	\$ 67,302.90
1.000	D3 03 3130 3030	Replace chiller, water cooled, 100 ton, reciprocating	\$ 106,209.72	1.15	\$ 125,862.04	0.97	\$ 122,141.18
1.000	D3 03 3130 5030	Replace chiller, water cooled, 200 ton, reciprocating	\$ 156,206.39	1.15	\$ 185,109.75	0.97	\$ 179,637.35
1.000	D3 03 3135 1030	Replace chiller, air cooled, 20 ton	\$ 44,444.44	1.15	\$ 52,668.13	0.97	\$ 51,111.10
1.000	D3 03 3135 2030	Replace chiller, air cooled, 50 ton	\$ 66,547.11	1.15	\$ 78,860.53	0.97	\$ 76,529.18
1.000	D3 03 3135 3030	Replace chiller, air cooled, 100 ton	\$ 115,773.38	1.15	\$ 137,195.29	0.97	\$ 133,139.38
1.000	D3 03 3137 4030	Replace chiller, water cooled, 5 ton, reciprocating	\$ 8,474.46	1.15	\$ 10,042.52	0.97	\$ 9,745.63
1.000	D3 03 3137 5030	Replace chiller, water cooled, 10 ton, reciprocating	\$ 18,542.87	1.15	\$ 21,973.91	0.97	\$ 21,324.30
1.000	D3 03 3137 6030	Replace chiller, water cooled, 15 ton, reciprocating	\$ 31,480.37	1.15	\$ 37,305.28	0.97	\$ 36,202.42
1.000	D3 03 3140 1030	Replace hermetic centrifugal chiller, 100 ton	\$ 148,767.99	1.15	\$ 176,295.00	0.97	\$ 171,083.19
1.000	D3 03 3140 2030	Replace hermetic centrifugal chiller, 300 ton	\$ 214,438.43	1.15	\$ 254,116.65	0.97	\$ 246,604.20
1.000	D3 03 3140 3030	Replace hermetic centrifugal chiller, 1000 ton	\$ 612,180.28	1.15	\$ 725,453.93	0.97	\$ 704,007.32
1.000	D3 03 3142 1030	Replace open centrifugal chiller, 300 ton	\$ 293,285.47	1.15	\$ 347,553.00	0.97	\$ 337,278.29
1.000	D3 03 3142 2030	Replace open centrifugal chiller, 1000 ton	\$ 1,003,121.30	1.15	\$ 1,188,732.00	0.97	\$ 1,153,589.50

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹													
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ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN													
Escalation	6%												
De-Escalation to July 2009	1.03												NON-GREEN
De-Escalation Factor to be Applied	0.97												
Green Factor	1.15	Assumed Value											
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor		
1.000	D3 03 3145 1030	Replace chiller, absorption, 100 ton	20	Q7	Ea.	465.00	\$ 166,000.00	\$ 191,900.00	1.095	\$ 210,130.50	0.97		
1.000	D3 03 3145 2030	Replace chiller, absorption, 350 ton	20	Q7	Ea.	600.00	\$ 364,700.00	\$ 418,300.00	1.095	\$ 458,038.50	0.97		
1.000	D3 03 3145 3030	Replace chiller, absorption, 950 ton	20	Q7	Ea.	799.00	\$ 719,300.00	\$ 822,900.00	1.095	\$ 901,075.50	0.97		
1.000	D3 04 3210 1030	Replace fan, induced draft, 2000 CFM	20	Q9	Ea.	9.46	\$ 5,050.00	\$ 5,818.00	1.095	\$ 6,370.71	0.97		
1.000	D3 04 3210 2030	Replace fan, induced draft, 6700 CFM	20	Q9	Ea.	13.57	\$ 6,776.00	\$ 7,790.00	1.095	\$ 8,530.05	0.97		
1.000	D3 04 3210 3030	Replace fan, induced draft, 17,700 CFM	20	Q9	Ea.	39.01	\$ 13,620.00	\$ 15,700.00	1.095	\$ 17,191.50	0.97		
1.000	D3 04 3220 2030	Replace roof mounted exhaust fan, 800 CFM exhaust fan	20	Q20	Ea.	7.80	\$ 1,272.00	\$ 1,483.00	1.095	\$ 1,623.89	0.97		
1.000	D3 04 3220 2040	Replace roof mounted exhaust fan, 2000 CFM exhaust fan	20	Q20	Ea.	9.75	\$ 2,133.00	\$ 2,504.00	1.095	\$ 2,741.88	0.97		
1.000	D3 04 3220 2050	Replace roof mounted exhaust fan, 8500 CFM exhaust fan	20	Q20	Ea.	13.00	\$ 3,369.00	\$ 3,905.00	1.095	\$ 4,275.98	0.97		
1.000	D3 04 3220 2060	Replace roof mounted exhaust fan, 20,300 CFM exhaust fan	20	Q20	Ea.	39.01	\$ 9,485.00	\$ 11,015.00	1.095	\$ 12,061.43	0.97		
1.000	D3 04 3430 0010	Replace radiator, baseboard 10' section	20	Q5	Ea.	6.78	\$ 751.00	\$ 894.00	1.095	\$ 978.93	0.97		
1.000	D3 04 3440 0010	Replace finned radiator wall, 10' section	20	Q5	Ea.	10.40	\$ 1,135.00	\$ 1,350.00	1.095	\$ 1,478.25	0.97		
1.000	D3 04 3520 1020	Replace gate valve, partial, 3/8" - 1 - 1/2" valves	20	1 Stpi	Ea.	1.35	\$ 243.09	\$ 285.87	1.095	\$ 313.03	0.97		
1.000	D3 04 3520 2020	Replace gate valve, partial, 2" - 3" valves	20	Q1	Ea.	2.06	\$ 739.59	\$ 851.87	1.095	\$ 932.80	0.97		
1.000	D3 04 3520 3030	Replace drain valve, 3/4" valves	20	1 Stpi	Ea.	0.63	\$ 50.89	\$ 62.37	1.095	\$ 68.30	0.97		
1.000	D3 05 3150 0030	Replace heater wall mounted/recessed heater, with fan	20	1 Elec	Ea.	3.33	\$ 395.00	\$ 470.00	1.095	\$ 514.65	0.97		
1.000	D3 05 3245 1030	Replace heat pump, 1.5 ton, air to air split	20	Q5	Ea.	12.99	\$ 3,026.00	\$ 3,540.00	1.095	\$ 3,876.30	0.97		
1.000	D3 05 3245 2030	Replace heat pump, 5 ton, air to air split	20	Q5	Ea.	62.37	\$ 7,375.00	\$ 8,775.00	1.095	\$ 9,608.63	0.97		
1.000	D3 05 3245 3030	Replace heat pump, 10 ton, air to air split	20	Q6	Ea.	73.47	\$ 13,075.00	\$ 15,425.00	1.095	\$ 16,890.38	0.97		
1.000	D3 05 3245 4030	Replace heat pump, 25 ton, air to air split	20	Q7	Ea.	184.54	\$ 31,975.00	\$ 37,600.00	1.095	\$ 41,172.00	0.97		
1.000	D3 05 3245 5030	Replace heat pump, 50 ton, air to air split	20	Q7	Ea.	303.97	\$ 69,925.00	\$ 81,925.00	1.095	\$ 89,707.88	0.97		
1.000	D3 05 3245 6030	Replace heat pump, thru-wall unit, 1.5 ton	20	Q5	Ea.	20.13	\$ 3,965.00	\$ 4,635.00	1.095	\$ 5,075.33	0.97		
1.000	D3 05 3245 7030	Replace heat pump, thru-wall unit, 5 ton	20	Q5	Ea.	48.00	\$ 7,350.00	\$ 8,675.00	1.095	\$ 9,499.13	0.97		
1.000	D3 05 3272 1030	Replace air conditioner, DX, 5 ton	20	Q6	Ea.	39.00	\$ 6,655.00	\$ 7,825.00	1.095	\$ 8,568.38	0.97		
1.000	D3 05 3272 2030	Replace air conditioner, DX, 20 ton	20	Q7	Ea.	69.35	\$ 19,125.00	\$ 22,175.00	1.095	\$ 24,281.63	0.97		
1.000	D3 05 3272 3030	Replace air conditioner, DX, 50 ton	20	Q7	Ea.	124.68	\$ 53,550.00	\$ 61,675.00	1.095	\$ 67,534.13	0.97		
1.000	D3 05 3274 1015	Replace computer room A/C, incl. remote air cooled cond, 5 ton	20	Q6	Ea.	48.56	\$ 21,780.00	\$ 25,075.00	1.095	\$ 27,457.13	0.97		
1.000	D3 05 3274 1025	Replace computer room A/C, incl. remote air cooled cond, 10 ton	20	Q6	Ea.	97.90	\$ 42,925.00	\$ 49,450.00	1.095	\$ 54,147.75	0.97		
1.000	D3 05 3274 1035	Replace computer room A/C, incl. remote air cooled cond, 15 ton	20	Q6	Ea.	123.04	\$ 48,125.00	\$ 55,775.00	1.095	\$ 61,073.63	0.97		
1.000	D3 05 3274 1045	Replace computer room A/C, incl. remote air cooled cond, 20 ton	20	Q6	Ea.	123.11	\$ 56,925.00	\$ 65,775.00	1.095	\$ 72,023.63	0.97		
1.000	D3 05 3276 1015	Replace computer room A/C, chilled water, 5 ton	20	Q6	Ea.	41.07	\$ 15,980.00	\$ 18,375.00	1.095	\$ 20,120.63	0.97		
1.000	D3 05 3276 1025	Replace computer room A/C, chilled water, 10 ton	20	Q6	Ea.	76.00	\$ 18,325.00	\$ 21,350.00	1.095	\$ 23,378.25	0.97		
1.000	D3 05 3276 1035	Replace computer room A/C, chilled water, 15 ton	20	Q6	Ea.	94.76	\$ 20,225.00	\$ 23,675.00	1.095	\$ 25,924.13	0.97		
1.000	D3 05 3276 1045	Replace computer room A/C, chilled water, 20 ton	20	Q6	Ea.	70.16	\$ 19,525.00	\$ 22,675.00	1.095	\$ 24,829.13	0.97		
1.000	D3 05 3410 0030	Replace baseboard heater units	20	1 Elec	Ea.	2.53	\$ 227.00	\$ 275.00	1.095	\$ 301.13	0.97		
1.000	D4 01 3310 1030	Replace sprinkler head	20	1 Plum	Ea.	0.98	\$ 71.00	\$ 87.00	1.095	\$ 95.27	0.97		
							\$ 4,191,180.57	\$ 4,849,282.61					

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
15% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value					
				GREEN			
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 03 3145 1030	Replace chiller, absorption, 100 ton	\$ 203,918.41	1.15	\$ 241,650.08	0.97	\$ 234,506.17
1.000	D3 03 3145 2030	Replace chiller, absorption, 350 ton	\$ 444,497.50	1.15	\$ 526,744.28	0.97	\$ 511,172.13
1.000	D3 03 3145 3030	Replace chiller, absorption, 950 ton	\$ 874,436.99	1.15	\$ 1,036,236.83	0.97	\$ 1,005,602.54
1.000	D3 04 3210 1030	Replace fan, induced draft, 2000 CFM	\$ 6,182.37	1.15	\$ 7,326.32	0.97	\$ 7,109.73
1.000	D3 04 3210 2030	Replace fan, induced draft, 6700 CFM	\$ 8,277.88	1.15	\$ 9,809.56	0.97	\$ 9,519.56
1.000	D3 04 3210 3030	Replace fan, induced draft, 17,700 CFM	\$ 16,683.27	1.15	\$ 19,770.23	0.97	\$ 19,185.76
1.000	D3 04 3220 2030	Replace roof mounted exhaust fan, 800 CFM exhaust fan	\$ 1,575.88	1.15	\$ 1,867.47	0.97	\$ 1,812.26
1.000	D3 04 3220 2040	Replace roof mounted exhaust fan, 2000 CFM exhaust fan	\$ 2,660.82	1.15	\$ 3,153.16	0.97	\$ 3,059.95
1.000	D3 04 3220 2050	Replace roof mounted exhaust fan, 8500 CFM exhaust fan	\$ 4,149.56	1.15	\$ 4,917.37	0.97	\$ 4,772.00
1.000	D3 04 3220 2060	Replace roof mounted exhaust fan, 20,300 CFM exhaust fan	\$ 11,704.85	1.15	\$ 13,870.64	0.97	\$ 13,460.58
1.000	D3 04 3430 0010	Replace radiator, baseboard 10' section	\$ 949.99	1.15	\$ 1,125.77	0.97	\$ 1,092.49
1.000	D3 04 3440 0010	Replace finned radiator wall, 10' section	\$ 1,434.55	1.15	\$ 1,699.99	0.97	\$ 1,649.73
1.000	D3 04 3520 1020	Replace gate valve, partial, 3/8" - 1 - 1/2" valves	\$ 303.77	1.15	\$ 359.98	0.97	\$ 349.34
1.000	D3 04 3520 2020	Replace gate valve, partial, 2" - 3" valves	\$ 905.22	1.15	\$ 1,072.72	0.97	\$ 1,041.00
1.000	D3 04 3520 3030	Replace drain valve, 3/4" valves	\$ 66.28	1.15	\$ 78.54	0.97	\$ 76.22
1.000	D3 05 3150 0030	Replace heater wall mounted/recessed heater, with fan	\$ 499.44	1.15	\$ 591.85	0.97	\$ 574.35
1.000	D3 05 3245 1030	Replace heat pump, 1.5 ton, air to air split	\$ 3,761.70	1.15	\$ 4,457.75	0.97	\$ 4,325.96
1.000	D3 05 3245 2030	Replace heat pump, 5 ton, air to air split	\$ 9,324.57	1.15	\$ 11,049.92	0.97	\$ 10,723.25
1.000	D3 05 3245 3030	Replace heat pump, 10 ton, air to air split	\$ 16,391.04	1.15	\$ 19,423.93	0.97	\$ 18,849.70
1.000	D3 05 3245 4030	Replace heat pump, 25 ton, air to air split	\$ 39,954.83	1.15	\$ 47,347.80	0.97	\$ 45,948.06
1.000	D3 05 3245 5030	Replace heat pump, 50 ton, air to air split	\$ 87,055.84	1.15	\$ 103,164.06	0.97	\$ 100,114.22
1.000	D3 05 3245 6030	Replace heat pump, thru-wall unit, 1.5 ton	\$ 4,925.28	1.15	\$ 5,836.62	0.97	\$ 5,664.08
1.000	D3 05 3245 7030	Replace heat pump, thru-wall unit, 5 ton	\$ 9,218.30	1.15	\$ 10,923.99	0.97	\$ 10,601.05
1.000	D3 05 3272 1030	Replace air conditioner, DX, 5 ton	\$ 8,315.07	1.15	\$ 9,853.63	0.97	\$ 9,562.33
1.000	D3 05 3272 2030	Replace air conditioner, DX, 20 ton	\$ 23,563.79	1.15	\$ 27,923.87	0.97	\$ 27,098.36
1.000	D3 05 3272 3030	Replace air conditioner, DX, 50 ton	\$ 65,537.61	1.15	\$ 77,664.24	0.97	\$ 75,368.25
1.000	D3 05 3274 1015	Replace computer room A/C, incl. remote air cooled cond, 5 ton	\$ 26,645.41	1.15	\$ 31,575.69	0.97	\$ 30,642.22
1.000	D3 05 3274 1025	Replace computer room A/C, incl. remote air cooled cond, 10 ton	\$ 52,546.98	1.15	\$ 62,269.91	0.97	\$ 60,429.03
1.000	D3 05 3274 1035	Replace computer room A/C, incl. remote air cooled cond, 15 ton	\$ 59,268.10	1.15	\$ 70,234.67	0.97	\$ 68,158.32
1.000	D3 05 3274 1045	Replace computer room A/C, incl. remote air cooled cond, 20 ton	\$ 69,894.39	1.15	\$ 82,827.17	0.97	\$ 80,378.55
1.000	D3 05 3276 1015	Replace computer room A/C, chilled water, 5 ton	\$ 19,525.80	1.15	\$ 23,138.72	0.97	\$ 22,454.67
1.000	D3 05 3276 1025	Replace computer room A/C, chilled water, 10 ton	\$ 22,687.12	1.15	\$ 26,884.99	0.97	\$ 26,090.19
1.000	D3 05 3276 1035	Replace computer room A/C, chilled water, 15 ton	\$ 25,157.73	1.15	\$ 29,812.74	0.97	\$ 28,931.39
1.000	D3 05 3276 1045	Replace computer room A/C, chilled water, 20 ton	\$ 24,095.10	1.15	\$ 28,553.49	0.97	\$ 27,709.37
1.000	D3 05 3410 0030	Replace baseboard heater units	\$ 292.22	1.15	\$ 346.29	0.97	\$ 336.06
1.000	D4 01 3310 1030	Replace sprinkler head	\$ 92.45	1.15	\$ 109.55	0.97	\$ 106.32
			\$ 5,152,985.90				\$ 5,925,933.79
			\$ 1,545,895.77	Assume 30% required		Assume 30% required	\$ 1,777,780.14

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
15% GF												
CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation 6%												
De-Escalation to July 2009 1.03												
De-Escalation Factor to be Applied 0.97												
Green Factor 1.15 Assumed Value												
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 01 3170 0130	Replace 1000' type L 3/8" copper, fuel oil storage	25	1 Plum	M.L.F.	185.72	\$ 14,500.00	\$ 17,800.00	1.095	\$ 19,491.00	0.97	
1.000	D3 01 3170 0140	Replace 1000' type L 1/2" copper, fuel oil storage	25	1 Plum	M.L.F.	192.61	\$ 15,150.00	\$ 18,700.00	1.095	\$ 20,476.50	0.97	
1.000	D3 01 3170 0150	Replace 1000' type L 5/8" copper, fuel oil storage	25	1 Plum	M.L.F.	197.48	\$ 17,050.00	\$ 20,700.00	1.095	\$ 22,666.50	0.97	
1.000	D3 01 3170 0160	Replace 1000' type L 3/4" copper, fuel oil storage	25	1 Plum	M.L.F.	205.29	\$ 17,500.00	\$ 21,300.00	1.095	\$ 23,323.50	0.97	
1.000	D3 01 3170 0170	Replace 1000' type L 1" copper, fuel oil storage	25	1 Plum	M.L.F.	229.41	\$ 21,325.00	\$ 25,950.00	1.095	\$ 28,415.25	0.97	
1.000	D3 04 3450 1020	Replace coil, hot water boost, 12" x 24" duct coil, 1-row	25	Q5	Ea.	1.97	\$ 474.50	\$ 557.00	1.095	\$ 609.92	0.97	
1.000	D3 04 3450 1030	Replace coil, hot water boost, 24" x 24" duct coil, 1-row	25	Q5	Ea.	5.15	\$ 744.50	\$ 879.00	1.095	\$ 962.51	0.97	
1.000	D3 04 3450 1040	Replace coil, hot water boost, 24" x 36" duct coil, 1-row	25	Q5	Ea.	7.74	\$ 1,084.00	\$ 1,287.00	1.095	\$ 1,409.27	0.97	
1.000	D3 04 3450 1050	Replace coil, hot water boost, 36" x 36" duct coil, 1-row	25	Q5	Ea.	11.60	\$ 1,474.00	\$ 1,730.00	1.095	\$ 1,894.35	0.97	
1.000	D3 04 3510 0010	install new gasket, 4" pipe size, steel/iron	25	1 Plum	Ea.	2.60	\$ 178.00	\$ 221.00	1.095	\$ 242.00	0.97	
							\$ 89,480.00	\$ 109,124.00				
1.000	D3 01 3110 0010	Replace 275 gallon fuel oil storage tank	30	Q5	Ea.	6.24	\$ 775.00	\$ 921.00	1.095	\$ 1,008.50	0.97	
1.000	D3 01 3160 0020	Replace oil filter housing	30	1 Stpi	Ea.	0.52	\$ 54.50	\$ 66.00	1.095	\$ 72.27	0.97	
1.000	D3 01 3210 0010	install new 2" gasket, 1 per M.L.F. natural gas, steel/iron	30	1 Stpi	Ea.	1.60	\$ 108.50	\$ 135.00	1.095	\$ 147.83	0.97	
1.000	D3 01 3210 0020	install new 3" gasket, 1 per M.L.F. natural gas, steel/iron	30	1 Stpi	Ea.	1.89	\$ 127.50	\$ 158.50	1.095	\$ 173.56	0.97	
1.000	D3 01 3210 0030	install new 4" gasket, 1 per M.L.F. natural gas, steel/iron	30	1 Stpi	Ea.	2.60	\$ 177.50	\$ 221.00	1.095	\$ 242.00	0.97	
1.000	D3 01 3210 0040	install new 6" gasket, 1 per M.L.F. natural gas, steel/iron	30	1 Stpi	Ea.	3.47	\$ 239.00	\$ 297.00	1.095	\$ 325.22	0.97	
1.000	D3 02 3180 1060	Replace boiler, gas, 250 MBH	30	Q7	Ea.	65.66	\$ 7,450.00	\$ 8,900.00	1.095	\$ 9,745.50	0.97	
1.000	D3 02 3180 2070	Replace boiler, gas, 2000 MBH	30	Q7	Ea.	166.76	\$ 29,925.00	\$ 35,225.00	1.095	\$ 38,571.38	0.97	
1.000	D3 02 3180 3070	Replace boiler, gas, 10,000 MBH	30	Q7	Ea.	1,086.40	\$ 211,300.00	\$ 247,900.00	1.095	\$ 271,450.50	0.97	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
15% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor PER 20 YEARS	GREEN Total Adjusted Green OH&P Location	De-Escalation Factor PER 20 YEARS	Total Green with All Adjustments
1.000	D3 01 3170 0130	Replace 1000' type L 3/8" copper, fuel oil storage	\$ 18,914.79	1.15	\$ 22,414.65	0.97	\$ 21,752.01
1.000	D3 01 3170 0140	Replace 1000' type L 1/2" copper, fuel oil storage	\$ 19,871.15	1.15	\$ 23,547.98	0.97	\$ 22,851.83
1.000	D3 01 3170 0150	Replace 1000' type L 5/8" copper, fuel oil storage	\$ 21,996.41	1.15	\$ 26,066.48	0.97	\$ 25,295.87
1.000	D3 01 3170 0160	Replace 1000' type L 3/4" copper, fuel oil storage	\$ 22,633.99	1.15	\$ 26,822.03	0.97	\$ 26,029.09
1.000	D3 01 3170 0170	Replace 1000' type L 1" copper, fuel oil storage	\$ 27,575.21	1.15	\$ 32,677.54	0.97	\$ 31,711.49
1.000	D3 04 3450 1020	Replace coil, hot water boost, 12" x 24" duct coil, 1-row	\$ 591.88	1.15	\$ 701.40	0.97	\$ 680.67
1.000	D3 04 3450 1030	Replace coil, hot water boost, 24" x 24" duct coil, 1-row	\$ 934.05	1.15	\$ 1,106.88	0.97	\$ 1,074.16
1.000	D3 04 3450 1040	Replace coil, hot water boost, 24" x 36" duct coil, 1-row	\$ 1,367.60	1.15	\$ 1,620.65	0.97	\$ 1,572.74
1.000	D3 04 3450 1050	Replace coil, hot water boost, 36" x 36" duct coil, 1-row	\$ 1,838.35	1.15	\$ 2,178.50	0.97	\$ 2,114.10
1.000	D3 04 3510 0010	install new gasket, 4" pipe size, steel/iron	\$ 234.84	1.15	\$ 278.29	0.97	\$ 270.07
			\$ 115,958.27				\$ 133,352.01
			\$ 34,787.48	Assume 30% required		Assume 30% required	\$ 40,005.60
				PER 25 YEARS		PER 25 YEARS	
1.000	D3 01 3110 0010	Replace 275 gallon fuel oil storage tank	\$ 978.68	1.15	\$ 1,159.77	0.97	\$ 1,125.48
1.000	D3 01 3160 0020	Replace oil filter housing	\$ 70.13	1.15	\$ 83.11	0.97	\$ 80.65
1.000	D3 01 3210 0010	install new 2" gasket, 1 per M.L.F. natural gas, steel/iron	\$ 143.45	1.15	\$ 170.00	0.97	\$ 164.97
1.000	D3 01 3210 0020	install new 3" gasket, 1 per M.L.F. natural gas, steel/iron	\$ 168.43	1.15	\$ 199.59	0.97	\$ 193.69
1.000	D3 01 3210 0030	install new 4" gasket, 1 per M.L.F. natural gas, steel/iron	\$ 234.84	1.15	\$ 278.29	0.97	\$ 270.07
1.000	D3 01 3210 0040	install new 6" gasket, 1 per M.L.F. natural gas, steel/iron	\$ 315.60	1.15	\$ 374.00	0.97	\$ 362.94
1.000	D3 02 3180 1060	Replace boiler, gas, 250 MBH	\$ 9,457.39	1.15	\$ 11,207.33	0.97	\$ 10,876.00
1.000	D3 02 3180 2070	Replace boiler, gas, 2000 MBH	\$ 37,431.09	1.15	\$ 44,357.08	0.97	\$ 43,045.75
1.000	D3 02 3180 3070	Replace boiler, gas, 10,000 MBH	\$ 263,425.61	1.15	\$ 312,168.08	0.97	\$ 302,939.45

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
15% GF												
CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation 6%												
De-Escalation to July 2009 1.03												
De-Escalation Factor to be Applied 0.97												
Green Factor 1.15 Assumed Value												
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 02 3182 1050	Replace boiler, coal, 4600 MBH	30	5 Stpi	Ea.	366.91	\$ 119,850.00	\$ 138,825.00	1.095	\$ 152,013.38	0.97	
1.000	D3 02 3184 1060	Replace boiler, oil, 250 MBH	30	Q7	Ea.	73.39	\$ 8,050.00	\$ 9,650.00	1.095	\$ 10,566.75	0.97	
1.000	D3 02 3184 2060	Replace boiler, oil, 2000 MBH	30	Q7	Ea.	205.76	\$ 31,625.00	\$ 37,425.00	1.095	\$ 40,980.38	0.97	
1.000	D3 02 3184 3060	Replace boiler, oil, 10,000 MBH	30	Q7	Ea.	894.01	\$ 193,800.00	\$ 226,100.00	1.095	\$ 247,579.50	0.97	
1.000	D3 02 3186 1050	Replace boiler, gas/oil, 2000 MBH	30	Q7	Ea.	172.76	\$ 41,725.00	\$ 48,625.00	1.095	\$ 53,244.38	0.97	
1.000	D3 02 3186 2050	Replace boiler, gas/oil, 20,000 MBH	30	Q7	Ea.	4,684.20	\$ 515,000.00	\$ 619,000.00	1.095	\$ 677,805.00	0.97	
1.000	D3 04 3310 0030	Replace steam converter	30	Q5	Ea.	6.24	\$ 3,220.00	\$ 3,701.00	1.095	\$ 4,052.60	0.97	
1.000	D3 04 3340 0030	Replace condensate meter 500 lb./hr.	30	1 Stpi	Ea.	1.11	\$ 2,649.00	\$ 3,030.00	1.095	\$ 3,317.85	0.97	
1.000	D3 04 3340 0130	Replace condensate meter 1500 lb./hr.	30	1 Stpi	Ea.	2.23	\$ 2,948.00	\$ 3,359.50	1.095	\$ 3,678.65	0.97	
							\$ 1,169,024.00	\$ 1,383,539.00				
1.000	D3 04 3252 0020	Replace metal pipe flue, architectural fireplace	50	2 Sswk	L.F.	0.31	\$ 25.10	\$ 30.22	1.095	\$ 33.09	0.97	
1.000	D3 04 3410 0010	Replace radiator valve 1/2" angle union	50	1 Stpi	Ea.	0.65	\$ 80.45	\$ 96.45	1.095	\$ 105.61	0.97	
1.000	D3 04 3410 0020	Replace radiator valve 3/4" angle union	50	1 Stpi	Ea.	0.78	\$ 91.70	\$ 110.50	1.095	\$ 121.00	0.97	
1.000	D3 04 3410 0030	Replace radiator valve 1" angle union	50	1 Stpi	Ea.	0.82	\$ 101.10	\$ 121.00	1.095	\$ 132.50	0.97	
1.000	D3 04 3410 0040	Replace radiator valve 1-1/4" angle union	50	1 Stpi	Ea.	1.04	\$ 129.50	\$ 154.00	1.095	\$ 168.63	0.97	
1.000	D3 04 3420 0010	Replace C.I. radiator 4 tube 25"H 10' section	50	Q5	Section	3.25	\$ 482.50	\$ 573.50	1.095	\$ 627.98	0.97	
1.000	D3 04 3540 0020	Replace expansion tank, 24 gal capacity	50	Q5	Ea.	2.23	\$ 1,268.00	\$ 1,453.50	1.095	\$ 1,591.58	0.97	
1.000	D3 04 3540 0120	Replace expansion tank, 60 gal capacity	50	Q5	Ea.	3.90	\$ 1,850.00	\$ 2,119.00	1.095	\$ 2,320.31	0.97	
1.000	D3 04 3540 0220	Replace expansion tank, 175 gal capacity	50	Q5	Ea.	7.79	\$ 4,900.00	\$ 5,638.00	1.095	\$ 6,173.61	0.97	
1.000	D3 04 3540 0320	Replace expansion tank, 400 gal capacity	50	Q5	Ea.	11.16	\$ 10,165.00	\$ 11,669.00	1.095	\$ 12,777.56	0.97	
							\$ 19,093.35	\$ 21,965.17				
NOTES:												
REPORT RECOMMENDATIONS												
SHALL INDICATE THAT THE ITEMS MENTIONED ABOVE												
HAVE NOT BEEN QUANTIFIED												
THEREFORE IT IS FOR ANALYSIS ONLY AND DOES NOT												
DEPICT CURRENT OR APPLICABLE CONDITIONS												
FOOTNOTES:												
1												
RS Means CostWorks 2010 Operations and Maintenance												

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
15% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value					
				GREEN			
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 02 3182 1050	Replace boiler, coal, 4600 MBH	\$ 147,519.40	1.15	\$ 174,815.38	0.97	\$ 169,647.31
1.000	D3 02 3184 1060	Replace boiler, oil, 250 MBH	\$ 10,254.37	1.15	\$ 12,151.76	0.97	\$ 11,792.52
1.000	D3 02 3184 2060	Replace boiler, oil, 2000 MBH	\$ 39,768.87	1.15	\$ 47,127.43	0.97	\$ 45,734.20
1.000	D3 02 3184 3060	Replace boiler, oil, 10,000 MBH	\$ 240,260.30	1.15	\$ 284,716.43	0.97	\$ 276,299.35
1.000	D3 02 3186 1050	Replace boiler, gas/oil, 2000 MBH	\$ 51,670.31	1.15	\$ 61,231.03	0.97	\$ 59,420.86
1.000	D3 02 3186 2050	Replace boiler, gas/oil, 20,000 MBH	\$ 657,767.04	1.15	\$ 779,475.75	0.97	\$ 756,432.10
1.000	D3 04 3310 0030	Replace steam converter	\$ 3,932.79	1.15	\$ 4,660.48	0.97	\$ 4,522.71
1.000	D3 04 3340 0030	Replace condensate meter 500 lb./hr.	\$ 3,219.76	1.15	\$ 3,815.53	0.97	\$ 3,702.73
1.000	D3 04 3340 0130	Replace condensate meter 1500 lb./hr.	\$ 3,569.90	1.15	\$ 4,230.45	0.97	\$ 4,105.39
			\$ 1,470,187.97				\$ 1,690,716.17
			\$ 735,093.99	Assume 50% required		Assume 50% required	\$ 845,358.08
				PER 30 YEARS		PER 30 YEARS	
1.000	D3 04 3252 0020	Replace metal pipe flue, architectural fireplace	\$ 32.11	1.15	\$ 38.05	0.97	\$ 36.93
1.000	D3 04 3410 0010	Replace radiator valve 1/2" angle union	\$ 102.49	1.15	\$ 121.45	0.97	\$ 117.86
1.000	D3 04 3410 0020	Replace radiator valve 3/4" angle union	\$ 117.42	1.15	\$ 139.15	0.97	\$ 135.03
1.000	D3 04 3410 0030	Replace radiator valve 1" angle union	\$ 128.58	1.15	\$ 152.37	0.97	\$ 147.86
1.000	D3 04 3410 0040	Replace radiator valve 1-1/4" angle union	\$ 163.64	1.15	\$ 193.92	0.97	\$ 188.19
1.000	D3 04 3420 0010	Replace C.I. radiator 4 tube 25"H 10' section	\$ 609.42	1.15	\$ 722.18	0.97	\$ 700.83
1.000	D3 04 3540 0020	Replace expansion tank, 24 gal capacity	\$ 1,544.53	1.15	\$ 1,830.32	0.97	\$ 1,776.21
1.000	D3 04 3540 0120	Replace expansion tank, 60 gal capacity	\$ 2,251.71	1.15	\$ 2,668.35	0.97	\$ 2,589.47
1.000	D3 04 3540 0220	Replace expansion tank, 175 gal capacity	\$ 5,991.10	1.15	\$ 7,099.65	0.97	\$ 6,889.76
1.000	D3 04 3540 0320	Replace expansion tank, 400 gal capacity	\$ 12,399.81	1.15	\$ 14,694.19	0.97	\$ 14,259.78
			\$ 23,340.82				\$ 26,841.94
			\$ 11,670.41	Assume 50% required		Assume 50% required	\$ 13,420.97
				PER 50 YEARS		PER 50 YEARS	
NOTES:							
REPORT RECOMMENDATIONS							
SHALL INDICATE THAT THE ITEMS MENTIONED ABOVE							
HAVE NOT BEEN QUANTIFIED							
THEREFORE IT IS FOR ANALYSIS ONLY AND DOES NOT							
DEPICT CURRENT OR APPLICABLE CONDITIONS							
FOOTNOTES:							
1							
RS Means CostWorks 2010 Operations and Maintenance							

Appendix C-SM6 15% GF Summary of FMRRC

Summary of Green versus Non-Green Major Repair and Replacement Costs based on Frequency (HVAC & FP) 15% GF			
Type of Construction	Description	TOTAL COST	COMMENTS
Non-Green	Up to 10 Years	\$ 748,879.83	
Non-Green	10 th yr on till 25 th Year	\$ 2,831,875.84	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
Non-Green	25 th yr on till 50 th Year	\$ 746,764.39	
Green	Up to 10 Years	\$ 861,211.80	
Green	10 th yr on till 25 th Year	\$ 3,256,657.22	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
Green	25 th yr on till 50 th Year	\$ 858,779.05	
SUMMARY OF FINDINGS			
Green v. Non-Green	13.04%	Green Major Repair and Replacement is 13.04% higher in cost than that of a traditional building	

Appendix C-SM7 10% GF Analysis of YPM

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹									
ANNUALIZED-10% GF									
PROJECT:	EAST HALL								
LOCATION:	US NATIONAL AVERAGES								
Escalation	6%								
De-Escalation to July 2009	1.03								
De-Escalation Factor to be Applied	0.97								
Green Factor	1.10	Assumed Value							
Qty	Assembly Number	Description	Labor Hours	Total In-House	Total Incl. O&P	Location Factor	Location Adjusted Total O&P	De-Escalation Factor to July 2009 Costs	
1.000	D3 02 5130 1950	Boiler, hot water, oil, gas, or comb. fired, up to 120 MBH, annualized	12.53	\$ 885.00	\$ 1,100.00	1.095	\$ 1,204.50	0.97	
1.000	D3 02 5110 1950	Boiler, electric, to 1500 gal., annualized	3.83	\$ 315.00	\$ 390.00	1.095	\$ 427.05	0.97	
1.000	D3 02 5130 2950	Boiler, hot water, oil, gas, or comb. fired, 120 - 500 MBH, annualized	15.45	\$ 1,100.00	\$ 1,375.00	1.095	\$ 1,505.63	0.97	
1.000	D3 02 5130 3950	Boiler, hot water, oil, gas, or comb. fired, 500 -1000 MBH, annualized	17.38	\$ 1,225.00	\$ 1,525.00	1.095	\$ 1,669.88	0.97	
1.000	D3 02 5130 4950	Boiler, hot water, oil, gas, or comb. fired, over 1000 MBH, annualized	19.70	\$ 1,400.00	\$ 1,725.00	1.095	\$ 1,888.88	0.97	
1.000	D3 02 5140 1950	Boiler, steam, oil, gas, or comb. fired, up to 120 MBH, annualized	16.19	\$ 1,200.00	\$ 1,475.00	1.095	\$ 1,615.13	0.97	
1.000	D3 02 5140 2950	Boiler, steam, oil, gas, or comb. fired, 120 to 500 MBH, annualized	18.98	\$ 1,425.00	\$ 1,750.00	1.095	\$ 1,916.25	0.97	
1.000	D3 02 5140 3950	Boiler, steam, oil, gas, or comb. fired, 500 to 1000 MBH, annualized	20.70	\$ 1,550.00	\$ 1,925.00	1.095	\$ 2,107.88	0.97	
1.000	D3 02 5140 4950	Boiler, steam, oil, gas, or comb. fired, over 1000 MBH, annualized	22.45	\$ 1,675.00	\$ 2,075.00	1.095	\$ 2,272.13	0.97	
1.000	D3 02 5210 1950	Deaerator tank, annualized	1.51	\$ 138.00	\$ 167.00	1.095	\$ 182.87	0.97	
1.000	D3 02 5310 1950	Pump, boiler fuel oil, annualized	1.23	\$ 132.00	\$ 159.00	1.095	\$ 174.11	0.97	
1.000	D3 02 5310 2950	Pump, condensate return, over 1 H.P., annualized	1.12	\$ 125.00	\$ 151.00	1.095	\$ 165.35	0.97	
1.000	D3 02 5310 3950	Pump, condensate return unit, 2 pumps, annualized	1.14	\$ 180.00	\$ 212.00	1.095	\$ 232.14	0.97	
1.000	D3 03 5110 1950	Water cooling tower, up to 50 tons, annualized	4.55	\$ 330.00	\$ 410.00	1.095	\$ 448.95	0.97	
1.000	D3 03 5110 2950	Water cooling tower, 50 thru 500 tons, annualized	9.91	\$ 705.00	\$ 870.00	1.095	\$ 952.65	0.97	
1.000	D3 03 5110 3950	Water cooling tower, 500 thru 1000 tons, annualized	17.73	\$ 1,300.00	\$ 1,600.00	1.095	\$ 1,752.00	0.97	
1.000	D3 03 5130 1950	Chiller, recip., air cooled, up to 25 tons, annualized	9.71	\$ 680.00	\$ 840.00	1.095	\$ 919.80	0.97	
1.000	D3 03 5130 2950	Chiller, recip., air cooled, over 25 tons, annualized	12.89	\$ 905.00	\$ 1,100.00	1.095	\$ 1,204.50	0.97	
1.000	D3 03 5135 1950	Chiller, recip., water cooled, up to 50 tons, annualized	7.94	\$ 570.00	\$ 700.00	1.095	\$ 766.50	0.97	
1.000	D3 03 5135 2950	Chiller, recip., water cooled, over 50 tons, annualized	10.91	\$ 760.00	\$ 945.00	1.095	\$ 1,034.78	0.97	
1.000	D3 03 5140 1950	Chiller, centrif., water cooled, up to 100 tons, annualized	26.76	\$ 1,975.00	\$ 2,425.00	1.095	\$ 2,655.38	0.97	
1.000	D3 03 5140 2950	Chiller, centrif., water cooled, over 100 tons, annualized	33.36	\$ 2,425.00	\$ 3,000.00	1.095	\$ 3,285.00	0.97	
1.000	D3 03 5150 1950	Chiller, absorption unit, up to 500 tons, annualized	6.22	\$ 490.00	\$ 600.00	1.095	\$ 657.00	0.97	
1.000	D3 03 5150 2950	Chiller, absorption unit, 500 to 5000 tons, annualized	9.42	\$ 835.00	\$ 1,025.00	1.095	\$ 1,122.38	0.97	
1.000	D3 03 5160 1950	Chiller, screw, water cooled, up to 100 tons, annualized	14.77	\$ 1,200.00	\$ 1,475.00	1.095	\$ 1,615.13	0.97	
1.000	D3 03 5160 2950	Chiller, screw, water cooled, over 100 tons, annualized	16.72	\$ 1,350.00	\$ 1,675.00	1.095	\$ 1,834.13	0.97	
1.000	D3 03 5170 1950	Evaporative cooler, annualized	1.25	\$ 110.00	\$ 134.00	1.095	\$ 146.73	0.97	
1.000	D3 03 5180 1950	Evaporative cooler, rotating drum, annualized	1.31	\$ 122.00	\$ 148.00	1.095	\$ 162.06	0.97	
1.000	D3 03 5210 1950	Condenser, air cooled, 3 tons to 25 tons, annualized	1.76	\$ 152.00	\$ 185.00	1.095	\$ 202.58	0.97	

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹							
ANNUALIZED-10% GF							
PROJECT:	EAST HALL						
LOCATION:	US NATIONAL AVERAGES						
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green	GREEN FACTOR	Adjusted Total with Green Factor OH&P	De-Escalation Factor to July 2009 Costs	Total with All Adjustments
1.000	D3 02 5130 1950	Boiler, hot water, oil, gas, or comb. fired, up to 120 MBH, annualized	\$ 1,168.89	1.10	\$ 1,324.95	0.97	\$ 1,285.78
1.000	D3 02 5110 1950	Boiler, electric, to 1500 gal., annualized	\$ 414.43	1.10	\$ 469.76	0.97	\$ 455.87
1.000	D3 02 5130 2950	Boiler, hot water, oil, gas, or comb. fired, 120 - 500 MBH, annualized	\$ 1,461.11	1.10	\$ 1,656.19	0.97	\$ 1,607.23
1.000	D3 02 5130 3950	Boiler, hot water, oil, gas, or comb. fired, 500 -1000 MBH, annualized	\$ 1,620.51	1.10	\$ 1,836.86	0.97	\$ 1,782.56
1.000	D3 02 5130 4950	Boiler, hot water, oil, gas, or comb. fired, over 1000 MBH, annualized	\$ 1,833.03	1.10	\$ 2,077.76	0.97	\$ 2,016.34
1.000	D3 02 5140 1950	Boiler, steam, oil, gas, or comb. fired, up to 120 MBH, annualized	\$ 1,567.38	1.10	\$ 1,776.64	0.97	\$ 1,724.11
1.000	D3 02 5140 2950	Boiler, steam, oil, gas, or comb. fired, 120 to 500 MBH, annualized	\$ 1,859.60	1.10	\$ 2,107.88	0.97	\$ 2,045.56
1.000	D3 02 5140 3950	Boiler, steam, oil, gas, or comb. fired, 500 to 1000 MBH, annualized	\$ 2,045.56	1.10	\$ 2,318.66	0.97	\$ 2,250.12
1.000	D3 02 5140 4950	Boiler, steam, oil, gas, or comb. fired, over 1000 MBH, annualized	\$ 2,204.95	1.10	\$ 2,499.34	0.97	\$ 2,425.45
1.000	D3 02 5210 1950	Deaerator tank, annualized	\$ 177.46	1.10	\$ 201.15	0.97	\$ 195.20
1.000	D3 02 5310 1950	Pump, boiler fuel oil, annualized	\$ 168.96	1.10	\$ 191.52	0.97	\$ 185.85
1.000	D3 02 5310 2950	Pump, condensate return, over 1 H.P., annualized	\$ 160.46	1.10	\$ 181.88	0.97	\$ 176.50
1.000	D3 02 5310 3950	Pump, condensate return unit, 2 pumps, annualized	\$ 225.28	1.10	\$ 255.35	0.97	\$ 247.80
1.000	D3 03 5110 1950	Water cooling tower, up to 50 tons, annualized	\$ 435.68	1.10	\$ 493.85	0.97	\$ 479.25
1.000	D3 03 5110 2950	Water cooling tower, 50 thru 500 tons, annualized	\$ 924.49	1.10	\$ 1,047.92	0.97	\$ 1,016.94
1.000	D3 03 5110 3950	Water cooling tower, 500 thru 1000 tons, annualized	\$ 1,700.21	1.10	\$ 1,927.20	0.97	\$ 1,870.23
1.000	D3 03 5130 1950	Chiller, recip., air cooled, up to 25 tons, annualized	\$ 892.61	1.10	\$ 1,011.78	0.97	\$ 981.87
1.000	D3 03 5130 2950	Chiller, recip., air cooled, over 25 tons, annualized	\$ 1,168.89	1.10	\$ 1,324.95	0.97	\$ 1,285.78
1.000	D3 03 5135 1950	Chiller, recip., water cooled, up to 50 tons, annualized	\$ 743.84	1.10	\$ 843.15	0.97	\$ 818.22
1.000	D3 03 5135 2950	Chiller, recip., water cooled, over 50 tons, annualized	\$ 1,004.18	1.10	\$ 1,138.25	0.97	\$ 1,104.60
1.000	D3 03 5140 1950	Chiller, centrif., water cooled, up to 100 tons, annualized	\$ 2,576.87	1.10	\$ 2,920.91	0.97	\$ 2,834.56
1.000	D3 03 5140 2950	Chiller, centrif., water cooled, over 100 tons, annualized	\$ 3,187.89	1.10	\$ 3,613.50	0.97	\$ 3,506.67
1.000	D3 03 5150 1950	Chiller, absorption unit, up to 500 tons, annualized	\$ 637.58	1.10	\$ 722.70	0.97	\$ 701.33
1.000	D3 03 5150 2950	Chiller, absorption unit, 500 to 5000 tons, annualized	\$ 1,089.19	1.10	\$ 1,234.61	0.97	\$ 1,198.11
1.000	D3 03 5160 1950	Chiller, screw, water cooled, up to 100 tons, annualized	\$ 1,567.38	1.10	\$ 1,776.64	0.97	\$ 1,724.11
1.000	D3 03 5160 2950	Chiller, screw, water cooled, over 100 tons, annualized	\$ 1,779.90	1.10	\$ 2,017.54	0.97	\$ 1,957.89
1.000	D3 03 5170 1950	Evaporative cooler, annualized	\$ 142.39	1.10	\$ 161.40	0.97	\$ 156.63
1.000	D3 03 5180 1950	Evaporative cooler, rotating drum, annualized	\$ 157.27	1.10	\$ 178.27	0.97	\$ 173.00
1.000	D3 03 5210 1950	Condenser, air cooled, 3 tons to 25 tons, annualized	\$ 196.59	1.10	\$ 222.83	0.97	\$ 216.24

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹								
ANNUALIZED-10% GF								
PROJECT:	EAST HALL							
LOCATION:	US NATIONAL AVERAGES							
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.10	Assumed Value						
Qty	Assembly Number	Description	Labor Hours	Total In-House	Total Incl. O&P	Location Factor	Location Adjusted Total O&P	De-Escalation Factor to July 2009 Costs
1.000	D3 03 5210 2950	Condenser, air cooled, 26 tons through 100 tons, annualized	1.99	\$ 200.00	\$ 242.00	1.095	\$ 264.99	0.97
1.000	D3 03 5210 3950	Condenser, air cooled, over 100 tons, annualized	2.19	\$ 245.00	\$ 294.00	1.095	\$ 321.93	0.97
1.000	D3 03 5220 1950	Condensing unit, air cooled, 3 to 25 tons, annualized	2.56	\$ 254.00	\$ 310.00	1.095	\$ 339.45	0.97
1.000	D3 03 5220 2950	Condensing unit, air cooled, 26 to 100 tons, annualized	2.98	\$ 310.00	\$ 375.00	1.095	\$ 410.63	0.97
1.000	D3 03 5220 3950	Condensing unit, air cooled, over 100 tons, annualized	3.51	\$ 375.00	\$ 450.00	1.095	\$ 492.75	0.97
1.000	D3 03 5240 1950	Condensing unit, water cooled, 3 to 24 tons, annualized	1.32	\$ 115.00	\$ 140.00	1.095	\$ 153.30	0.97
1.000	D3 03 5240 2950	Condensing unit, water cooled, 25 to 100 tons, annualized	2.85	\$ 258.00	\$ 315.00	1.095	\$ 344.93	0.97
1.000	D3 03 5240 3950	Condensing unit, water cooled, over 100 tons, annualized	2.85	\$ 305.00	\$ 365.00	1.095	\$ 399.68	0.97
1.000	D3 03 5260 1950	Compressor, DX Refrigeration, to 25 tons, annualized	2.44	\$ 173.00	\$ 214.00	1.095	\$ 234.33	0.97
1.000	D3 03 5260 2950	Compressor, DX refrigeration, 25 to 100 tons, annualized	3.14	\$ 216.00	\$ 269.00	1.095	\$ 294.56	0.97
1.000	D3 03 5290 1950	Fluid cooler, annualized	1.12	\$ 87.00	\$ 108.00	1.095	\$ 118.26	0.97
1.000	D3 04 5110 1950	Air handling unit, 3 thru 24 tons, annualized	2.06	\$ 232.00	\$ 279.00	1.095	\$ 305.51	0.97
1.000	D3 04 5110 2950	Air handling unit, 25 thru 50 tons, annualized	2.14	\$ 530.00	\$ 615.00	1.095	\$ 673.43	0.97
1.000	D3 04 5110 3950	Air handling unit, over 50 tons, annualized	3.27	\$ 715.00	\$ 840.00	1.095	\$ 919.80	0.97
1.000	D3 04 5112 1950	Air handling unit, computer room, annualized	3.42	\$ 281.00	\$ 345.00	1.095	\$ 377.78	0.97
1.000	D3 04 5120 1950	Fan coil unit, annualized	3.34	\$ 242.00	\$ 299.00	1.095	\$ 327.41	0.97
1.000	D3 04 5150 1950	Air filter, electrostatic, annualized	8.77	\$ 515.00	\$ 635.00	1.095	\$ 695.33	0.97
1.000	D3 04 5160 1950	VAV Boxes, annualized	0.93	\$ 68.00	\$ 84.00	1.095	\$ 91.98	0.97
1.000	D3 04 5170 1950	Fire dampers, annualized	1.16	\$ 80.50	\$ 100.00	1.095	\$ 109.50	0.97
1.000	D3 04 5210 1950	Fan, axial, up to 5,000 CFM, annualized	1.24	\$ 77.00	\$ 94.00	1.095	\$ 102.93	0.97

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE¹
ANNUALIZED-10% GF

PROJECT:	EAST HALL						
LOCATION:	US NATIONAL AVERAGES						
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green	GREEN FACTOR	Adjusted Total with Green Factor OH&P	De-Escalation Factor to July 2009 Costs	Total with All Adjustments
1.000	D3 03 5210 2950	Condenser, air cooled, 26 tons through 100 tons, annualized	\$ 257.16	1.10	\$ 291.49	0.97	\$ 282.87
1.000	D3 03 5210 3950	Condenser, air cooled, over 100 tons, annualized	\$ 312.41	1.10	\$ 354.12	0.97	\$ 343.65
1.000	D3 03 5220 1950	Condensing unit, air cooled, 3 to 25 tons, annualized	\$ 329.41	1.10	\$ 373.40	0.97	\$ 362.36
1.000	D3 03 5220 2950	Condensing unit, air cooled, 26 to 100 tons, annualized	\$ 398.49	1.10	\$ 451.69	0.97	\$ 438.33
1.000	D3 03 5220 3950	Condensing unit, air cooled, over 100 tons, annualized	\$ 478.18	1.10	\$ 542.03	0.97	\$ 526.00
1.000	D3 03 5240 1950	Condensing unit, water cooled, 3 to 24 tons, annualized	\$ 148.77	1.10	\$ 168.63	0.97	\$ 163.64
1.000	D3 03 5240 2950	Condensing unit, water cooled, 25 to 100 tons, annualized	\$ 334.73	1.10	\$ 379.42	0.97	\$ 368.20
1.000	D3 03 5240 3950	Condensing unit, water cooled, over 100 tons, annualized	\$ 387.86	1.10	\$ 439.64	0.97	\$ 426.65
1.000	D3 03 5260 1950	Compressor, DX Refrigeration, to 25 tons, annualized	\$ 227.40	1.10	\$ 257.76	0.97	\$ 250.14
1.000	D3 03 5260 2950	Compressor, DX refrigeration, 25 to 100 tons, annualized	\$ 285.85	1.10	\$ 324.01	0.97	\$ 314.43
1.000	D3 03 5290 1950	Fluid cooler, annualized	\$ 114.76	1.10	\$ 130.09	0.97	\$ 126.24
1.000	D3 04 5110 1950	Air handling unit, 3 thru 24 tons, annualized	\$ 296.47	1.10	\$ 336.06	0.97	\$ 326.12
1.000	D3 04 5110 2950	Air handling unit, 25 thru 50 tons, annualized	\$ 653.52	1.10	\$ 740.77	0.97	\$ 718.87
1.000	D3 04 5110 3950	Air handling unit, over 50 tons, annualized	\$ 892.61	1.10	\$ 1,011.78	0.97	\$ 981.87
1.000	D3 04 5112 1950	Air handling unit, computer room, annualized	\$ 366.61	1.10	\$ 415.55	0.97	\$ 403.27
1.000	D3 04 5120 1950	Fan coil unit, annualized	\$ 317.73	1.10	\$ 360.15	0.97	\$ 349.50
1.000	D3 04 5150 1950	Air filter, electrostatic, annualized	\$ 674.77	1.10	\$ 764.86	0.97	\$ 742.25
1.000	D3 04 5160 1950	VAV Boxes, annualized	\$ 89.26	1.10	\$ 101.18	0.97	\$ 98.19
1.000	D3 04 5170 1950	Fire dampers, annualized	\$ 106.26	1.10	\$ 120.45	0.97	\$ 116.89
1.000	D3 04 5210 1950	Fan, axial, up to 5,000 CFM, annualized	\$ 99.89	1.10	\$ 113.22	0.97	\$ 109.88

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹									
ANNUALIZED-10% GF									
PROJECT:	EAST HALL								
LOCATION:	US NATIONAL AVERAGES								
Escalation	6%								
De-Escalation to July 2009	1.03								
De-Escalation Factor to be Applied	0.97								
Green Factor	1.10	Assumed Value							
Qty	Assembly Number	Description	Labor Hours	Total In-House	Total Incl. O&P	Location Factor	Location Adjusted Total O&P	De-Escalation Factor to July 2009 Costs	
1.000	D3 04 5210 2950	Fan, axial, 5,000 to 10,000 CFM, annualized	1.29	\$ 79.50	\$ 97.50	1.095	\$ 106.76	0.97	
1.000	D3 04 5210 3950	Fan, axial, over 10,000 CFM, annualized	1.39	\$ 85.00	\$ 105.00	1.095	\$ 114.98	0.97	
1.000	D3 04 5220 1950	Fan, centrifugal, up to 5,000 CFM, annualized	1.08	\$ 67.50	\$ 83.00	1.095	\$ 90.89	0.97	
1.000	D3 04 5220 2950	Fan, centrifugal, 5,000 to 10,000 CFM, annualized	1.14	\$ 71.00	\$ 87.00	1.095	\$ 95.27	0.97	
1.000	D3 04 5220 3950	Fan, centrifugal, over 10,000 CFM, annualized	1.18	\$ 73.50	\$ 90.00	1.095	\$ 98.55	0.97	
1.000	D3 04 5250 1950	Hood and blower, annualized	2.32	\$ 218.00	\$ 259.00	1.095	\$ 283.61	0.97	
1.000	D3 04 5410 1950	Centrifugal, over 1 HP, annualized	1.20	\$ 92.50	\$ 114.00	1.095	\$ 124.83	0.97	
1.000	D3 04 5410 2950	Centrifugal, w/ reduction gear, over 1 H.P., annualized	1.28	\$ 98.00	\$ 121.00	1.095	\$ 132.50	0.97	
1.000	D3 04 5420 1950	Pump w/ oil reservoir, electric, annualized	1.20	\$ 92.50	\$ 114.00	1.095	\$ 124.83	0.97	
1.000	D3 04 5600 1950	Heat exchanger, steam, annualized	0.92	\$ 85.50	\$ 104.00	1.095	\$ 113.88	0.97	
1.000	D3 05 5110 1950	Unit heater, gas radiant, annualized	1.01	\$ 68.00	\$ 84.50	1.095	\$ 92.53	0.97	
1.000	D3 05 5110 2950	Unit heater, gas infrared, annualized	1.50	\$ 128.00	\$ 156.00	1.095	\$ 170.82	0.97	
1.000	D3 05 5110 3950	Unit heater, steam, annualized	0.84	\$ 85.00	\$ 103.00	1.095	\$ 112.79	0.97	
1.000	D3 05 5122 1950	Forced air heater, oil or gas fired, up to 120 MBH, annualized	5.80	\$ 490.00	\$ 600.00	1.095	\$ 657.00	0.97	
1.000	D3 05 5122 2950	Forced air heater, oil or gas fired, over 120 MBH, annualized	7.41	\$ 635.00	\$ 775.00	1.095	\$ 848.63	0.97	
1.000	D3 05 5210 1950	Package unit, air cooled, 3 thru 24 ton, annualized	2.40	\$ 229.00	\$ 278.00	1.095	\$ 304.41	0.97	
1.000	D3 05 5210 2950	Package unit, air cooled, 25 thru 50 ton, annualized	3.25	\$ 315.00	\$ 380.00	1.095	\$ 416.10	0.97	
1.000	D3 05 5220 1950	Package unit, water cooled, 3 thru 24 ton, annualized	2.40	\$ 229.00	\$ 278.00	1.095	\$ 304.41	0.97	
1.000	D3 05 5220 2950	Package unit, water cooled, 25 thru 50 ton, annualized	3.25	\$ 315.00	\$ 380.00	1.095	\$ 416.10	0.97	
1.000	D3 05 5230 1950	Package unit, computer room, annualized	4.34	\$ 340.00	\$ 420.00	1.095	\$ 459.90	0.97	
1.000	D3 05 5240 1950	Package unit with duct gas heater, annualized	4.96	\$ 385.00	\$ 475.00	1.095	\$ 520.13	0.97	
1.000	D3 05 5250 1950	Air conditioning, split system, DX air cooled, to 10 tons, annualized	3.54	\$ 305.00	\$ 370.00	1.095	\$ 405.15	0.97	
1.000	D3 05 5250 2950	Air conditioning, split system, DX air cooled, over 10 tons, annualized	3.57	\$ 335.00	\$ 410.00	1.095	\$ 448.95	0.97	
1.000	D3 05 5310 1950	Heat pump, air cooled, up to 5 ton, annualized	3.20	\$ 251.00	\$ 310.00	1.095	\$ 339.45	0.97	
1.000	D3 05 5310 2950	Heat pump, air cooled, over 5 ton, annualized	3.59	\$ 305.00	\$ 375.00	1.095	\$ 410.63	0.97	
1.000	D3 05 5320 1950	Heat pump, water cooled, up to 5 ton, annualized	3.56	\$ 274.00	\$ 335.00	1.095	\$ 366.83	0.97	
1.000	D3 05 5320 2950	Heat pump, water cooled, over 5 ton, annualized	3.23	\$ 283.00	\$ 345.00	1.095	\$ 377.78	0.97	
1.000	D3 06 5100 1950	Controls, central system, electro/pneumatic, annualized	1.92	\$ 168.00	\$ 205.00	1.095	\$ 224.48	0.97	
1.000	D3 09 5110 1950	Air compressor, gas engine powered, annualized	16.57	\$ 1,325.00	\$ 1,600.00	1.095	\$ 1,752.00	0.97	

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹							
ANNUALIZED-10% GF							
PROJECT:	EAST HALL						
LOCATION:	US NATIONAL AVERAGES						
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green	GREEN FACTOR	Adjusted Total with Green Factor OH&P	De-Escalation Factor to July 2009 Costs	Total with All Adjustments
1.000	D3 04 5210 2950	Fan, axial, 5,000 to 10,000 CFM, annualized	\$ 103.61	1.10	\$ 117.44	0.97	\$ 113.97
1.000	D3 04 5210 3950	Fan, axial, over 10,000 CFM, annualized	\$ 111.58	1.10	\$ 126.47	0.97	\$ 122.73
1.000	D3 04 5220 1950	Fan, centrifugal, up to 5,000 CFM, annualized	\$ 88.20	1.10	\$ 99.97	0.97	\$ 97.02
1.000	D3 04 5220 2950	Fan, centrifugal, 5,000 to 10,000 CFM, annualized	\$ 92.45	1.10	\$ 104.79	0.97	\$ 101.69
1.000	D3 04 5220 3950	Fan, centrifugal, over 10,000 CFM, annualized	\$ 95.64	1.10	\$ 108.41	0.97	\$ 105.20
1.000	D3 04 5250 1950	Hood and blower, annualized	\$ 275.22	1.10	\$ 311.97	0.97	\$ 302.74
1.000	D3 04 5410 1950	Centrifugal, over 1 HP, annualized	\$ 121.14	1.10	\$ 137.31	0.97	\$ 133.25
1.000	D3 04 5410 2950	Centrifugal, w/ reduction gear, over 1 H.P., annualized	\$ 128.58	1.10	\$ 145.74	0.97	\$ 141.44
1.000	D3 04 5420 1950	Pump w/ oil reservoir, electric, annualized	\$ 121.14	1.10	\$ 137.31	0.97	\$ 133.25
1.000	D3 04 5600 1950	Heat exchanger, steam, annualized	\$ 110.51	1.10	\$ 125.27	0.97	\$ 121.56
1.000	D3 05 5110 1950	Unit heater, gas radiant, annualized	\$ 89.79	1.10	\$ 101.78	0.97	\$ 98.77
1.000	D3 05 5110 2950	Unit heater, gas infrared, annualized	\$ 165.77	1.10	\$ 187.90	0.97	\$ 182.35
1.000	D3 05 5110 3950	Unit heater, steam, annualized	\$ 109.45	1.10	\$ 124.06	0.97	\$ 120.40
1.000	D3 05 5122 1950	Forced air heater, oil or gas fired, up to 120 MBH, annualized	\$ 637.58	1.10	\$ 722.70	0.97	\$ 701.33
1.000	D3 05 5122 2950	Forced air heater, oil or gas fired, over 120 MBH, annualized	\$ 823.54	1.10	\$ 933.49	0.97	\$ 905.89
1.000	D3 05 5210 1950	Package unit, air cooled, 3 thru 24 ton, annualized	\$ 295.41	1.10	\$ 334.85	0.97	\$ 324.95
1.000	D3 05 5210 2950	Package unit, air cooled, 25 thru 50 ton, annualized	\$ 403.80	1.10	\$ 457.71	0.97	\$ 444.18
1.000	D3 05 5220 1950	Package unit, water cooled, 3 thru 24 ton, annualized	\$ 295.41	1.10	\$ 334.85	0.97	\$ 324.95
1.000	D3 05 5220 2950	Package unit, water cooled, 25 thru 50 ton, annualized	\$ 403.80	1.10	\$ 457.71	0.97	\$ 444.18
1.000	D3 05 5230 1950	Package unit, computer room, annualized	\$ 446.30	1.10	\$ 505.89	0.97	\$ 490.93
1.000	D3 05 5240 1950	Package unit with duct gas heater, annualized	\$ 504.75	1.10	\$ 572.14	0.97	\$ 555.22
1.000	D3 05 5250 1950	Air conditioning, split system, DX air cooled, to 10 tons, annualized	\$ 393.17	1.10	\$ 445.67	0.97	\$ 432.49
1.000	D3 05 5250 2950	Air conditioning, split system, DX air cooled, over 10 tons, annualized	\$ 435.68	1.10	\$ 493.85	0.97	\$ 479.25
1.000	D3 05 5310 1950	Heat pump, air cooled, up to 5 ton, annualized	\$ 329.41	1.10	\$ 373.40	0.97	\$ 362.36
1.000	D3 05 5310 2950	Heat pump, air cooled, over 5 ton, annualized	\$ 398.49	1.10	\$ 451.69	0.97	\$ 438.33
1.000	D3 05 5320 1950	Heat pump, water cooled, up to 5 ton, annualized	\$ 355.98	1.10	\$ 403.51	0.97	\$ 391.58
1.000	D3 05 5320 2950	Heat pump, water cooled, over 5 ton, annualized	\$ 366.61	1.10	\$ 415.55	0.97	\$ 403.27
1.000	D3 06 5100 1950	Controls, central system, electro/pneumatic, annualized	\$ 217.84	1.10	\$ 246.92	0.97	\$ 239.62
1.000	D3 09 5110 1950	Air compressor, gas engine powered, annualized	\$ 1,700.21	1.10	\$ 1,927.20	0.97	\$ 1,870.23

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹								
ANNUALIZED-10% GF								
PROJECT:	EAST HALL							
LOCATION:	US NATIONAL AVERAGES							
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.10	Assumed Value						
Qty	Assembly Number	Description	Labor Hours	Total In-House	Total Incl. O&P	Location Factor	Location Adjusted Total O&P	De-Escalation Factor to July 2009 Costs
1.000	D3 09 5114 1950	Air compressor, centrifugal, to 40 H.P., annualized	3.41	\$ 286.00	\$ 350.00	1.095	\$ 383.25	0.97
1.000	D3 09 5114 2950	Air compressor, centrifugal, over 40 H.P., annualized	14.89	\$ 1,175.00	\$ 1,425.00	1.095	\$ 1,560.38	0.97
1.000	D3 09 5118 1950	Air compressor, reciprocating, less than 5 H.P., annualized	4.80	\$ 395.00	\$ 485.00	1.095	\$ 531.08	0.97
1.000	D3 09 5118 2950	Air compressor, reciprocating, 5 to 40 H.P., annualized	4.86	\$ 400.00	\$ 490.00	1.095	\$ 536.55	0.97
1.000	D3 09 5118 3950	Air compressor, reciprocating, over 40 H.P., annualized	5.72	\$ 455.00	\$ 560.00	1.095	\$ 613.20	0.97
1.000	D3 09 5210 1950	Steam humidification system, annualized	2.54	\$ 208.00	\$ 255.00	1.095	\$ 279.23	0.97
1.000	D3 09 5210 2950	Evaporative pan with heating coil humidification system, annualized	1.89	\$ 151.00	\$ 186.00	1.095	\$ 203.67	0.97
1.000	D3 09 5220 1950	Dehumidifier, desiccant wheel, annualized	5.06	\$ 430.00	\$ 515.00	1.095	\$ 563.93	0.97
1.000	D4 01 5100 1950	Backflow prevention device, up to 4", annualized	0.33	\$ 21.50	\$ 27.00	1.095	\$ 29.57	0.97
1.000	D4 01 5100 2950	Backflow prevention device, over 4", annualized	0.49	\$ 32.00	\$ 40.00	1.095	\$ 43.80	0.97
1.000	D4 01 5150 1950	Extinguishing system, wet pipe, annualized	11.34	\$ 870.00	\$ 1,075.00	1.095	\$ 1,177.13	0.97
1.000	D4 01 5180 1950	Extinguishing system, deluge / preaction, annualized	11.57	\$ 885.00	\$ 1,075.00	1.095	\$ 1,177.13	0.97
1.000	D4 01 5210 1950	Fire pump, electric motor driven, annualized	47.74	\$ 3,100.00	\$ 3,875.00	1.095	\$ 4,243.13	0.97
1.000	D4 01 5250 1950	Fire pump, motor/engine driven, annualized	69.88	\$ 4,575.00	\$ 5,700.00	1.095	\$ 6,241.50	0.97
1.000	D4 01 5310 1950	Extinguishing system, dry pipe, annualized	13.02	\$ 1,025.00	\$ 1,250.00	1.095	\$ 1,368.75	0.97
1.000	D4 09 5100 1950	Extinguishing system, CO2, annualized	9.47	\$ 795.00	\$ 975.00	1.095	\$ 1,067.63	0.97
1.000	D4 09 5200 1950	Extinguishing system, foam bottle, annualized	3.71	\$ 231.00	\$ 289.00	1.095	\$ 316.46	0.97
1.000	D4 09 5210 1950	Extinguishing system, foam pump electric, annualized	17.76	\$ 1,275.00	\$ 1,575.00	1.095	\$ 1,724.63	0.97
1.000	D4 09 5220 1950	Extinguishing system, foam pump diesel, annualized	22.16	\$ 1,625.00	\$ 2,000.00	1.095	\$ 2,190.00	0.97
1.000	D4 09 5400 1950	Extinguishing system, dry chemical, annualized	5.61	\$ 555.00	\$ 670.00	1.095	\$ 733.65	0.97
1.000	D4 09 5450 1950	Extinguishing system, FM200, annualized	9.26	\$ 740.00	\$ 905.00	1.095	\$ 990.98	0.97

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹							
ANNUALIZED-10% GF							
PROJECT:	EAST HALL						
LOCATION:	US NATIONAL AVERAGES						
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green	GREEN FACTOR	Adjusted Total with Green Factor OH&P	De-Escalation Factor to July 2009 Costs	Total with All Adjustments
1.000	D3 09 5114 1950	Air compressor, centrifugal, to 40 H.P., annualized	\$ 371.92	1.10	\$ 421.58	0.97	\$ 409.11
1.000	D3 09 5114 2950	Air compressor, centrifugal, over 40 H.P., annualized	\$ 1,514.25	1.10	\$ 1,716.41	0.97	\$ 1,665.67
1.000	D3 09 5118 1950	Air compressor, reciprocating, less than 5 H.P., annualized	\$ 515.37	1.10	\$ 584.18	0.97	\$ 566.91
1.000	D3 09 5118 2950	Air compressor, reciprocating, 5 to 40 H.P., annualized	\$ 520.69	1.10	\$ 590.21	0.97	\$ 572.76
1.000	D3 09 5118 3950	Air compressor, reciprocating, over 40 H.P., annualized	\$ 595.07	1.10	\$ 674.52	0.97	\$ 654.58
1.000	D3 09 5210 1950	Steam humidification system, annualized	\$ 270.97	1.10	\$ 307.15	0.97	\$ 298.07
1.000	D3 09 5210 2950	Evaporative pan with heating coil humidification system, annualized	\$ 197.65	1.10	\$ 224.04	0.97	\$ 217.41
1.000	D3 09 5220 1950	Dehumidifier, desiccant wheel, annualized	\$ 547.25	1.10	\$ 620.32	0.97	\$ 601.98
1.000	D4 01 5100 1950	Backflow prevention device, up to 4", annualized	\$ 28.69	1.10	\$ 32.52	0.97	\$ 31.56
1.000	D4 01 5100 2950	Backflow prevention device, over 4", annualized	\$ 42.51	1.10	\$ 48.18	0.97	\$ 46.76
1.000	D4 01 5150 1950	Extinguishing system, wet pipe, annualized	\$ 1,142.33	1.10	\$ 1,294.84	0.97	\$ 1,256.56
1.000	D4 01 5180 1950	Extinguishing system, deluge / preaction, annualized	\$ 1,142.33	1.10	\$ 1,294.84	0.97	\$ 1,256.56
1.000	D4 01 5210 1950	Fire pump, electric motor driven, annualized	\$ 4,117.69	1.10	\$ 4,667.44	0.97	\$ 4,529.45
1.000	D4 01 5250 1950	Fire pump, motor/engine driven, annualized	\$ 6,056.98	1.10	\$ 6,865.65	0.97	\$ 6,662.68
1.000	D4 01 5310 1950	Extinguishing system, dry pipe, annualized	\$ 1,328.29	1.10	\$ 1,505.63	0.97	\$ 1,461.11
1.000	D4 09 5100 1950	Extinguishing system, CO2, annualized	\$ 1,036.06	1.10	\$ 1,174.39	0.97	\$ 1,139.67
1.000	D4 09 5200 1950	Extinguishing system, foam bottle, annualized	\$ 307.10	1.10	\$ 348.10	0.97	\$ 337.81
1.000	D4 09 5210 1950	Extinguishing system, foam pump electric, annualized	\$ 1,673.64	1.10	\$ 1,897.09	0.97	\$ 1,841.00
1.000	D4 09 5220 1950	Extinguishing system, foam pump diesel, annualized	\$ 2,125.26	1.10	\$ 2,409.00	0.97	\$ 2,337.78
1.000	D4 09 5400 1950	Extinguishing system, dry chemical, annualized	\$ 711.96	1.10	\$ 807.02	0.97	\$ 783.16
1.000	D4 09 5450 1950	Extinguishing system, FM200, annualized	\$ 961.68	1.10	\$ 1,090.07	0.97	\$ 1,057.85
			\$ 74,713.41				\$ 82,184.75
			\$ 18,678.35	Assumed 25%		Assumed 25%	\$ 20,546.19
			Non-Green	Of Total per year		Of Total per year	Green

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹								
ANNUALIZED-10% GF								
PROJECT:	EAST HALL							
LOCATION:	US NATIONAL AVERAGES							
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.10	Assumed Value						
Qty	Assembly Number	Description	Labor Hours	Total In-House	Total Incl. O&P	Location Factor	Location Adjusted Total O&P	De-Escalation Factor to July 2009 Costs
SUMMARY OF FINDINGS								
		Description	Cost	% Difference	Comments			
		Yearly Non-Green Preventative Maintenance Costs	\$ 18,678.35					
		Yearly Green Preventative Maintenance Costs	\$ 20,546.19	9.09%	Green Costs are 9.09% higher than Non-Green based on this analysis			
FOOTNOTES:								
1	RS Means CostWorks 2010 Operations and Maintenance							

Appendix C-SM8 10% GF Analysis of FMRRC

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
10% GF												
CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation 6%												
De-Escalation to July 2009 1.03												
De-Escalation Factor to be Applied 0.97												
Green Factor 1.10 Assumed Value												
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 04 3140 0020	Maintenance and inspection duct heater	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
1.000	D3 05 3112 0020	Maintenance and inspection infrared heater suspended, commercial	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
1.000	D3 05 3114 0020	Maintenance and inspection standard suspended heater	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
1.000	D3 05 3116 0020	Maintenance and inspection explosionproof industrial heater	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
1.000	D3 05 3160 0020	Maintenance and inspection convector suspended, commercial	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
1.000	D3 05 3410 0020	Maintenance and inspection baseboard heating units	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
							\$ 411.00	\$ 516.00				
1.000	D3 01 3160 0010	Preventive maintenance oil filter	1	1 Stpi	Ea.	0.05	\$ 5.45	\$ 6.60	1.095	\$ 7.23	0.97	
1.000	D3 05 3112 0010	Maintenance and repair infrared heater suspended, commercial	1	1 Elec	Ea.	0.62	\$ 37.00	\$ 46.50	1.095	\$ 50.92	0.97	
1.000	D3 05 3150 0020	Maintenance and inspection wall mounted/recessed heater, with fan	1	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
1.000	D4 01 3310 1020	Inspect sprinkler system	1	1 Plum	Ea.	0.47	\$ 30.20	\$ 37.80	1.095	\$ 41.39	0.97	
1.000	D4 01 3310 1040	Rebuild double check 3" backflow preventer sprinkler system	1	1 Plum	Ea.	5.21	\$ 694.00	\$ 825.00	1.095	\$ 903.38	0.97	
1.000	D4 01 3310 1050	Rebuild double check 4" backflow preventer sprinkler system	1	1 Plum	Ea.	5.86	\$ 864.00	\$ 1,025.00	1.095	\$ 1,122.38	0.97	
1.000	D4 01 3310 1060	Rebuild double check 6" backflow preventer sprinkler system	1	1 Plum	Ea.	6.50	\$ 994.00	\$ 1,180.00	1.095	\$ 1,292.10	0.97	
1.000	D4 01 3310 1070	Rebuild reduced pressure 3" backflow preventer sprinkler system	1	1 Plum	Ea.	5.21	\$ 694.00	\$ 825.00	1.095	\$ 903.38	0.97	
1.000	D4 01 3310 1080	Rebuild reduced pressure 4" backflow preventer sprinkler system	1	1 Plum	Ea.	5.86	\$ 864.00	\$ 1,025.00	1.095	\$ 1,122.38	0.97	
1.000	D4 01 3310 1090	Rebuild reduced pressure 6" backflow preventer sprinkler system	1	1 Plum	Ea.	6.50	\$ 994.00	\$ 1,180.00	1.095	\$ 1,292.10	0.97	
							\$ 5,245.15	\$ 6,236.90				
1.000	D3 04 3310 0020	Inspect for leaks steam converter	2	1 Stpi	Ea.	0.09	\$ 5.94	\$ 7.42	1.095	\$ 8.12	0.97	
1.000	D3 05 3114 0010	Maintenance and repair standard suspended heater	2	1 Elec	Ea.	0.60	\$ 94.55	\$ 111.35	1.095	\$ 121.93	0.97	
1.000	D3 05 3116 0010	Maintenance and repair explosionproof industrial heater	2	1 Elec	Ea.	0.82	\$ 132.00	\$ 156.05	1.095	\$ 170.87	0.97	
1.000	D3 05 3160 0010	Maintenance and repair convector suspended, commercial	2	1 Elec	Ea.	0.62	\$ 37.00	\$ 46.50	1.095	\$ 50.92	0.97	
1.000	D3 05 3410 0010	Maintenance and repair baseboard heating units	2	1 Elec	Ea.	0.62	\$ 37.00	\$ 46.50	1.095	\$ 50.92	0.97	
							\$ 306.49	\$ 367.82				
1.000	D3 04 3520 3010	Repack drain valve gland, 3/4" valves	3	1 Stpi	Ea.	0.22	\$ 23.00	\$ 27.50	1.095	\$ 30.11	0.97	
							\$ 23.00	\$ 27.50				

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
10% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 04 3140 0020	Maintenance and inspection duct heater	\$ 91.39	1.10	\$ 103.59	0.97	\$ 100.52
1.000	D3 05 3112 0020	Maintenance and inspection infrared heater suspended, commercial	\$ 91.39	1.10	\$ 103.59	0.97	\$ 100.52
1.000	D3 05 3114 0020	Maintenance and inspection standard suspended heater	\$ 91.39	1.10	\$ 103.59	0.97	\$ 100.52
1.000	D3 05 3116 0020	Maintenance and inspection explosionproof industrial heater	\$ 91.39	1.10	\$ 103.59	0.97	\$ 100.52
1.000	D3 05 3160 0020	Maintenance and inspection convector suspended, commercial	\$ 91.39	1.10	\$ 103.59	0.97	\$ 100.52
1.000	D3 05 3410 0020	Maintenance and inspection baseboard heating units	\$ 91.39	1.10	\$ 103.59	0.97	\$ 100.52
			\$ 548.32				\$ 603.15
			\$ 274.16	Assume 50% required		Assume 50% required	\$ 301.57
				PER 0.5 YEAR		PER 0.5 YEAR	
1.000	D3 01 3160 0010	Preventive maintenance oil filter	\$ 7.01	1.10	\$ 7.95	0.97	\$ 7.71
1.000	D3 05 3112 0010	Maintenance and repair infrared heater suspended, commercial	\$ 49.41	1.10	\$ 56.01	0.97	\$ 54.35
1.000	D3 05 3150 0020	Maintenance and inspection wall mounted/recessed heater, with fan	\$ 91.39	1.10	\$ 103.59	0.97	\$ 100.52
1.000	D4 01 3310 1020	Inspect sprinkler system	\$ 40.17	1.10	\$ 45.53	0.97	\$ 44.18
1.000	D4 01 3310 1040	Rebuild double check 3" backflow preventer sprinkler system	\$ 876.67	1.10	\$ 993.71	0.97	\$ 964.34
1.000	D4 01 3310 1050	Rebuild double check 4" backflow preventer sprinkler system	\$ 1,089.19	1.10	\$ 1,234.61	0.97	\$ 1,198.11
1.000	D4 01 3310 1060	Rebuild double check 6" backflow preventer sprinkler system	\$ 1,253.90	1.10	\$ 1,421.31	0.97	\$ 1,379.29
1.000	D4 01 3310 1070	Rebuild reduced pressure 3" backflow preventer sprinkler system	\$ 876.67	1.10	\$ 993.71	0.97	\$ 964.34
1.000	D4 01 3310 1080	Rebuild reduced pressure 4" backflow preventer sprinkler system	\$ 1,089.19	1.10	\$ 1,234.61	0.97	\$ 1,198.11
1.000	D4 01 3310 1090	Rebuild reduced pressure 6" backflow preventer sprinkler system	\$ 1,253.90	1.10	\$ 1,421.31	0.97	\$ 1,379.29
			\$ 6,627.51				\$ 7,290.26
			\$ 3,313.75	Assume 50% required		Assume 50% required	\$ 3,645.13
				PER YEAR		PER YEAR	
1.000	D3 04 3310 0020	Inspect for leaks steam converter	\$ 7.88	1.10	\$ 8.94	0.97	\$ 8.67
1.000	D3 05 3114 0010	Maintenance and repair standard suspended heater	\$ 118.32	1.10	\$ 134.12	0.97	\$ 130.16
1.000	D3 05 3116 0010	Maintenance and repair explosionproof industrial heater	\$ 165.82	1.10	\$ 187.96	0.97	\$ 182.41
1.000	D3 05 3160 0010	Maintenance and repair convector suspended, commercial	\$ 49.41	1.10	\$ 56.01	0.97	\$ 54.35
1.000	D3 05 3410 0010	Maintenance and repair baseboard heating units	\$ 49.41	1.10	\$ 56.01	0.97	\$ 54.35
			\$ 390.86				\$ 429.94
			\$ 195.43	Assume 50% required		Assume 50% required	\$ 214.97
				PER 2 YEARS		PER 2 YEARS	
1.000	D3 04 3520 3010	Repack drain valve gland, 3/4" valves	\$ 29.22	1.10	\$ 33.12	0.97	\$ 32.14
			\$ 29.22				\$ 32.14
			\$ 14.61	Assume 50% required		Assume 50% required	\$ 16.07

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
10% GF												
CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation	6%											
De-Escalation to July 2009	1.03											NON-GREEN
De-Escalation Factor to be Applied	0.97											
Green Factor	1.10	Assumed Value										
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 01 3150 0010	Preventive maintenance fuel level meter	5	1 Stpi	Ea.	0.50	\$ 32.00	\$ 40.00	1.095	\$ 43.80	0.97	
1.000	D3 01 3240 0010	Check gas pressure natural gas, pressure reducing valve	5	1 Stpi	Ea.	0.13	\$ 8.35	\$ 10.45	1.095	\$ 11.44	0.97	
1.000	D3 04 3310 0010	Repair steam converter	5	1 Stpi	Ea.	5.94	\$ 380.00	\$ 480.00	1.095	\$ 525.60	0.97	
1.000	D3 04 3320 0010	Repair flash tank 24 gallon	5	1 Stpi	Ea.	5.94	\$ 380.00	\$ 480.00	1.095	\$ 525.60	0.97	
1.000	D3 04 3530 1010	Repair circulator pump, 1/12 - 3/4 H.P.	5	1 Stpi	Ea.	0.51	\$ 80.33	\$ 94.55	1.095	\$ 103.53	0.97	
1.000	D3 04 3530 2010	Repair circulator pump, 1 H.P.	5	1 Stpi	Ea.	0.51	\$ 80.53	\$ 94.80	1.095	\$ 103.81	0.97	
1.000	D3 04 3540 0010	Refill expansion tank	5	1 Stpi	Ea.	0.20	\$ 12.85	\$ 16.10	1.095	\$ 17.63	0.97	
1.000	D3 04 3550 1010	Repair damaged pipe insulation, fiberglass 1/2"	5	Q14	Ea.	0.26	\$ 15.88	\$ 19.50	1.095	\$ 21.35	0.97	
1.000	D3 04 3550 1110	Repair damaged pipe insulation, fiberglass 3/4"	5	Q14	Ea.	0.27	\$ 16.70	\$ 20.45	1.095	\$ 22.39	0.97	
1.000	D3 04 3550 1120	Repair damaged pipe insulation, fiberglass 1"	5	Q14	Ea.	0.28	\$ 17.50	\$ 21.40	1.095	\$ 23.43	0.97	
1.000	D3 04 3550 1130	Repair damaged pipe insulation, fbgs 1-1/4"	5	Q14	Ea.	0.30	\$ 18.35	\$ 22.55	1.095	\$ 24.69	0.97	
1.000	D3 04 3550 1140	Repair damaged pipe insulation, fbgs 1-1/2"	5	Q14	Ea.	0.30	\$ 18.65	\$ 22.80	1.095	\$ 24.97	0.97	
1.000	D3 04 3550 1150	Repair damaged pipe insulation, fiberglass 2"	5	Q14	Ea.	0.31	\$ 19.60	\$ 24.10	1.095	\$ 26.39	0.97	
1.000	D3 04 3550 1160	Repair damaged pipe insulation, fiberglass 3"	5	Q14	Ea.	0.35	\$ 22.25	\$ 27.10	1.095	\$ 29.67	0.97	
1.000	D3 04 3550 1170	Repair damaged pipe insulation, fiberglass 4"	5	Q14	Ea.	0.42	\$ 27.20	\$ 33.15	1.095	\$ 36.30	0.97	
1.000	D3 04 3550 1180	Repair damaged pipe insulation, fiberglass 6"	5	Q14	Ea.	0.52	\$ 33.70	\$ 40.90	1.095	\$ 44.79	0.97	
1.000	D3 04 3550 1220	Replace pipe insulation, fiberglass 1/2"	5	Q14	M.L.F.	100.00	\$ 6,375.00	\$ 7,775.00	1.095	\$ 8,513.63	0.97	
1.000	D3 04 3550 1230	Replace pipe insulation, fiberglass 3/4"	5	Q14	M.L.F.	104.35	\$ 6,675.00	\$ 8,175.00	1.095	\$ 8,951.63	0.97	
1.000	D3 04 3550 1240	Replace pipe insulation, fiberglass 1"	5	Q14	M.L.F.	109.09	\$ 7,025.00	\$ 8,575.00	1.095	\$ 9,389.63	0.97	
1.000	D3 04 3550 1250	Replace pipe insulation, fiberglass 1-1/4"	5	Q14	M.L.F.	114.29	\$ 7,375.00	\$ 9,025.00	1.095	\$ 9,882.38	0.97	
1.000	D3 04 3550 1260	Replace pipe insulation, fiberglass 1-1/2"	5	Q14	M.L.F.	114.29	\$ 7,525.00	\$ 9,150.00	1.095	\$ 10,019.25	0.97	
1.000	D3 04 3550 1270	Replace pipe insulation, fiberglass 2"	5	Q14	M.L.F.	120.00	\$ 7,925.00	\$ 9,650.00	1.095	\$ 10,566.75	0.97	
1.000	D3 04 3550 1280	Replace pipe insulation, fiberglass 3"	5	Q14	M.L.F.	133.33	\$ 8,950.00	\$ 10,925.00	1.095	\$ 11,962.88	0.97	
1.000	D3 04 3550 1290	Replace pipe insulation, fiberglass 4"	5	Q14	M.L.F.	160.00	\$ 10,975.00	\$ 13,350.00	1.095	\$ 14,618.25	0.97	
1.000	D3 04 3550 1300	Replace pipe insulation, fiberglass 6"	5	Q14	M.L.F.	200.00	\$ 13,650.00	\$ 16,575.00	1.095	\$ 18,149.63	0.97	
1.000	D3 04 3550 1410	Repair damaged pipe insulation rubber 1/2"	5	1 Asbe	Ea.	0.35	\$ 22.90	\$ 28.20	1.095	\$ 30.88	0.97	
1.000	D3 04 3550 1420	Repair damaged pipe insulation rubber 3/4"	5	1 Asbe	Ea.	0.35	\$ 23.40	\$ 28.55	1.095	\$ 31.26	0.97	
1.000	D3 04 3550 1430	Repair damaged pipe insulation rubber 1"	5	1 Asbe	Ea.	0.36	\$ 23.95	\$ 29.65	1.095	\$ 32.47	0.97	
1.000	D3 04 3550 1440	Repair damaged pipe insulation rubber 1-1/4"	5	1 Asbe	Ea.	0.36	\$ 25.35	\$ 31.25	1.095	\$ 34.22	0.97	
1.000	D3 04 3550 1450	Repair damaged pipe insulation rubber 1-1/2"	5	1 Asbe	Ea.	0.36	\$ 25.85	\$ 31.75	1.095	\$ 34.77	0.97	
1.000	D3 04 3550 1460	Repair damaged pipe insulation rubber 2"	5	1 Asbe	Ea.	0.36	\$ 26.95	\$ 32.85	1.095	\$ 35.97	0.97	
1.000	D3 04 3550 1470	Repair damaged pipe insulation rubber 3"	5	1 Asbe	Ea.	0.37	\$ 30.20	\$ 36.45	1.095	\$ 39.91	0.97	
1.000	D3 04 3550 1480	Repair damaged pipe insulation rubber 4"	5	1 Asbe	Ea.	0.39	\$ 33.65	\$ 40.50	1.095	\$ 44.35	0.97	
1.000	D3 04 3550 1490	Repair damaged pipe insulation rubber 6"	5	1 Asbe	Ea.	0.39	\$ 38.65	\$ 46.50	1.095	\$ 50.92	0.97	
1.000	D3 04 3550 1510	Replace pipe insulation foam rubber 1/2"	5	1 Asbe	L.F.	0.27	\$ 18.10	\$ 22.20	1.095	\$ 24.31	0.97	
1.000	D3 04 3550 1520	Replace pipe insulation foam rubber 3/4"	5	1 Asbe	L.F.	0.27	\$ 18.60	\$ 22.75	1.095	\$ 24.91	0.97	
1.000	D3 04 3550 1530	Replace pipe insulation foam rubber 1"	5	1 Asbe	L.F.	0.27	\$ 19.15	\$ 23.50	1.095	\$ 25.73	0.97	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
10% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor PER 3 YEARS	GREEN Total Adjusted Green OH&P Location	De-Escalation Factor PER 3 YEARS	Total Green with All Adjustments
1.000	D3 01 3150 0010	Preventive maintenance fuel level meter	\$ 42.51	1.10	\$ 48.18	0.97	\$ 46.76
1.000	D3 01 3240 0010	Check gas pressure natural gas, pressure reducing valve	\$ 11.10	1.10	\$ 12.59	0.97	\$ 12.21
1.000	D3 04 3310 0010	Repair steam converter	\$ 510.06	1.10	\$ 578.16	0.97	\$ 561.07
1.000	D3 04 3320 0010	Repair flash tank 24 gallon	\$ 510.06	1.10	\$ 578.16	0.97	\$ 561.07
1.000	D3 04 3530 1010	Repair circulator pump, 1/12 - 3/4 H.P.	\$ 100.47	1.10	\$ 113.89	0.97	\$ 110.52
1.000	D3 04 3530 2010	Repair circulator pump, 1 H.P.	\$ 100.74	1.10	\$ 114.19	0.97	\$ 110.81
1.000	D3 04 3540 0010	Refill expansion tank	\$ 17.11	1.10	\$ 19.39	0.97	\$ 18.82
1.000	D3 04 3550 1010	Repair damaged pipe insulation, fiberglass 1/2"	\$ 20.72	1.10	\$ 23.49	0.97	\$ 22.79
1.000	D3 04 3550 1110	Repair damaged pipe insulation, fiberglass 3/4"	\$ 21.73	1.10	\$ 24.63	0.97	\$ 23.90
1.000	D3 04 3550 1120	Repair damaged pipe insulation, fiberglass 1"	\$ 22.74	1.10	\$ 25.78	0.97	\$ 25.01
1.000	D3 04 3550 1130	Repair damaged pipe insulation, fbgs 1-1/4"	\$ 23.96	1.10	\$ 27.16	0.97	\$ 26.36
1.000	D3 04 3550 1140	Repair damaged pipe insulation, fbgs 1-1/2"	\$ 24.23	1.10	\$ 27.46	0.97	\$ 26.65
1.000	D3 04 3550 1150	Repair damaged pipe insulation, fiberglass 2"	\$ 25.61	1.10	\$ 29.03	0.97	\$ 28.17
1.000	D3 04 3550 1160	Repair damaged pipe insulation, fiberglass 3"	\$ 28.80	1.10	\$ 32.64	0.97	\$ 31.68
1.000	D3 04 3550 1170	Repair damaged pipe insulation, fiberglass 4"	\$ 35.23	1.10	\$ 39.93	0.97	\$ 38.75
1.000	D3 04 3550 1180	Repair damaged pipe insulation, fiberglass 6"	\$ 43.46	1.10	\$ 49.26	0.97	\$ 47.81
1.000	D3 04 3550 1220	Replace pipe insulation, fiberglass 1/2"	\$ 8,261.94	1.10	\$ 9,364.99	0.97	\$ 9,088.13
1.000	D3 04 3550 1230	Replace pipe insulation, fiberglass 3/4"	\$ 8,686.99	1.10	\$ 9,846.79	0.97	\$ 9,555.69
1.000	D3 04 3550 1240	Replace pipe insulation, fiberglass 1"	\$ 9,112.04	1.10	\$ 10,328.59	0.97	\$ 10,023.24
1.000	D3 04 3550 1250	Replace pipe insulation, fiberglass 1-1/4"	\$ 9,590.22	1.10	\$ 10,870.61	0.97	\$ 10,549.24
1.000	D3 04 3550 1260	Replace pipe insulation, fiberglass 1-1/2"	\$ 9,723.05	1.10	\$ 11,021.18	0.97	\$ 10,695.36
1.000	D3 04 3550 1270	Replace pipe insulation, fiberglass 2"	\$ 10,254.37	1.10	\$ 11,623.43	0.97	\$ 11,279.80
1.000	D3 04 3550 1280	Replace pipe insulation, fiberglass 3"	\$ 11,609.22	1.10	\$ 13,159.16	0.97	\$ 12,770.14
1.000	D3 04 3550 1290	Replace pipe insulation, fiberglass 4"	\$ 14,186.09	1.10	\$ 16,080.08	0.97	\$ 15,604.70
1.000	D3 04 3550 1300	Replace pipe insulation, fiberglass 6"	\$ 17,613.07	1.10	\$ 19,964.59	0.97	\$ 19,374.37
1.000	D3 04 3550 1410	Repair damaged pipe insulation rubber 1/2"	\$ 29.97	1.10	\$ 33.97	0.97	\$ 32.96
1.000	D3 04 3550 1420	Repair damaged pipe insulation rubber 3/4"	\$ 30.34	1.10	\$ 34.39	0.97	\$ 33.37
1.000	D3 04 3550 1430	Repair damaged pipe insulation rubber 1"	\$ 31.51	1.10	\$ 35.71	0.97	\$ 34.66
1.000	D3 04 3550 1440	Repair damaged pipe insulation rubber 1-1/4"	\$ 33.21	1.10	\$ 37.64	0.97	\$ 36.53
1.000	D3 04 3550 1450	Repair damaged pipe insulation rubber 1-1/2"	\$ 33.74	1.10	\$ 38.24	0.97	\$ 37.11
1.000	D3 04 3550 1460	Repair damaged pipe insulation rubber 2"	\$ 34.91	1.10	\$ 39.57	0.97	\$ 38.40
1.000	D3 04 3550 1470	Repair damaged pipe insulation rubber 3"	\$ 38.73	1.10	\$ 43.90	0.97	\$ 42.61
1.000	D3 04 3550 1480	Repair damaged pipe insulation rubber 4"	\$ 43.04	1.10	\$ 48.78	0.97	\$ 47.34
1.000	D3 04 3550 1490	Repair damaged pipe insulation rubber 6"	\$ 49.41	1.10	\$ 56.01	0.97	\$ 54.35
1.000	D3 04 3550 1510	Replace pipe insulation foam rubber 1/2"	\$ 23.59	1.10	\$ 26.74	0.97	\$ 25.95
1.000	D3 04 3550 1520	Replace pipe insulation foam rubber 3/4"	\$ 24.17	1.10	\$ 27.40	0.97	\$ 26.59
1.000	D3 04 3550 1530	Replace pipe insulation foam rubber 1"	\$ 24.97	1.10	\$ 28.31	0.97	\$ 27.47

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹													
10% GF													
CostWorks 2010 - EAST HALL													
Based on National Averages													
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN													
Escalation 6%													
De-Escalation to July 2009 1.03													
De-Escalation Factor to be Applied 0.97													
Green Factor 1.10 Assumed Value													
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor		
1.000	D3 04 3550 1540	Replace pipe insulation foam rubber 1-1/4"	5	1 Asbe	L.F.	0.28	\$ 20.40	\$ 24.85	1.095	\$ 27.21	0.97		
1.000	D3 04 3550 1550	Replace pipe insulation foam rubber 1-1/2"	5	1 Asbe	L.F.	0.28	\$ 21.00	\$ 25.50	1.095	\$ 27.92	0.97		
1.000	D3 04 3550 1560	Replace pipe insulation foam rubber 2"	5	1 Asbe	L.F.	0.28	\$ 22.00	\$ 26.70	1.095	\$ 29.24	0.97		
1.000	D3 04 3550 1570	Replace pipe insulation foam rubber 3"	5	1 Asbe	L.F.	0.28	\$ 25.15	\$ 30.40	1.095	\$ 33.29	0.97		
1.000	D3 04 3550 1580	Replace pipe insulation foam rubber 4"	5	1 Asbe	L.F.	0.30	\$ 28.40	\$ 34.30	1.095	\$ 37.56	0.97		
1.000	D3 04 3550 1590	Replace pipe insulation foam rubber 6"	5	1 Asbe	L.F.	0.30	\$ 33.40	\$ 39.80	1.095	\$ 43.58	0.97		
1.000	D3 05 3150 0010	Maintenance and repair wall mounted/recessed heater, with fan	5	1 Elec	Ea.	0.98	\$ 136.05	\$ 161.85	1.095	\$ 177.23	0.97		
							\$ 78,232.04	\$ 95,365.40					
1.000	D3 04 3330 0010	Replace steam regulator valve 1-1/2" diameter	6	1 Stpi	Ea.	1.20	\$ 2,200.50	\$ 2,507.00	1.095	\$ 2,745.17	0.97		
1.000	D3 04 3330 0110	Replace steam regulator valve 2" diameter	6	1 Stpi	Ea.	1.42	\$ 2,680.50	\$ 3,063.00	1.095	\$ 3,353.99	0.97		
1.000	D3 04 3330 0210	Replace steam regulator valve 2-1/2" diameter	6	Q5	Ea.	2.60	\$ 3,400.00	\$ 3,887.50	1.095	\$ 4,256.81	0.97		
1.000	D3 04 3330 0310	Replace steam regulator valve 3" diameter	6	Q5	Ea.	2.84	\$ 4,229.50	\$ 4,818.50	1.095	\$ 5,276.26	0.97		
							\$ 12,510.50	\$ 14,276.00					
1.000	D3 02 3180 1010	Repair boiler, gas, 250 MBH	7	1 Stpi	Ea.	9.87	\$ 1,724.80	\$ 2,035.70	1.095	\$ 2,229.09	0.97		
1.000	D3 02 3180 2010	Repair boiler, gas, 2000 MBH	7	Q5	Ea.	19.53	\$ 4,553.55	\$ 5,294.20	1.095	\$ 5,797.15	0.97		
1.000	D3 02 3180 3010	Repair boiler, gas, 10,000 MBH	7	Q5	Ea.	38.04	\$ 14,628.05	\$ 16,867.20	1.095	\$ 18,469.58	0.97		
1.000	D3 02 3184 1010	Repair boiler, oil, 250 MBH	7	Q5	Ea.	10.49	\$ 1,325.20	\$ 1,585.70	1.095	\$ 1,736.34	0.97		
1.000	D3 02 3184 2010	Repair boiler, oil, 2000 MBH	7	1 Stpi	Ea.	10.78	\$ 1,337.45	\$ 1,597.70	1.095	\$ 1,749.48	0.97		
1.000	D3 02 3184 3010	Repair boiler, oil, 10,000 MBH	7	1 Stpi	Ea.	11.16	\$ 1,494.10	\$ 1,778.20	1.095	\$ 1,947.13	0.97		
1.000	D3 02 3186 1010	Repair boiler, gas/oil, 2000 MBH	7	Q5	Ea.	22.94	\$ 4,958.60	\$ 5,780.20	1.095	\$ 6,329.32	0.97		
1.000	D3 02 3186 2010	Repair boiler, gas/oil, 20,000 MBH	7	Q5	Ea.	43.27	\$ 15,233.40	\$ 17,587.60	1.095	\$ 19,258.42	0.97		
1.000	D3 04 3350 1030	Replace steam trap, 15 PSIG, 3/4" threaded	7	1 Stpi	Ea.	0.98	\$ 178.00	\$ 210.00	1.095	\$ 229.95	0.97		
1.000	D3 04 3350 1040	Replace steam trap, 15 PSIG, 1" threaded	7	1 Stpi	Ea.	1.04	\$ 206.50	\$ 243.00	1.095	\$ 266.09	0.97		
1.000	D3 04 3350 1050	Replace steam trap, 15 PSIG, 1-1/4" threaded	7	1 Stpi	Ea.	1.20	\$ 246.50	\$ 289.00	1.095	\$ 316.46	0.97		
1.000	D3 04 3350 1060	Replace steam trap, 15 PSIG, 1-1/2" threaded	7	1 Stpi	Ea.	1.73	\$ 357.00	\$ 416.50	1.095	\$ 456.07	0.97		
1.000	D3 04 3350 1070	Replace steam trap, 15 PSIG, 2" threaded	7	1 Stpi	Ea.	2.60	\$ 615.50	\$ 719.50	1.095	\$ 787.85	0.97		
							\$ 46,858.65	\$ 54,404.50					

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹										
10% GF										
CostWorks 2010 - EAST HALL										
Based on National Averages										
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN										
Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.10	Assumed Value								
				Total Non-Green with All Adjustments	Green Factor	GREEN	De-Escalation Factor	Total Green with All Adjustments		
Qty	Assembly Number	Description								
1.000	D3 04 3550 1540	Replace pipe insulation foam rubber 1-1/4"	\$	26.41	1.10	\$	29.93	0.97	\$	29.05
1.000	D3 04 3550 1550	Replace pipe insulation foam rubber 1-1/2"	\$	27.10	1.10	\$	30.71	0.97	\$	29.81
1.000	D3 04 3550 1560	Replace pipe insulation foam rubber 2"	\$	28.37	1.10	\$	32.16	0.97	\$	31.21
1.000	D3 04 3550 1570	Replace pipe insulation foam rubber 3"	\$	32.30	1.10	\$	36.62	0.97	\$	35.53
1.000	D3 04 3550 1580	Replace pipe insulation foam rubber 4"	\$	36.45	1.10	\$	41.31	0.97	\$	40.09
1.000	D3 04 3550 1590	Replace pipe insulation foam rubber 6"	\$	42.29	1.10	\$	47.94	0.97	\$	46.52
1.000	D3 05 3150 0010	Maintenance and repair wall mounted/recessed heater, with fan	\$	171.99	1.10	\$	194.95	0.97	\$	189.19
			\$	101,337.99					\$	111,471.79
			\$	50,669.00	Assume 50% required			Assume 50% required	\$	55,735.90
					PER 5 YEARS			PER 5 YEARS		
1.000	D3 04 3330 0010	Replace steam regulator valve 1-1/2" diameter	\$	2,664.01	1.10	\$	3,019.68	0.97	\$	2,930.41
1.000	D3 04 3330 0110	Replace steam regulator valve 2" diameter	\$	3,254.83	1.10	\$	3,689.38	0.97	\$	3,580.31
1.000	D3 04 3330 0210	Replace steam regulator valve 2-1/2" diameter	\$	4,130.97	1.10	\$	4,682.49	0.97	\$	4,544.07
1.000	D3 04 3330 0310	Replace steam regulator valve 3" diameter	\$	5,120.28	1.10	\$	5,803.88	0.97	\$	5,632.30
			\$	15,170.08					\$	16,687.09
			\$	7,585.04	Assume 50% required			Assume 50% required	\$	8,343.55
					PER 6 YEARS			PER 6 YEARS		
1.000	D3 02 3180 1010	Repair boiler, gas, 250 MBH	\$	2,163.19	1.10	\$	2,452.00	0.97	\$	2,379.51
1.000	D3 02 3180 2010	Repair boiler, gas, 2000 MBH	\$	5,625.77	1.10	\$	6,376.86	0.97	\$	6,188.34
1.000	D3 02 3180 3010	Repair boiler, gas, 10,000 MBH	\$	17,923.57	1.10	\$	20,316.54	0.97	\$	19,715.92
1.000	D3 02 3184 1010	Repair boiler, oil, 250 MBH	\$	1,685.01	1.10	\$	1,909.98	0.97	\$	1,853.51
1.000	D3 02 3184 2010	Repair boiler, oil, 2000 MBH	\$	1,697.76	1.10	\$	1,924.43	0.97	\$	1,867.54
1.000	D3 02 3184 3010	Repair boiler, oil, 10,000 MBH	\$	1,889.57	1.10	\$	2,141.84	0.97	\$	2,078.52
1.000	D3 02 3186 1010	Repair boiler, gas/oil, 2000 MBH	\$	6,142.21	1.10	\$	6,962.25	0.97	\$	6,756.43
1.000	D3 02 3186 2010	Repair boiler, gas/oil, 20,000 MBH	\$	18,689.08	1.10	\$	21,184.26	0.97	\$	20,557.99
1.000	D3 04 3350 1030	Replace steam trap, 15 PSIG, 3/4" threaded	\$	223.15	1.10	\$	252.95	0.97	\$	245.47
1.000	D3 04 3350 1040	Replace steam trap, 15 PSIG, 1" threaded	\$	258.22	1.10	\$	292.69	0.97	\$	284.04
1.000	D3 04 3350 1050	Replace steam trap, 15 PSIG, 1-1/4" threaded	\$	307.10	1.10	\$	348.10	0.97	\$	337.81
1.000	D3 04 3350 1060	Replace steam trap, 15 PSIG, 1-1/2" threaded	\$	442.58	1.10	\$	501.67	0.97	\$	486.84
1.000	D3 04 3350 1070	Replace steam trap, 15 PSIG, 2" threaded	\$	764.56	1.10	\$	866.64	0.97	\$	841.02
			\$	57,811.77					\$	63,592.95
			\$	28,905.89	Assume 50% required			Assume 50% required	\$	31,796.47
					PER 7 YEARS			PER 7 YEARS		

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹													
10% GF													
CostWorks 2010 - EAST HALL													
Based on National Averages													
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN													
Escalation	6%												
De-Escalation to July 2009	1.03												NON-GREEN
De-Escalation Factor to be Applied	0.97												
Green Factor	1.10		Assumed Value										
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor		
1.000	D3 04 3520 3020	Replace drain valve stem assembly, 3/4" valves	8	1 Stpi	Ea.	0.55	\$ 45.74	\$ 56.37	1.095	\$ 61.73	0.97		
1.000	D3 05 3265 1010	Repair air conditioner, window, 1 ton	8	1 Stpi	Ea.	1.07	\$ 75.75	\$ 93.65	1.095	\$ 102.55	0.97		
1.000	D3 05 3266 2010	Repair air conditioner, window, 2 ton	8	1 Stpi	Ea.	1.13	\$ 87.00	\$ 107.00	1.095	\$ 117.17	0.97		
							\$ 208.49	\$ 257.02					
1.000	D3 01 3170 0010	Remake flare type joint fuel oil storage: pipe & fittings, copper	10	1 Stpi	M.L.F.	0.29	\$ 18.35	\$ 23.00	1.095	\$ 25.19	0.97		
1.000	D3 02 3198 1010	Repair boiler blowoff system	10	1 Stpi	Ea.	1.00	\$ 64.50	\$ 80.50	1.095	\$ 88.15	0.97		
1.000	D3 02 3296 1010	Repair deaerator	10	1 Stpi	Ea.	1.00	\$ 64.50	\$ 80.50	1.095	\$ 88.15	0.97		
1.000	D3 02 3388 1010	Repair spreader, pneumatic coal	10	2 Stpi	Ea.	22.33	\$ 4,949.50	\$ 5,776.00	1.095	\$ 6,324.72	0.97		
1.000	D3 02 3390 1010	Repair fuel oil equipment, pump	10	1 Stpi	Ea.	5.42	\$ 392.05	\$ 485.50	1.095	\$ 531.62	0.97		
1.000	D3 03 3115 1010	Repair cooling tower, 50 ton	10	2 Stpi	Ea.	8.17	\$ 960.00	\$ 1,148.00	1.095	\$ 1,257.06	0.97		
1.000	D3 03 3115 2010	Repair cooling tower, 100 ton	10	2 Stpi	Ea.	28.25	\$ 3,491.00	\$ 4,170.50	1.095	\$ 4,566.70	0.97		
1.000	D3 03 3115 3010	Repair cooling tower, 300 ton	10	2 Stpi	Ea.	43.58	\$ 5,947.50	\$ 7,097.50	1.095	\$ 7,771.76	0.97		
1.000	D3 03 3115 4010	Repair cooling tower, 1000 ton	10	2 Stpi	Ea.	76.41	\$ 13,669.50	\$ 16,111.50	1.095	\$ 17,642.09	0.97		
1.000	D3 03 3130 1010	Repair water cooled chiller, 20 ton, reciprocating	10	Q6	Ea.	79.24	\$ 21,967.50	\$ 25,490.50	1.095	\$ 27,912.10	0.97		
1.000	D3 03 3130 2010	Repair water cooled chiller, 50 ton, reciprocating	10	Q6	Ea.	190.33	\$ 53,667.50	\$ 62,505.50	1.095	\$ 68,443.52	0.97		
1.000	D3 03 3130 3010	Repair water cooled chiller, 100 ton, reciprocating	10	Q6	Ea.	484.44	\$ 69,624.50	\$ 82,555.50	1.095	\$ 90,398.27	0.97		
1.000	D3 03 3130 5010	Repair water cooled chiller, 200 ton, reciprocating	10	Q7	Ea.	489.03	\$ 71,339.50	\$ 84,655.50	1.095	\$ 92,697.77	0.97		
1.000	D3 03 3135 1010	Repair recip. chiller, air cooled, 20 ton	10	2 Stpi	Ea.	95.12	\$ 23,680.50	\$ 27,565.50	1.095	\$ 30,184.22	0.97		
1.000	D3 03 3135 2010	Repair recip. chiller, air cooled, 50 ton	10	Q6	Ea.	215.43	\$ 56,231.50	\$ 65,533.50	1.095	\$ 71,759.18	0.97		
1.000	D3 03 3135 3010	Repair chiller, air cooled, 100 ton chiller	10	Q6	Ea.	425.64	\$ 55,498.50	\$ 66,039.50	1.095	\$ 72,313.25	0.97		
1.000	D3 03 3137 4010	Repair water cooled chiller, 5 ton, reciprocating	10	1 Stpi	Ea.	11.80	\$ 1,379.00	\$ 1,654.50	1.095	\$ 1,811.68	0.97		
1.000	D3 03 3137 5010	Repair water cooled chiller, 10 ton, reciprocating	10	2 Stpi	Ea.	26.79	\$ 3,025.50	\$ 3,633.50	1.095	\$ 3,978.68	0.97		
1.000	D3 03 3137 6010	Repair water cooled chiller, 15 ton, reciprocating	10	Q5	Ea.	53.80	\$ 5,714.50	\$ 6,850.50	1.095	\$ 7,501.30	0.97		
1.000	D3 03 3140 1010	Repair hermetic centrifugal chiller, 100 ton	10	Q7	Ea.	242.03	\$ 41,653.00	\$ 48,961.00	1.095	\$ 53,612.30	0.97		
1.000	D3 03 3140 2010	Repair hermetic centrifugal chiller, 300 ton	10	Q7	Ea.	560.26	\$ 96,365.00	\$ 113,192.50	1.095	\$ 123,945.79	0.97		
1.000	D3 03 3140 3010	Repair hermetic centrifugal chiller, 1000 ton	10	Q7	Ea.	1,767.34	\$ 303,562.50	\$ 356,854.50	1.095	\$ 390,755.68	0.97		
1.000	D3 03 3142 1010	Repair open centrifugal chiller, 300 ton	10	Q7	Ea.	578.94	\$ 97,404.50	\$ 114,460.50	1.095	\$ 125,334.25	0.97		
1.000	D3 03 3142 2010	Repair open centrifugal chiller, 1000 ton	10	Q7	Ea.	1,808.56	\$ 307,714.50	\$ 361,880.50	1.095	\$ 396,259.15	0.97		
1.000	D3 03 3145 1010	Repair chiller, absorption, 100 ton	10	2 Stpi	Ea.	35.51	\$ 15,938.50	\$ 18,353.50	1.095	\$ 20,097.08	0.97		
1.000	D3 03 3145 2010	Repair chiller, absorption, 350 ton	10	2 Stpi	Ea.	39.71	\$ 16,837.50	\$ 19,424.50	1.095	\$ 21,269.83	0.97		
1.000	D3 03 3145 3010	Repair chiller, absorption, 950 ton	10	4 Stpi	Ea.	54.20	\$ 20,777.50	\$ 23,959.50	1.095	\$ 26,235.65	0.97		
1.000	D3 03 3210 1010	Repair condenser, air cooled, 5 ton	10	1 Stpi	Ea.	4.61	\$ 598.00	\$ 715.00	1.095	\$ 782.93	0.97		
1.000	D3 03 3210 2010	Repair condenser, air cooled, 20 ton	10	2 Stpi	Ea.	7.93	\$ 1,213.50	\$ 1,441.50	1.095	\$ 1,578.44	0.97		
1.000	D3 03 3210 3010	Repair condenser, air cooled, 50 ton	10	2 Stpi	Ea.	11.40	\$ 1,838.50	\$ 2,159.50	1.095	\$ 2,364.65	0.97		
1.000	D3 03 3210 4010	Repair condenser, air cooled, 100 ton	10	2 Stpi	Ea.	21.80	\$ 3,609.50	\$ 4,240.50	1.095	\$ 4,643.35	0.97		

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹								
10% GF								
CostWorks 2010 - EAST HALL								
Based on National Averages								
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN								
Escalation								
	6%							
De-Escalation to July 2009								
	1.03							
De-Escalation Factor to be Applied								
	0.97							
Green Factor								
	1.10	Assumed Value						
GREEN								
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments	
1.000	D3 04 3520 3020	Replace drain valve stem assembly, 3/4" valves	\$ 59.90	1.10	\$ 67.90	0.97	\$ 65.89	
1.000	D3 05 3265 1010	Repair air conditioner, window, 1 ton	\$ 99.52	1.10	\$ 112.80	0.97	\$ 109.47	
1.000	D3 05 3266 2010	Repair air conditioner, window, 2 ton	\$ 113.70	1.10	\$ 128.88	0.97	\$ 125.07	
			\$ 273.12				\$ 300.43	
			\$ 136.56	Assume 50% required		Assume 50% required	\$ 150.21	
				PER 8 YEARS		PER 8 YEARS		
1.000	D3 01 3170 0010	Remake flare type joint fuel oil storage: pipe & fittings, copper	\$ 24.44	1.10	\$ 27.70	0.97	\$ 26.88	
1.000	D3 02 3198 1010	Repair boiler blowoff system	\$ 85.54	1.10	\$ 96.96	0.97	\$ 94.10	
1.000	D3 02 3296 1010	Repair deaerator	\$ 85.54	1.10	\$ 96.96	0.97	\$ 94.10	
1.000	D3 02 3388 1010	Repair spreader, pneumatic coal	\$ 6,137.74	1.10	\$ 6,957.19	0.97	\$ 6,751.52	
1.000	D3 02 3390 1010	Repair fuel oil equipment, pump	\$ 515.91	1.10	\$ 584.78	0.97	\$ 567.50	
1.000	D3 03 3115 1010	Repair cooling tower, 50 ton	\$ 1,219.90	1.10	\$ 1,382.77	0.97	\$ 1,341.89	
1.000	D3 03 3115 2010	Repair cooling tower, 100 ton	\$ 4,431.69	1.10	\$ 5,023.37	0.97	\$ 4,874.86	
1.000	D3 03 3115 3010	Repair cooling tower, 300 ton	\$ 7,542.01	1.10	\$ 8,548.94	0.97	\$ 8,296.21	
1.000	D3 03 3115 4010	Repair cooling tower, 1000 ton	\$ 17,120.54	1.10	\$ 19,406.30	0.97	\$ 18,832.59	
1.000	D3 03 3130 1010	Repair water cooled chiller, 20 ton, reciprocating	\$ 27,086.93	1.10	\$ 30,703.31	0.97	\$ 29,795.62	
1.000	D3 03 3130 2010	Repair water cooled chiller, 50 ton, reciprocating	\$ 66,420.13	1.10	\$ 75,287.87	0.97	\$ 73,062.14	
1.000	D3 03 3130 3010	Repair water cooled chiller, 100 ton, reciprocating	\$ 87,725.83	1.10	\$ 99,438.10	0.97	\$ 96,498.41	
1.000	D3 03 3130 5010	Repair water cooled chiller, 200 ton, reciprocating	\$ 89,957.35	1.10	\$ 101,967.55	0.97	\$ 98,953.08	
1.000	D3 03 3135 1010	Repair recip. chiller, air cooled, 20 ton	\$ 29,291.89	1.10	\$ 33,202.64	0.97	\$ 32,221.07	
1.000	D3 03 3135 2010	Repair recip. chiller, air cooled, 50 ton	\$ 69,637.76	1.10	\$ 78,935.10	0.97	\$ 76,601.54	
1.000	D3 03 3135 3010	Repair chiller, air cooled, 100 ton chiller	\$ 70,175.45	1.10	\$ 79,544.58	0.97	\$ 77,193.00	
1.000	D3 03 3137 4010	Repair water cooled chiller, 5 ton, reciprocating	\$ 1,758.12	1.10	\$ 1,992.85	0.97	\$ 1,933.93	
1.000	D3 03 3137 5010	Repair water cooled chiller, 10 ton, reciprocating	\$ 3,861.06	1.10	\$ 4,376.55	0.97	\$ 4,247.17	
1.000	D3 03 3137 6010	Repair water cooled chiller, 15 ton, reciprocating	\$ 7,279.54	1.10	\$ 8,251.43	0.97	\$ 8,007.49	
1.000	D3 03 3140 1010	Repair hermetic centrifugal chiller, 100 ton	\$ 52,027.35	1.10	\$ 58,973.52	0.97	\$ 57,230.09	
1.000	D3 03 3140 2010	Repair hermetic centrifugal chiller, 300 ton	\$ 120,281.58	1.10	\$ 136,340.37	0.97	\$ 132,309.73	
1.000	D3 03 3140 3010	Repair hermetic centrifugal chiller, 1000 ton	\$ 379,203.76	1.10	\$ 429,831.25	0.97	\$ 417,124.14	
1.000	D3 03 3142 1010	Repair open centrifugal chiller, 300 ton	\$ 121,628.99	1.10	\$ 137,867.67	0.97	\$ 133,791.89	
1.000	D3 03 3142 2010	Repair open centrifugal chiller, 1000 ton	\$ 384,544.53	1.10	\$ 435,885.06	0.97	\$ 422,998.99	
1.000	D3 03 3145 1010	Repair chiller, absorption, 100 ton	\$ 19,502.95	1.10	\$ 22,106.79	0.97	\$ 21,453.25	
1.000	D3 03 3145 2010	Repair chiller, absorption, 350 ton	\$ 20,641.03	1.10	\$ 23,396.81	0.97	\$ 22,705.13	
1.000	D3 03 3145 3010	Repair chiller, absorption, 950 ton	\$ 25,460.05	1.10	\$ 28,859.22	0.97	\$ 28,006.05	
1.000	D3 03 3210 1010	Repair condenser, air cooled, 5 ton	\$ 759.78	1.10	\$ 861.22	0.97	\$ 835.76	
1.000	D3 03 3210 2010	Repair condenser, air cooled, 20 ton	\$ 1,531.78	1.10	\$ 1,736.29	0.97	\$ 1,684.96	
1.000	D3 03 3210 3010	Repair condenser, air cooled, 50 ton	\$ 2,294.75	1.10	\$ 2,601.12	0.97	\$ 2,524.22	
1.000	D3 03 3210 4010	Repair condenser, air cooled, 100 ton	\$ 4,506.08	1.10	\$ 5,107.68	0.97	\$ 4,956.68	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹													
10% GF													
CostWorks 2010 - EAST HALL													
Based on National Averages													
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN													
Escalation		6%											
De-Escalation to July 2009		1.03											NON-GREEN
De-Escalation Factor to be Applied		0.97											
Green Factor		1.10 Assumed Value											
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor		
1.000	D3 03 3260 1010	Repair evaporative condenser, 20 ton	10	2 Stpi	Ea.	75.77	\$ 8,799.50	\$ 10,542.50	1.095	\$ 11,544.04	0.97		
1.000	D3 03 3260 2010	Repair evaporative condenser, 100 ton	10	2 Stpi	Ea.	109.64	\$ 12,635.50	\$ 15,101.50	1.095	\$ 16,536.14	0.97		
1.000	D3 03 3260 3010	Repair evaporative condenser, 300 ton	10	2 Stpi	Ea.	116.45	\$ 15,611.50	\$ 18,507.50	1.095	\$ 20,265.71	0.97		
1.000	D3 04 3120 1010	Repair fan coil unit, 1 ton	10	1 Stpi	Ea.	3.15	\$ 387.00	\$ 461.50	1.095	\$ 505.34	0.97		
1.000	D3 04 3120 2010	Repair fan coil unit, 3 ton	10	1 Stpi	Ea.	3.15	\$ 497.00	\$ 586.50	1.095	\$ 642.22	0.97		
1.000	D3 04 3120 3010	Repair fan coil unit, 5 ton	10	1 Stpi	Ea.	3.51	\$ 527.00	\$ 626.50	1.095	\$ 686.02	0.97		
1.000	D3 04 3120 4010	Repair fan coil unit, 10 ton	10	1 Stpi	Ea.	3.71	\$ 605.00	\$ 713.00	1.095	\$ 780.74	0.97		
1.000	D3 04 3120 5010	Repair fan coil unit, 20 ton	10	1 Stpi	Ea.	3.91	\$ 713.00	\$ 839.00	1.095	\$ 918.71	0.97		
1.000	D3 04 3120 6010	Repair fan coil unit, 30 ton	10	1 Stpi	Ea.	4.40	\$ 996.00	\$ 1,170.00	1.095	\$ 1,281.15	0.97		
1.000	D3 04 3122 1010	Repair fan coil, DX 1-1/2 ton, cooling only	10	1 Stpi	Ea.	13.52	\$ 1,397.30	\$ 1,692.50	1.095	\$ 1,853.29	0.97		
1.000	D3 04 3122 2010	Repair fan coil, DX 2 ton, cooling only	10	1 Stpi	Ea.	13.93	\$ 1,439.80	\$ 1,739.00	1.095	\$ 1,904.21	0.97		
1.000	D3 04 3122 3010	Repair fan coil, DX 2-1/2 ton, cooling only	10	1 Stpi	Ea.	14.40	\$ 1,637.30	\$ 1,965.00	1.095	\$ 2,151.68	0.97		
1.000	D3 04 3122 4010	Repair fan coil, DX 3 ton, cooling only	10	1 Stpi	Ea.	13.91	\$ 1,587.30	\$ 1,900.00	1.095	\$ 2,080.50	0.97		
1.000	D3 04 3122 5050	Repair fan coil, DX 5 ton, cooling only	10	1 Stpi	Ea.	15.02	\$ 1,852.30	\$ 2,215.00	1.095	\$ 2,425.43	0.97		
1.000	D3 04 3122 7070	Repair fan coil, DX 10 ton, cooling only	10	Q6	Ea.	51.44	\$ 13,478.30	\$ 15,704.00	1.095	\$ 17,195.88	0.97		
1.000	D3 04 3122 9090	Repair fan coil, DX 20 ton, cooling only	10	Q6	Ea.	74.75	\$ 20,248.30	\$ 23,539.00	1.095	\$ 25,775.21	0.97		
1.000	D3 04 3124 5010	Replace fan coil, DX 5 ton, with heat	10	Q5	Ea.	14.64	\$ 2,873.00	\$ 3,379.00	1.095	\$ 3,700.01	0.97		
1.000	D3 04 3124 6010	Replace fan coil, DX 10 ton, with heat	10	Q6	Ea.	25.33	\$ 5,800.00	\$ 6,750.00	1.095	\$ 7,391.25	0.97		
1.000	D3 04 3124 7010	Replace fan coil, DX 20 ton, with heat	10	Q6	Ea.	94.22	\$ 14,000.00	\$ 16,450.00	1.095	\$ 18,012.75	0.97		
1.000	D3 04 3128 1010	Repair unit ventilator, 750 CFM, 2 ton	10	1 Stpi	Ea.	3.96	\$ 434.35	\$ 520.60	1.095	\$ 570.06	0.97		
1.000	D3 04 3128 2010	Repair unit ventilator, 1250 CFM, 3 ton	10	1 Stpi	Ea.	3.96	\$ 544.35	\$ 645.60	1.095	\$ 706.93	0.97		
1.000	D3 04 3128 2040	Repair unit ventilator, 2000 CFM, 5 ton	10	1 Stpi	Ea.	4.42	\$ 580.80	\$ 693.50	1.095	\$ 759.38	0.97		
1.000	D3 04 3210 1010	Repair fan, induced draft, 2000 CFM	10	1 Stpi	Ea.	3.00	\$ 242.50	\$ 297.50	1.095	\$ 325.76	0.97		
1.000	D3 04 3210 2010	Repair fan, induced draft, 6700 CFM	10	1 Stpi	Ea.	3.00	\$ 242.50	\$ 297.50	1.095	\$ 325.76	0.97		
1.000	D3 04 3210 3010	Repair fan, induced draft, 17,700 CFM	10	1 Stpi	Ea.	3.22	\$ 262.50	\$ 322.50	1.095	\$ 353.14	0.97		
1.000	D3 04 3220 3010	Replace utility set, belt drive, 800 CFM exhaust fan	10	Q20	Ea.	6.50	\$ 1,222.00	\$ 1,427.00	1.095	\$ 1,562.57	0.97		
1.000	D3 04 3220 3020	Replace utility set, belt drive, 3600 CFM exhaust fan	10	Q20	Ea.	9.75	\$ 2,308.00	\$ 2,679.00	1.095	\$ 2,933.51	0.97		
1.000	D3 04 3220 3030	Replace utility set, belt drive, 11,000 CFM exhaust fan	10	Q20	Ea.	19.50	\$ 5,740.00	\$ 6,655.00	1.095	\$ 7,287.23	0.97		
1.000	D3 04 3220 3040	Replace utility set, belt drive, 3600 CFM exhaust fan	10	Q20	Ea.	48.77	\$ 8,990.00	\$ 10,550.00	1.095	\$ 11,552.25	0.97		
1.000	D3 04 3220 4010	Replace axial flow fan, 3800 CFM exhaust fan	10	Q20	Ea.	11.47	\$ 5,590.00	\$ 6,444.00	1.095	\$ 7,056.18	0.97		
1.000	D3 04 3220 4020	Replace axial flow fan, 6400 CFM exhaust fan	10	Q20	Ea.	13.93	\$ 6,312.00	\$ 7,250.00	1.095	\$ 7,938.75	0.97		
1.000	D3 04 3220 4030	Replace axial flow fan, 15,600 CFM exhaust fan	10	Q20	Ea.	24.37	\$ 10,035.00	\$ 11,570.00	1.095	\$ 12,669.15	0.97		
1.000	D3 04 3220 4040	Replace axial flow fan, 28,000 CFM exhaust fan	10	Q20	Ea.	97.46	\$ 20,325.00	\$ 23,800.00	1.095	\$ 26,061.00	0.97		
1.000	D3 04 3520 1010	Repack gate valve gland, 3/8" - 1 - 1/2" valves	10	1 Stpi	Ea.	0.22	\$ 23.00	\$ 27.50	1.095	\$ 30.11	0.97		
1.000	D3 04 3520 2010	Repack gate valve gland, 2" - 3" valves	10	1 Stpi	Ea.	0.29	\$ 30.50	\$ 36.50	1.095	\$ 39.97	0.97		
1.000	D3 05 3110 1010	Repair unit heater, 12 MBH, 2 PSI steam	10	1 Stpi	Ea.	3.13	\$ 385.35	\$ 459.60	1.095	\$ 503.26	0.97		
1.000	D3 05 3110 2010	Repair unit heater, 36 MBH, 2 PSI steam	10	1 Stpi	Ea.	3.13	\$ 485.35	\$ 574.60	1.095	\$ 629.19	0.97		
1.000	D3 05 3110 3010	Repair unit heater, 85 MBH, 2 PSI steam	10	1 Stpi	Ea.	3.13	\$ 495.35	\$ 584.60	1.095	\$ 640.14	0.97		
1.000	D3 05 3110 4010	Repair unit heater, 250 MBH, 2 PSI steam	10	1 Stpi	Ea.	3.67	\$ 532.35	\$ 633.10	1.095	\$ 693.24	0.97		

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
10% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value					
				GREEN			
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 03 3260 1010	Repair evaporative condenser, 20 ton	\$ 11,202.76	1.10	\$ 12,698.44	0.97	\$ 12,323.04
1.000	D3 03 3260 2010	Repair evaporative condenser, 100 ton	\$ 16,047.28	1.10	\$ 18,189.76	0.97	\$ 17,652.01
1.000	D3 03 3260 3010	Repair evaporative condenser, 300 ton	\$ 19,666.60	1.10	\$ 22,292.28	0.97	\$ 21,633.26
1.000	D3 04 3120 1010	Repair fan coil unit, 1 ton	\$ 490.40	1.10	\$ 555.88	0.97	\$ 539.44
1.000	D3 04 3120 2010	Repair fan coil unit, 3 ton	\$ 623.23	1.10	\$ 706.44	0.97	\$ 685.55
1.000	D3 04 3120 3010	Repair fan coil unit, 5 ton	\$ 665.74	1.10	\$ 754.62	0.97	\$ 732.31
1.000	D3 04 3120 4010	Repair fan coil unit, 10 ton	\$ 757.65	1.10	\$ 858.81	0.97	\$ 833.42
1.000	D3 04 3120 5010	Repair fan coil unit, 20 ton	\$ 891.55	1.10	\$ 1,010.58	0.97	\$ 980.70
1.000	D3 04 3120 6010	Repair fan coil unit, 30 ton	\$ 1,243.28	1.10	\$ 1,409.27	0.97	\$ 1,367.60
1.000	D3 04 3122 1010	Repair fan coil, DX 1-1/2 ton, cooling only	\$ 1,798.50	1.10	\$ 2,038.62	0.97	\$ 1,978.35
1.000	D3 04 3122 2010	Repair fan coil, DX 2 ton, cooling only	\$ 1,847.91	1.10	\$ 2,094.63	0.97	\$ 2,032.70
1.000	D3 04 3122 3010	Repair fan coil, DX 2-1/2 ton, cooling only	\$ 2,088.07	1.10	\$ 2,366.84	0.97	\$ 2,296.87
1.000	D3 04 3122 4010	Repair fan coil, DX 3 ton, cooling only	\$ 2,018.99	1.10	\$ 2,288.55	0.97	\$ 2,220.89
1.000	D3 04 3122 5050	Repair fan coil, DX 5 ton, cooling only	\$ 2,353.72	1.10	\$ 2,667.97	0.97	\$ 2,589.09
1.000	D3 04 3122 7070	Repair fan coil, DX 10 ton, cooling only	\$ 16,687.52	1.10	\$ 18,915.47	0.97	\$ 18,356.27
1.000	D3 04 3122 9090	Repair fan coil, DX 20 ton, cooling only	\$ 25,013.21	1.10	\$ 28,352.73	0.97	\$ 27,514.53
1.000	D3 04 3124 5010	Replace fan coil, DX 5 ton, with heat	\$ 3,590.62	1.10	\$ 4,070.01	0.97	\$ 3,949.68
1.000	D3 04 3124 6010	Replace fan coil, DX 10 ton, with heat	\$ 7,172.74	1.10	\$ 8,130.38	0.97	\$ 7,890.02
1.000	D3 04 3124 7010	Replace fan coil, DX 20 ton, with heat	\$ 17,480.24	1.10	\$ 19,814.03	0.97	\$ 19,228.26
1.000	D3 04 3128 1010	Repair unit ventilator, 750 CFM, 2 ton	\$ 553.20	1.10	\$ 627.06	0.97	\$ 608.52
1.000	D3 04 3128 2010	Repair unit ventilator, 1250 CFM, 3 ton	\$ 686.03	1.10	\$ 777.63	0.97	\$ 754.64
1.000	D3 04 3128 2040	Repair unit ventilator, 2000 CFM, 5 ton	\$ 736.93	1.10	\$ 835.32	0.97	\$ 810.63
1.000	D3 04 3210 1010	Repair fan, induced draft, 2000 CFM	\$ 316.13	1.10	\$ 358.34	0.97	\$ 347.75
1.000	D3 04 3210 2010	Repair fan, induced draft, 6700 CFM	\$ 316.13	1.10	\$ 358.34	0.97	\$ 347.75
1.000	D3 04 3210 3010	Repair fan, induced draft, 17,700 CFM	\$ 342.70	1.10	\$ 388.45	0.97	\$ 376.97
1.000	D3 04 3220 3010	Replace utility set, belt drive, 800 CFM exhaust fan	\$ 1,516.37	1.10	\$ 1,718.82	0.97	\$ 1,668.01
1.000	D3 04 3220 3020	Replace utility set, belt drive, 3600 CFM exhaust fan	\$ 2,846.78	1.10	\$ 3,226.86	0.97	\$ 3,131.46
1.000	D3 04 3220 3030	Replace utility set, belt drive, 11,000 CFM exhaust fan	\$ 7,071.79	1.10	\$ 8,015.95	0.97	\$ 7,778.97
1.000	D3 04 3220 3040	Replace utility set, belt drive, 3600 CFM exhaust fan	\$ 11,210.73	1.10	\$ 12,707.48	0.97	\$ 12,331.80
1.000	D3 04 3220 4010	Replace axial flow fan, 3800 CFM exhaust fan	\$ 6,847.58	1.10	\$ 7,761.80	0.97	\$ 7,532.34
1.000	D3 04 3220 4020	Replace axial flow fan, 6400 CFM exhaust fan	\$ 7,704.06	1.10	\$ 8,732.63	0.97	\$ 8,474.46
1.000	D3 04 3220 4030	Replace axial flow fan, 15,600 CFM exhaust fan	\$ 12,294.61	1.10	\$ 13,936.07	0.97	\$ 13,524.07
1.000	D3 04 3220 4040	Replace axial flow fan, 28,000 CFM exhaust fan	\$ 25,290.56	1.10	\$ 28,667.10	0.97	\$ 27,819.61
1.000	D3 04 3520 1010	Repack gate valve gland, 3/8" - 1 - 1/2" valves	\$ 29.22	1.10	\$ 33.12	0.97	\$ 32.14
1.000	D3 04 3520 2010	Repack gate valve gland, 2" - 3" valves	\$ 38.79	1.10	\$ 43.96	0.97	\$ 42.66
1.000	D3 05 3110 1010	Repair unit heater, 12 MBH, 2 PSI steam	\$ 488.38	1.10	\$ 553.59	0.97	\$ 537.22
1.000	D3 05 3110 2010	Repair unit heater, 36 MBH, 2 PSI steam	\$ 610.59	1.10	\$ 692.11	0.97	\$ 671.64
1.000	D3 05 3110 3010	Repair unit heater, 85 MBH, 2 PSI steam	\$ 621.21	1.10	\$ 704.15	0.97	\$ 683.33
1.000	D3 05 3110 4010	Repair unit heater, 250 MBH, 2 PSI steam	\$ 672.75	1.10	\$ 762.57	0.97	\$ 740.03

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹											
10% GF											
CostWorks 2010 - EAST HALL											
Based on National Averages											
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN											
Escalation	6%										
De-Escalation to July 2009	1.03										
De-Escalation Factor to be Applied	0.97										
Green Factor	1.10 Assumed Value										
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor
1.000	D3 05 3110 5010	Repair unit heater, 400 MBH, 2 PSI steam	10	1 Stpi	Ea.	3.67	\$ 582.35	\$ 688.10	1.095	\$ 753.47	0.97
1.000	D3 05 3170 1010	Repair terminal reheat, 12" x 24" coil	10	1 Stpi	Ea.	1.20	\$ 77.00	\$ 96.50	1.095	\$ 105.67	0.97
1.000	D3 05 3170 2010	Repair terminal reheat, 18" x 24" coil	10	1 Stpi	Ea.	1.40	\$ 90.00	\$ 113.00	1.095	\$ 123.74	0.97
1.000	D3 05 3170 3010	Repair terminal reheat, 36" x 36" coil	10	1 Stpi	Ea.	2.20	\$ 141.00	\$ 177.00	1.095	\$ 193.82	0.97
1.000	D3 05 3170 4010	Repair terminal reheat, 48" x 126" coil	10	1 Stpi	Ea.	4.00	\$ 257.00	\$ 320.00	1.095	\$ 350.40	0.97
1.000	D3 05 3245 1010	Repair heat pump, 1.5 ton, air to air split	10	1 Stpi	Ea.	15.66	\$ 1,662.00	\$ 2,008.50	1.095	\$ 2,199.31	0.97
1.000	D3 05 3245 2010	Repair heat pump, 5 ton, air to air split	10	1 Stpi	Ea.	17.68	\$ 2,172.50	\$ 2,597.00	1.095	\$ 2,843.72	0.97
1.000	D3 05 3245 3010	Repair heat pump, 10 ton, air to air split	10	Q5	Ea.	23.74	\$ 3,525.50	\$ 4,177.00	1.095	\$ 4,573.82	0.97
1.000	D3 05 3245 4010	Repair heat pump, 25 ton, air to air split	10	Q5	Ea.	43.48	\$ 6,931.50	\$ 8,175.50	1.095	\$ 8,952.17	0.97
1.000	D3 05 3245 5010	Repair heat pump, 50 ton, air to air split	10	Q6	Ea.	253.91	\$ 37,759.50	\$ 44,695.00	1.095	\$ 48,941.03	0.97
1.000	D3 05 3245 6010	Repair heat pump, thru-wall unit, 1.5 ton	10	1 Stpi	Ea.	15.66	\$ 1,662.00	\$ 2,008.50	1.095	\$ 2,199.31	0.97
1.000	D3 05 3245 7010	Repair heat pump, thru-wall unit, 5 ton	10	1 Stpi	Ea.	17.68	\$ 2,172.50	\$ 2,597.00	1.095	\$ 2,843.72	0.97
1.000	D3 05 3265 1030	Replace air conditioner, window, 1 ton	10	L2	Ea.	3.30	\$ 853.00	\$ 988.00	1.095	\$ 1,081.86	0.97
1.000	D3 05 3266 2030	Replace air conditioner, window, 2 ton	10	L2	Ea.	7.80	\$ 1,551.00	\$ 1,806.00	1.095	\$ 1,977.57	0.97
1.000	D3 05 3272 1010	Repair air conditioner, DX, 5 ton	10	1 Stpi	Ea.	27.64	\$ 3,668.00	\$ 4,368.00	1.095	\$ 4,782.96	0.97
1.000	D3 05 3272 2010	Repair air conditioner, DX, 20 ton	10	Q6	Ea.	97.65	\$ 25,654.00	\$ 29,831.50	1.095	\$ 32,665.49	0.97
1.000	D3 05 3272 3010	Repair air conditioner, DX, 50 ton	10	Q6	Ea.	265.86	\$ 43,711.50	\$ 51,544.50	1.095	\$ 56,441.23	0.97
1.000	D3 05 3274 1010	Repair computer room air conditioner, air cooled, 5 ton	10	1 Stpi	Ea.	28.44	\$ 3,779.00	\$ 4,500.00	1.095	\$ 4,927.50	0.97
1.000	D3 05 3274 1020	Repair computer room air conditioner, air cooled, 10 ton	10	1 Stpi	Ea.	66.20	\$ 15,726.50	\$ 18,367.00	1.095	\$ 20,111.87	0.97
1.000	D3 05 3274 1030	Repair computer room air conditioner, air cooled, 15 ton	10	1 Stpi	Ea.	89.56	\$ 22,293.00	\$ 25,997.00	1.095	\$ 28,466.72	0.97
1.000	D3 05 3274 1040	Repair computer room air conditioner, air cooled, 20 ton	10	1 Stpi	Ea.	99.78	\$ 25,990.00	\$ 30,225.50	1.095	\$ 33,096.92	0.97
1.000	D3 05 3276 1010	Repair computer room A/C, chilled water, 5 ton	10	1 Stpi	Ea.	34.12	\$ 6,773.00	\$ 7,931.00	1.095	\$ 8,684.45	0.97
1.000	D3 05 3276 1020	Repair computer room A/C, chilled water, 10 ton	10	1 Stpi	Ea.	34.12	\$ 6,822.50	\$ 7,986.00	1.095	\$ 8,744.67	0.97
1.000	D3 05 3276 1030	Repair computer room A/C, chilled water, 15 ton	10	1 Stpi	Ea.	34.22	\$ 6,844.00	\$ 8,009.00	1.095	\$ 8,769.86	0.97
1.000	D3 05 3276 1040	Repair computer room A/C, chilled water, 20 ton	10	1 Stpi	Ea.	54.46	\$ 18,669.00	\$ 21,559.00	1.095	\$ 23,607.11	0.97
1.000	D3 05 3278 1010	Repair multi-zone rooftop unit, 15 ton	10	Q6	Ea.	73.34	\$ 19,768.00	\$ 23,005.50	1.095	\$ 25,191.02	0.97
1.000	D3 05 3278 2010	Repair multi-zone rooftop unit, 25 ton	10	Q6	Ea.	97.07	\$ 27,388.00	\$ 31,844.50	1.095	\$ 34,869.73	0.97
1.000	D3 05 3278 3010	Repair multi-zone rooftop unit, 40 ton	10	Q6	Ea.	123.97	\$ 27,378.50	\$ 32,003.50	1.095	\$ 35,043.83	0.97
1.000	D3 05 3278 4010	Repair multi-zone rooftop unit, 70 ton	10	Q7	Ea.	251.23	\$ 39,529.50	\$ 46,743.50	1.095	\$ 51,184.13	0.97
1.000	D3 05 3278 5010	Repair multi-zone rooftop unit, 105 ton	10	Q7	Ea.	273.02	\$ 41,014.50	\$ 48,531.50	1.095	\$ 53,141.99	0.97
1.000	D3 05 3280 1001	Repair single zone rt. unit, 3 ton	10	2 Stpi	Ea.	17.84	\$ 1,966.80	\$ 2,365.00	1.095	\$ 2,589.68	0.97
1.000	D3 05 3280 1003	Repair single zone rt. unit, 5 ton	10	2 Stpi	Ea.	18.27	\$ 2,136.80	\$ 2,565.00	1.095	\$ 2,808.68	0.97
1.000	D3 05 3280 1005	Repair single zone rt. unit, 7.5 ton	10	2 Stpi	Ea.	21.83	\$ 2,953.00	\$ 3,507.00	1.095	\$ 3,840.17	0.97
1.000	D3 05 3280 1007	Repair single zone rt. unit, 10 ton	10	2 Stpi	Ea.	54.79	\$ 13,769.00	\$ 16,062.00	1.095	\$ 17,587.89	0.97
1.000	D3 05 3280 1010	Repair single zone rooftop unit, 15 ton	10	2 Stpi	Ea.	76.72	\$ 20,010.50	\$ 23,315.00	1.095	\$ 25,529.93	0.97
1.000	D3 05 3280 2010	Repair single zone rooftop unit, 25 ton	10	Q6	Ea.	96.57	\$ 27,355.50	\$ 31,804.00	1.095	\$ 34,825.38	0.97
1.000	D3 05 3280 3010	Repair single zone rooftop unit, 60 ton	10	Q6	Ea.	298.68	\$ 43,236.00	\$ 51,258.00	1.095	\$ 56,127.51	0.97
1.000	D3 05 3280 4010	Repair single zone rooftop unit, 100 ton	10	Q7	Ea.	330.39	\$ 49,332.00	\$ 58,291.00	1.095	\$ 63,828.65	0.97
1.000	D3 05 3282 1010	Repair multi-zone variable volume, 50 ton	10	Q6	Ea.	251.40	\$ 36,162.50	\$ 42,863.00	1.095	\$ 46,934.99	0.97

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹								
10% GF								
CostWorks 2010 - EAST HALL								
Based on National Averages								
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN								
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.10	Assumed Value						
						GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments	
1.000	D3 05 3110 5010	Repair unit heater, 400 MBH, 2 PSI steam	\$ 731.19	1.10	\$ 828.82	0.97	\$ 804.31	
1.000	D3 05 3170 1010	Repair terminal reheat, 12" x 24" coil	\$ 102.54	1.10	\$ 116.23	0.97	\$ 112.80	
1.000	D3 05 3170 2010	Repair terminal reheat, 18" x 24" coil	\$ 120.08	1.10	\$ 136.11	0.97	\$ 132.08	
1.000	D3 05 3170 3010	Repair terminal reheat, 36" x 36" coil	\$ 188.09	1.10	\$ 213.20	0.97	\$ 206.89	
1.000	D3 05 3170 4010	Repair terminal reheat, 48" x 126" coil	\$ 340.04	1.10	\$ 385.44	0.97	\$ 374.05	
1.000	D3 05 3245 1010	Repair heat pump, 1.5 ton, air to air split	\$ 2,134.29	1.10	\$ 2,419.24	0.97	\$ 2,347.72	
1.000	D3 05 3245 2010	Repair heat pump, 5 ton, air to air split	\$ 2,759.65	1.10	\$ 3,128.09	0.97	\$ 3,035.61	
1.000	D3 05 3245 3010	Repair heat pump, 10 ton, air to air split	\$ 4,438.60	1.10	\$ 5,031.20	0.97	\$ 4,882.46	
1.000	D3 05 3245 4010	Repair heat pump, 25 ton, air to air split	\$ 8,687.52	1.10	\$ 9,847.39	0.97	\$ 9,556.27	
1.000	D3 05 3245 5010	Repair heat pump, 50 ton, air to air split	\$ 47,494.18	1.10	\$ 53,835.13	0.97	\$ 52,243.60	
1.000	D3 05 3245 6010	Repair heat pump, thru-wall unit, 1.5 ton	\$ 2,134.29	1.10	\$ 2,419.24	0.97	\$ 2,347.72	
1.000	D3 05 3245 7010	Repair heat pump, thru-wall unit, 5 ton	\$ 2,759.65	1.10	\$ 3,128.09	0.97	\$ 3,035.61	
1.000	D3 05 3265 1030	Replace air conditioner, window, 1 ton	\$ 1,049.88	1.10	\$ 1,190.05	0.97	\$ 1,154.86	
1.000	D3 05 3266 2030	Replace air conditioner, window, 2 ton	\$ 1,919.11	1.10	\$ 2,175.33	0.97	\$ 2,111.02	
1.000	D3 05 3272 1010	Repair air conditioner, DX, 5 ton	\$ 4,641.56	1.10	\$ 5,261.26	0.97	\$ 5,105.72	
1.000	D3 05 3272 2010	Repair air conditioner, DX, 20 ton	\$ 31,699.80	1.10	\$ 35,932.04	0.97	\$ 34,869.78	
1.000	D3 05 3272 3010	Repair air conditioner, DX, 50 ton	\$ 54,772.65	1.10	\$ 62,085.35	0.97	\$ 60,249.92	
1.000	D3 05 3274 1010	Repair computer room air conditioner, air cooled, 5 ton	\$ 4,781.83	1.10	\$ 5,420.25	0.97	\$ 5,260.01	
1.000	D3 05 3274 1020	Repair computer room air conditioner, air cooled, 10 ton	\$ 19,517.30	1.10	\$ 22,123.05	0.97	\$ 21,469.03	
1.000	D3 05 3274 1030	Repair computer room air conditioner, air cooled, 15 ton	\$ 27,625.15	1.10	\$ 31,313.39	0.97	\$ 30,387.67	
1.000	D3 05 3274 1040	Repair computer room air conditioner, air cooled, 20 ton	\$ 32,118.48	1.10	\$ 36,406.61	0.97	\$ 35,330.33	
1.000	D3 05 3276 1010	Repair computer room A/C, chilled water, 5 ton	\$ 8,427.71	1.10	\$ 9,552.89	0.97	\$ 9,270.48	
1.000	D3 05 3276 1020	Repair computer room A/C, chilled water, 10 ton	\$ 8,486.15	1.10	\$ 9,619.14	0.97	\$ 9,334.77	
1.000	D3 05 3276 1030	Repair computer room A/C, chilled water, 15 ton	\$ 8,510.59	1.10	\$ 9,646.84	0.97	\$ 9,361.65	
1.000	D3 05 3276 1040	Repair computer room A/C, chilled water, 20 ton	\$ 22,909.21	1.10	\$ 25,967.82	0.97	\$ 25,200.13	
1.000	D3 05 3278 1010	Repair multi-zone rooftop unit, 15 ton	\$ 24,446.30	1.10	\$ 27,710.12	0.97	\$ 26,890.93	
1.000	D3 05 3278 2010	Repair multi - zone rooftop unit, 25 ton	\$ 33,838.87	1.10	\$ 38,356.70	0.97	\$ 37,222.76	
1.000	D3 05 3278 3010	Repair multi-zone rooftop unit, 40 ton	\$ 34,007.83	1.10	\$ 38,548.22	0.97	\$ 37,408.61	
1.000	D3 05 3278 4010	Repair multi-zone rooftop unit, 70 ton	\$ 49,670.98	1.10	\$ 56,302.55	0.97	\$ 54,638.07	
1.000	D3 05 3278 5010	Repair multi-zone rooftop unit, 105 ton	\$ 51,570.96	1.10	\$ 58,456.19	0.97	\$ 56,728.05	
1.000	D3 05 3280 1001	Repair single zone rt. unit, 3 ton	\$ 2,513.12	1.10	\$ 2,848.64	0.97	\$ 2,764.43	
1.000	D3 05 3280 1003	Repair single zone rt. unit, 5 ton	\$ 2,725.64	1.10	\$ 3,089.54	0.97	\$ 2,998.21	
1.000	D3 05 3280 1005	Repair single zone rt. unit, 7.5 ton	\$ 3,726.64	1.10	\$ 4,224.18	0.97	\$ 4,099.30	
1.000	D3 05 3280 1007	Repair single zone rt. unit, 10 ton	\$ 17,067.94	1.10	\$ 19,346.68	0.97	\$ 18,774.73	
1.000	D3 05 3280 1010	Repair single zone rooftop unit, 15 ton	\$ 24,775.18	1.10	\$ 28,082.92	0.97	\$ 27,252.70	
1.000	D3 05 3280 2010	Repair single zone rooftop unit, 25 ton	\$ 33,795.84	1.10	\$ 38,307.92	0.97	\$ 37,175.42	
1.000	D3 05 3280 3010	Repair single zone rooftop unit, 60 ton	\$ 54,468.21	1.10	\$ 61,740.26	0.97	\$ 59,915.03	
1.000	D3 05 3280 4010	Repair single zone rooftop unit, 100 ton	\$ 61,941.68	1.10	\$ 70,211.51	0.97	\$ 68,135.85	
1.000	D3 05 3282 1010	Repair multi-zone variable volume, 50 ton	\$ 45,547.45	1.10	\$ 51,628.48	0.97	\$ 50,102.19	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
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Escalation	6%											
De-Escalation to July 2009	1.03											NON-GREEN
De-Escalation Factor to be Applied	0.97											
Green Factor	1.10	Assumed Value										
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 05 3282 2010	Repair multi-zone variable volume, 70 ton	10	Q7	Ea.	251.53	\$ 39,548.50	\$ 46,768.00	1.095	\$ 51,210.96	0.97	
1.000	D3 05 3282 3010	Repair multi-zone variable volume, 90 ton	10	Q7	Ea.	301.32	\$ 47,118.50	\$ 55,770.00	1.095	\$ 61,068.15	0.97	
1.000	D3 05 3282 4010	Repair multi-zone variable volume, 105 ton	10	Q7	Ea.	273.99	\$ 41,158.50	\$ 48,681.00	1.095	\$ 53,305.70	0.97	
1.000	D3 05 3282 5010	Repair multi-zone variable volume, 140 ton	10	Q7	Ea.	367.75	\$ 54,993.50	\$ 65,023.00	1.095	\$ 71,200.19	0.97	
1.000	D3 05 3284 1010	Repair single zone variable volume, 20 ton	10	Q6	Ea.	79.76	\$ 22,028.00	\$ 25,577.50	1.095	\$ 28,007.36	0.97	
1.000	D3 05 3284 1040	Replace single zone variable volume, 20 ton	10	Q7	Ea.	136.49	\$ 38,175.00	\$ 44,275.00	1.095	\$ 48,481.13	0.97	
1.000	D3 05 3284 2010	Repair single zone variable volume, 30 ton	10	Q6	Ea.	114.54	\$ 32,813.00	\$ 38,054.50	1.095	\$ 41,669.68	0.97	
1.000	D3 05 3284 2040	Replace single zone variable volume, 30 ton	10	Q7	Ea.	196.29	\$ 47,975.00	\$ 55,875.00	1.095	\$ 61,183.13	0.97	
1.000	D3 05 3284 3010	Repair single zone variable volume, 40 ton	10	Q6	Ea.	123.35	\$ 27,403.00	\$ 32,024.50	1.095	\$ 35,066.83	0.97	
1.000	D3 05 3284 3040	Replace single zone variable volume, 40 ton	10	Q7	Ea.	265.10	\$ 64,250.00	\$ 75,400.00	1.095	\$ 82,563.00	0.97	
1.000	D3 05 3284 4010	Repair single zone variable volume, 60 ton	10	Q6	Ea.	298.02	\$ 43,121.00	\$ 51,128.00	1.095	\$ 55,985.16	0.97	
1.000	D3 05 3284 4040	Replace single zone variable volume, 60 ton	10	Q7	Ea.	374.00	\$ 86,100.00	\$ 100,000.00	1.095	\$ 109,500.00	0.97	
1.000	D3 05 3286 1010	Repair central station A.H.U., 1300 CFM	10	1 Stpi	Ea.	3.45	\$ 516.30	\$ 610.50	1.095	\$ 668.50	0.97	
1.000	D3 05 3286 2010	Repair central station A.H.U., 1900 CFM	10	1 Stpi	Ea.	3.81	\$ 546.30	\$ 650.50	1.095	\$ 712.30	0.97	
1.000	D3 05 3286 3010	Repair central station A.H.U., 5400 CFM	10	1 Stpi	Ea.	4.01	\$ 624.30	\$ 737.00	1.095	\$ 807.02	0.97	
1.000	D3 05 3286 4010	Repair central station A.H.U., 8000 CFM	10	1 Stpi	Ea.	4.21	\$ 732.30	\$ 863.00	1.095	\$ 944.99	0.97	
1.000	D3 05 3286 5010	Repair central station A.H.U., 16,000 CFM	10	1 Stpi	Ea.	4.70	\$ 1,015.30	\$ 1,194.00	1.095	\$ 1,307.43	0.97	
1.000	D3 05 3286 6010	Repair central station A.H.U., 33,500 CFM	10	1 Stpi	Ea.	8.10	\$ 2,725.30	\$ 3,145.00	1.095	\$ 3,443.78	0.97	
1.000	D3 05 3286 7010	Repair central station A.H.U., 63,000 CFM	10	1 Stpi	Ea.	13.33	\$ 4,179.30	\$ 4,849.00	1.095	\$ 5,309.66	0.97	
1.000	D3 05 3310 1010	Repair furnace, gas, 25 MBH residential	10	Q1	Ea.	7.25	\$ 888.35	\$ 1,058.00	1.095	\$ 1,158.51	0.97	
1.000	D3 05 3310 2010	Repair furnace, gas, 100 MBH residential	10	Q1	Ea.	7.89	\$ 1,317.80	\$ 1,555.50	1.095	\$ 1,703.27	0.97	
1.000	D3 05 3310 3010	Repair furnace, gas, 200 MBH residential	10	Q1	Ea.	17.88	\$ 2,630.50	\$ 3,122.50	1.095	\$ 3,419.14	0.97	
1.000	D3 05 3320 1010	Repair furnace, oil, 55 MBH residential	10	Q1	Ea.	17.85	\$ 1,706.50	\$ 2,059.00	1.095	\$ 2,254.61	0.97	
1.000	D3 05 3320 2010	Repair furnace, oil, 100 MBH residential	10	Q1	Ea.	17.91	\$ 1,729.00	\$ 2,085.50	1.095	\$ 2,283.62	0.97	
1.000	D3 05 3320 3010	Repair furnace, oil, 200 MBH residential	10	Q1	Ea.	17.99	\$ 1,763.50	\$ 2,124.50	1.095	\$ 2,326.33	0.97	
1.000	D3 05 3330 1010	Repair furnace, electric, 25 MBH residential	10	Q20	Ea.	6.03	\$ 1,853.50	\$ 2,144.50	1.095	\$ 2,348.23	0.97	
1.000	D3 05 3330 2010	Repair furnace, electric, 50 MBH residential	10	Q20	Ea.	6.21	\$ 1,882.00	\$ 2,174.00	1.095	\$ 2,380.53	0.97	
1.000	D3 05 3330 3010	Repair furnace, electric, 85 MBH residential	10	Q20	Ea.	6.68	\$ 3,090.50	\$ 3,549.50	1.095	\$ 3,886.70	0.97	
1.000	D4 01 3110 3010	Rebuild 4" diameter reduced pressure backflow preventer	10	1 Plum	Ea.	2.92	\$ 509.40	\$ 598.95	1.095	\$ 655.85	0.97	
1.000	D4 01 3110 3020	Rebuild 6" diameter reduced pressure backflow preventer	10	1 Plum	Ea.	3.94	\$ 590.40	\$ 700.15	1.095	\$ 766.66	0.97	
1.000	D4 01 3110 3030	Rebuild 8" diameter reduced pressure backflow preventer	10	1 Plum	Ea.	4.95	\$ 736.55	\$ 876.65	1.095	\$ 959.93	0.97	
1.000	D4 01 3110 3040	Rebuild 10" diameter reduced pressure backflow preventer	10	1 Plum	Ea.	5.97	\$ 873.00	\$ 1,038.40	1.095	\$ 1,137.05	0.97	
							\$ 2,635,025.95	\$ 3,095,086.35				
1.000	D3 01 3210 0110	Replace 10' of buried 2" diam steel pipe/M.L.F. natural gas	12	Q4	Ea.	10.68	\$ 659.67	\$ 804.59	1.095	\$ 881.03	0.97	
1.000	D3 01 3210 0120	Replace 10' of buried 3" diam steel pipe/M.L.F. natural gas	12	Q4	Ea.	10.83	\$ 758.17	\$ 911.09	1.095	\$ 997.64	0.97	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹								
10% GF								
CostWorks 2010 - EAST HALL								
Based on National Averages								
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN								
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.10	Assumed Value						
				GREEN				
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments	
1.000	D3 05 3282 2010	Repair multi-zone variable volume, 70 ton	\$ 49,697.01	1.10	\$ 56,332.06	0.97	\$ 54,666.71	
1.000	D3 05 3282 3010	Repair multi-zone variable volume, 90 ton	\$ 59,262.79	1.10	\$ 67,174.97	0.97	\$ 65,189.07	
1.000	D3 05 3282 4010	Repair multi-zone variable volume, 105 ton	\$ 51,729.82	1.10	\$ 58,636.26	0.97	\$ 56,902.80	
1.000	D3 05 3282 5010	Repair multi-zone variable volume, 140 ton	\$ 69,095.29	1.10	\$ 78,320.20	0.97	\$ 76,004.82	
1.000	D3 05 3284 1010	Repair single zone variable volume, 20 ton	\$ 27,179.38	1.10	\$ 30,808.10	0.97	\$ 29,897.32	
1.000	D3 05 3284 1040	Replace single zone variable volume, 20 ton	\$ 47,047.88	1.10	\$ 53,329.24	0.97	\$ 51,752.66	
1.000	D3 05 3284 2010	Repair single zone variable volume, 30 ton	\$ 40,437.80	1.10	\$ 45,836.65	0.97	\$ 44,481.58	
1.000	D3 05 3284 2040	Replace single zone variable volume, 30 ton	\$ 59,374.37	1.10	\$ 67,301.44	0.97	\$ 65,311.80	
1.000	D3 05 3284 3010	Repair single zone variable volume, 40 ton	\$ 34,030.15	1.10	\$ 38,573.51	0.97	\$ 37,433.16	
1.000	D3 05 3284 3040	Replace single zone variable volume, 40 ton	\$ 80,122.19	1.10	\$ 90,819.30	0.97	\$ 88,134.41	
1.000	D3 05 3284 4010	Repair single zone variable volume, 60 ton	\$ 54,330.07	1.10	\$ 61,583.68	0.97	\$ 59,763.08	
1.000	D3 05 3284 4040	Replace single zone variable volume, 60 ton	\$ 106,262.85	1.10	\$ 120,450.00	0.97	\$ 116,889.13	
1.000	D3 05 3286 1010	Repair central station A.H.U., 1300 CFM	\$ 648.73	1.10	\$ 735.35	0.97	\$ 713.61	
1.000	D3 05 3286 2010	Repair central station A.H.U., 1900 CFM	\$ 691.24	1.10	\$ 783.53	0.97	\$ 760.36	
1.000	D3 05 3286 3010	Repair central station A.H.U., 5400 CFM	\$ 783.16	1.10	\$ 887.72	0.97	\$ 861.47	
1.000	D3 05 3286 4010	Repair central station A.H.U., 8000 CFM	\$ 917.05	1.10	\$ 1,039.48	0.97	\$ 1,008.75	
1.000	D3 05 3286 5010	Repair central station A.H.U., 16,000 CFM	\$ 1,268.78	1.10	\$ 1,438.17	0.97	\$ 1,395.66	
1.000	D3 05 3286 6010	Repair central station A.H.U., 33,500 CFM	\$ 3,341.97	1.10	\$ 3,788.15	0.97	\$ 3,676.16	
1.000	D3 05 3286 7010	Repair central station A.H.U., 63,000 CFM	\$ 5,152.69	1.10	\$ 5,840.62	0.97	\$ 5,667.95	
1.000	D3 05 3310 1010	Repair furnace, gas, 25 MBH residential	\$ 1,124.26	1.10	\$ 1,274.36	0.97	\$ 1,236.69	
1.000	D3 05 3310 2010	Repair furnace, gas, 100 MBH residential	\$ 1,652.92	1.10	\$ 1,873.60	0.97	\$ 1,818.21	
1.000	D3 05 3310 3010	Repair furnace, gas, 200 MBH residential	\$ 3,318.06	1.10	\$ 3,761.05	0.97	\$ 3,649.86	
1.000	D3 05 3320 1010	Repair furnace, oil, 55 MBH residential	\$ 2,187.95	1.10	\$ 2,480.07	0.97	\$ 2,406.75	
1.000	D3 05 3320 2010	Repair furnace, oil, 100 MBH residential	\$ 2,216.11	1.10	\$ 2,511.98	0.97	\$ 2,437.72	
1.000	D3 05 3320 3010	Repair furnace, oil, 200 MBH residential	\$ 2,257.55	1.10	\$ 2,558.96	0.97	\$ 2,483.31	
1.000	D3 05 3330 1010	Repair furnace, electric, 25 MBH residential	\$ 2,278.81	1.10	\$ 2,583.05	0.97	\$ 2,506.69	
1.000	D3 05 3330 2010	Repair furnace, electric, 50 MBH residential	\$ 2,310.15	1.10	\$ 2,618.58	0.97	\$ 2,541.17	
1.000	D3 05 3330 3010	Repair furnace, electric, 85 MBH residential	\$ 3,771.80	1.10	\$ 4,275.37	0.97	\$ 4,148.98	
1.000	D4 01 3110 3010	Rebuild 4" diameter reduced pressure backflow preventer	\$ 636.46	1.10	\$ 721.44	0.97	\$ 700.11	
1.000	D4 01 3110 3020	Rebuild 6" diameter reduced pressure backflow preventer	\$ 744.00	1.10	\$ 843.33	0.97	\$ 818.40	
1.000	D4 01 3110 3030	Rebuild 8" diameter reduced pressure backflow preventer	\$ 931.55	1.10	\$ 1,055.92	0.97	\$ 1,024.71	
1.000	D4 01 3110 3040	Rebuild 10" diameter reduced pressure backflow preventer	\$ 1,103.43	1.10	\$ 1,250.75	0.97	\$ 1,213.78	
			\$ 3,288,926.96				\$ 3,617,819.66	
			\$ 657,785.39	Assume 20% required		Assume 20% required	\$ 723,563.93	
				PER 10 YEARS		PER 10 YEARS		
1.000	D3 01 3210 0110	Replace 10' of buried 2" diam steel pipe/M.L.F. natural gas	\$ 854.98	1.10	\$ 969.13	0.97	\$ 940.48	
1.000	D3 01 3210 0120	Replace 10' of buried 3" diam steel pipe/M.L.F. natural gas	\$ 968.15	1.10	\$ 1,097.41	0.97	\$ 1,064.97	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
10% GF												
CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation												
		6%										
De-Escalation to July 2009												
		1.03										
De-Escalation Factor to be Applied												
		0.97										
Green Factor												
		1.10		Assumed Value								
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 01 3210 0130	Replace 10' of buried 4" diam steel pipe/M.L.F. natural gas	12	B35	Ea.	11.91	\$ 910.67	\$ 1,089.09	1.095	\$ 1,192.55	0.97	
1.000	D3 01 3210 0140	Replace 10' of buried 6" diam steel pipe/M.L.F. natural gas	12	B35	Ea.	13.20	\$ 1,215.67	\$ 1,445.09	1.095	\$ 1,582.37	0.97	
1.000	D3 01 3210 0410	Replace 10' of hung 2" diam steel pipe/M.L.F. natural gas	12	Q1	Ea.	6.79	\$ 542.53	\$ 666.29	1.095	\$ 729.59	0.97	
1.000	D3 01 3210 0420	Replace 10' of hung 3" diam steel pipe/M.L.F. natural gas	12	Q15	Ea.	8.18	\$ 629.67	\$ 769.09	1.095	\$ 842.15	0.97	
1.000	D3 01 3210 0430	Replace 10' of hung 4" diam steel pipe/M.L.F. natural gas	12	Q15	Ea.	9.36	\$ 758.67	\$ 920.09	1.095	\$ 1,007.50	0.97	
1.000	D3 01 3210 0440	Replace 10' of hung 6" diam steel pipe/M.L.F. natural gas	12	Q16	Ea.	13.93	\$ 1,179.67	\$ 1,434.09	1.095	\$ 1,570.33	0.97	
1.000	D3 01 3260 0120	Replace 10' steel pipe 1/2" diam. per M.L.F. LPG distribution	12	1 Plum	Ea.	3.40	\$ 259.17	\$ 318.59	1.095	\$ 348.86	0.97	
1.000	D3 01 3260 0220	Replace 10' steel pipe 3/4" diam. per M.L.F. LPG distribution	12	1 Plum	Ea.	3.09	\$ 246.67	\$ 303.09	1.095	\$ 331.88	0.97	
1.000	D3 01 3260 0320	Replace 10' steel pipe 1" diam. per M.L.F. LPG distribution	12	1 Plum	Ea.	3.87	\$ 319.17	\$ 390.09	1.095	\$ 427.15	0.97	
1.000	D3 01 3260 0420	Replace 10' steel pipe 1-1/4" diam. M.L.F. LPG distribution	12	Q1	Ea.	4.43	\$ 352.67	\$ 428.09	1.095	\$ 468.76	0.97	
1.000	D3 01 3260 0520	Replace 10' steel pipe 1-1/2" diam. M.L.F. LPG distribution	12	Q1	Ea.	4.83	\$ 390.17	\$ 473.59	1.095	\$ 518.58	0.97	
1.000	D3 01 3260 0620	Replace 10' section steel pipe 2" diam. M.L.F. LPG distribution	12	Q1	Ea.	5.80	\$ 479.17	\$ 587.09	1.095	\$ 642.86	0.97	
1.000	D3 02 3388 1060	Replace coal spreader pneumatic	12	4 Stpi	Ea.	195.04	\$ 19,875.00	\$ 24,125.00	1.095	\$ 26,416.88	0.97	
							\$ 28,576.74	\$ 34,664.96				
1.000	D3 01 3240 0110	Replace pressure regulator 1/2" diam. pipe natural gas	14	1 Stpi	Ea.	0.66	\$ 89.09	\$ 106.25	1.095	\$ 116.34	0.97	
1.000	D3 01 3240 0120	Replace pressure regulator 1" diam. pipe natural gas	14	1 Stpi	Ea.	0.83	\$ 148.24	\$ 174.80	1.095	\$ 191.41	0.97	
1.000	D3 01 3240 0130	Replace pressure regulator 1-1/2" diam. pipe natural gas	14	1 Stpi	Ea.	1.21	\$ 686.14	\$ 792.80	1.095	\$ 868.12	0.97	
1.000	D3 01 3240 0140	Replace pressure regulator 2" diam. pipe natural gas	14	1 Stpi	Ea.	1.43	\$ 701.14	\$ 808.80	1.095	\$ 885.64	0.97	
							\$ 1,624.61	\$ 1,882.65				
1.000	D3 01 3601 0010	Replace solar panel 3' x 8'	15	Q1	Ea.	5.67	\$ 1,285.00	\$ 1,487.00	1.095	\$ 1,628.27	0.97	
1.000	D3 02 3198 1020	Replace boiler blowoff system	15	Q5	Ea.	8.33	\$ 3,935.00	\$ 4,551.00	1.095	\$ 4,983.35	0.97	
1.000	D3 02 3292 1010	Repair chemical feed system	15	1 Stpi	Ea.	6.02	\$ 793.57	\$ 947.22	1.095	\$ 1,037.21	0.97	
1.000	D3 02 3292 1030	Replace chemical feed system	15	2 Stpi	Ea.	2.50	\$ 740.00	\$ 860.00	1.095	\$ 941.70	0.97	
1.000	D3 02 3294 1010	Repair feed water supply pump	15	1 Stpi	Ea.	9.45	\$ 2,565.00	\$ 2,974.50	1.095	\$ 3,257.08	0.97	
1.000	D3 02 3294 1030	Replace feed water pump	15	Q2	Ea.	33.33	\$ 15,170.00	\$ 17,535.00	1.095	\$ 19,200.83	0.97	
1.000	D3 02 3310 0010	Replace metal flue, all fuel SS, 6" diameter metal flue / chimney	15	Q9	L.F.	0.39	\$ 96.50	\$ 112.00	1.095	\$ 122.64	0.97	
1.000	D3 02 3310 0020	Replace metal flue, all fuel SS, 10" diameter metal flue / chimney	15	Q9	L.F.	0.48	\$ 130.00	\$ 150.00	1.095	\$ 164.25	0.97	
1.000	D3 02 3310 0030	Replace metal flue, all fuel SS, 20" diameter metal flue / chimney	15	Q10	L.F.	0.97	\$ 239.00	\$ 278.00	1.095	\$ 304.41	0.97	
1.000	D3 02 3310 0040	Replace metal flue, all fuel SS, 32" diameter metal flue / chimney	15	Q10	L.F.	1.29	\$ 380.00	\$ 440.00	1.095	\$ 481.80	0.97	
1.000	D3 02 3310 0050	Replace metal flue, all fuel SS, 48" diameter metal flue / chimney	15	Q10	L.F.	1.83	\$ 585.00	\$ 675.00	1.095	\$ 739.13	0.97	
1.000	D3 02 3390 1030	Replace fuel oil 25 GPH pump / motor set	15	Q5	Ea.	5.20	\$ 1,175.00	\$ 1,375.00	1.095	\$ 1,505.63	0.97	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
10% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value					
				GREEN			
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 01 3210 0130	Replace 10' of buried 4" diam steel pipe/M.L.F. natural gas	\$ 1,157.30	1.10	\$ 1,311.81	0.97	\$ 1,273.03
1.000	D3 01 3210 0140	Replace 10' of buried 6" diam steel pipe/M.L.F. natural gas	\$ 1,535.59	1.10	\$ 1,740.61	0.97	\$ 1,689.15
1.000	D3 01 3210 0410	Replace 10' of hung 2" diam steel pipe/M.L.F. natural gas	\$ 708.02	1.10	\$ 802.55	0.97	\$ 778.82
1.000	D3 01 3210 0420	Replace 10' of hung 3" diam steel pipe/M.L.F. natural gas	\$ 817.26	1.10	\$ 926.37	0.97	\$ 898.98
1.000	D3 01 3210 0430	Replace 10' of hung 4" diam steel pipe/M.L.F. natural gas	\$ 977.71	1.10	\$ 1,108.25	0.97	\$ 1,075.49
1.000	D3 01 3210 0440	Replace 10' of hung 6" diam steel pipe/M.L.F. natural gas	\$ 1,523.90	1.10	\$ 1,727.36	0.97	\$ 1,676.30
1.000	D3 01 3260 0120	Replace 10' steel pipe 1/2" diam. per M.L.F. LPG distribution	\$ 338.54	1.10	\$ 383.74	0.97	\$ 372.40
1.000	D3 01 3260 0220	Replace 10' steel pipe 3/4" diam. per M.L.F. LPG distribution	\$ 322.07	1.10	\$ 365.07	0.97	\$ 354.28
1.000	D3 01 3260 0320	Replace 10' steel pipe 1" diam. per M.L.F. LPG distribution	\$ 414.52	1.10	\$ 469.86	0.97	\$ 455.97
1.000	D3 01 3260 0420	Replace 10' steel pipe 1-1/4" diam. M.L.F. LPG distribution	\$ 454.90	1.10	\$ 515.63	0.97	\$ 500.39
1.000	D3 01 3260 0520	Replace 10' steel pipe 1-1/2" diam. M.L.F. LPG distribution	\$ 503.25	1.10	\$ 570.44	0.97	\$ 553.58
1.000	D3 01 3260 0620	Replace 10' section steel pipe 2" diam. M.L.F. LPG distribution	\$ 623.86	1.10	\$ 707.15	0.97	\$ 686.24
1.000	D3 02 3388 1060	Replace coal spreader pneumatic	\$ 25,635.91	1.10	\$ 29,058.56	0.97	\$ 28,199.50
			\$ 36,835.97				\$ 40,519.57
			\$ 18,417.99	Assume 50% required		Assume 50% required	\$ 20,259.79
				PER 12 YEARS		PER 12 YEARS	
1.000	D3 01 3240 0110	Replace pressure regulator 1/2" diam. pipe natural gas	\$ 112.90	1.10	\$ 127.98	0.97	\$ 124.19
1.000	D3 01 3240 0120	Replace pressure regulator 1" diam. pipe natural gas	\$ 185.75	1.10	\$ 210.55	0.97	\$ 204.32
1.000	D3 01 3240 0130	Replace pressure regulator 1-1/2" diam. pipe natural gas	\$ 842.45	1.10	\$ 954.93	0.97	\$ 926.70
1.000	D3 01 3240 0140	Replace pressure regulator 2" diam. pipe natural gas	\$ 859.45	1.10	\$ 974.20	0.97	\$ 945.40
			\$ 2,000.56				\$ 2,200.61
			\$ 1,000.28	Assume 50% required		Assume 50% required	\$ 1,100.31
				PER 14 YEARS		PER 14 YEARS	
1.000	D3 01 3601 0010	Replace solar panel 3' x 8'	\$ 1,580.13	1.10	\$ 1,791.09	0.97	\$ 1,738.14
1.000	D3 02 3198 1020	Replace boiler blowoff system	\$ 4,836.02	1.10	\$ 5,481.68	0.97	\$ 5,319.62
1.000	D3 02 3292 1010	Repair chemical feed system	\$ 1,006.54	1.10	\$ 1,140.93	0.97	\$ 1,107.20
1.000	D3 02 3292 1030	Replace chemical feed system	\$ 913.86	1.10	\$ 1,035.87	0.97	\$ 1,005.25
1.000	D3 02 3294 1010	Repair feed water supply pump	\$ 3,160.79	1.10	\$ 3,582.79	0.97	\$ 3,476.87
1.000	D3 02 3294 1030	Replace feed water pump	\$ 18,633.19	1.10	\$ 21,120.91	0.97	\$ 20,496.51
1.000	D3 02 3310 0010	Replace metal flue, all fuel SS, 6" diameter metal flue / chimney	\$ 119.01	1.10	\$ 134.90	0.97	\$ 130.92
1.000	D3 02 3310 0020	Replace metal flue, all fuel SS, 10" diameter metal flue / chimney	\$ 159.39	1.10	\$ 180.68	0.97	\$ 175.33
1.000	D3 02 3310 0030	Replace metal flue, all fuel SS, 20" diameter metal flue / chimney	\$ 295.41	1.10	\$ 334.85	0.97	\$ 324.95
1.000	D3 02 3310 0040	Replace metal flue, all fuel SS, 32" diameter metal flue / chimney	\$ 467.56	1.10	\$ 529.98	0.97	\$ 514.31
1.000	D3 02 3310 0050	Replace metal flue, all fuel SS, 48" diameter metal flue / chimney	\$ 717.27	1.10	\$ 813.04	0.97	\$ 789.00
1.000	D3 02 3390 1030	Replace fuel oil 25 GPH pump / motor set	\$ 1,461.11	1.10	\$ 1,656.19	0.97	\$ 1,607.23

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Escalation													
	6%												
De-Escalation to July 2009													
	1.03												NON-GREEN
De-Escalation Factor to be Applied													
	0.97												
Green Factor													
	1.10	Assumed Value											
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor		
1.000	D3 02 3390 1040	Replace fuel oil 45 GPH pump / motor set	15	Q5	Ea.	5.20	\$ 1,175.00	\$ 1,375.00	1.095	\$ 1,505.63	0.97		
1.000	D3 02 3390 1050	Replace fuel oil 90 GPH pump / motor set	15	Q5	Ea.	6.24	\$ 1,220.00	\$ 1,451.00	1.095	\$ 1,588.85	0.97		
1.000	D3 02 3390 1060	Replace fuel oil 160 GPH pump / motor set	15	Q5	Ea.	7.79	\$ 1,375.00	\$ 1,613.00	1.095	\$ 1,766.24	0.97		
1.000	D3 03 3115 1030	Replace cooling tower, 50 ton	15	Q6	Ea.	31.18	\$ 12,625.00	\$ 14,580.00	1.095	\$ 15,965.10	0.97		
1.000	D3 03 3115 2030	Replace cooling tower, 100 ton	15	Q6	Ea.	42.86	\$ 18,555.00	\$ 21,375.00	1.095	\$ 23,405.63	0.97		
1.000	D3 03 3115 3030	Replace cooling tower, 300 ton	15	Q6	Ea.	108.86	\$ 34,875.00	\$ 40,425.00	1.095	\$ 44,265.38	0.97		
1.000	D3 03 3115 4030	Replace cooling tower, 1000 ton	15	Q6	Ea.	313.05	\$ 87,750.00	\$ 101,850.00	1.095	\$ 111,525.75	0.97		
1.000	D3 03 3210 1030	Replace condenser, air cooled, 5 ton	15	Q5	Ea.	15.58	\$ 2,900.00	\$ 3,400.00	1.095	\$ 3,723.00	0.97		
1.000	D3 03 3210 2030	Replace condenser, air cooled, 20 ton	15	Q5	Ea.	31.17	\$ 7,125.00	\$ 8,325.00	1.095	\$ 9,115.88	0.97		
1.000	D3 03 3210 3030	Replace condenser, air cooled, 50 ton	15	Q6	Ea.	116.88	\$ 22,250.00	\$ 26,025.00	1.095	\$ 28,497.38	0.97		
1.000	D3 03 3210 4030	Replace condenser, air cooled, 100 ton	15	Q7	Ea.	207.26	\$ 43,650.00	\$ 51,000.00	1.095	\$ 55,845.00	0.97		
1.000	D3 03 3260 1030	Replace evaporative condenser, 20 ton	15	Q5	Ea.	66.33	\$ 10,425.00	\$ 12,300.00	1.095	\$ 13,468.50	0.97		
1.000	D3 03 3260 2030	Replace evaporative condenser, 100 ton	15	Q7	Ea.	172.76	\$ 28,625.00	\$ 33,825.00	1.095	\$ 37,038.38	0.97		
1.000	D3 03 3260 3030	Replace evaporative condenser, 300 ton	15	Q7	Ea.	457.03	\$ 75,850.00	\$ 89,700.00	1.095	\$ 98,221.50	0.97		
1.000	D3 04 3120 1030	Replace fan coil unit, 1 ton	15	Q5	Ea.	5.20	\$ 1,200.00	\$ 1,400.00	1.095	\$ 1,533.00	0.97		
1.000	D3 04 3120 2030	Replace fan coil unit, 3 ton	15	Q5	Ea.	7.79	\$ 2,350.00	\$ 2,713.00	1.095	\$ 2,970.74	0.97		
1.000	D3 04 3120 3030	Replace fan coil unit, 5 ton	15	Q5	Ea.	8.05	\$ 3,155.00	\$ 3,644.00	1.095	\$ 3,990.18	0.97		
1.000	D3 04 3120 4030	Replace fan coil unit, 10 ton	15	Q6	Ea.	34.62	\$ 5,515.00	\$ 6,490.00	1.095	\$ 7,106.55	0.97		
1.000	D3 04 3120 5030	Replace fan coil unit, 20 ton	15	Q6	Ea.	58.54	\$ 9,050.00	\$ 10,675.00	1.095	\$ 11,689.13	0.97		
1.000	D3 04 3120 6030	Replace fan coil unit, 30 ton	15	Q6	Ea.	77.92	\$ 13,650.00	\$ 16,050.00	1.095	\$ 17,574.75	0.97		
1.000	D3 04 3122 1040	Replace fan coil, DX 1-1/2 ton, no heat	15	Q5	Ea.	6.24	\$ 1,120.00	\$ 1,325.00	1.095	\$ 1,450.88	0.97		
1.000	D3 04 3122 2040	Replace fan coil, DX 2 ton, no heat	15	Q5	Ea.	6.50	\$ 1,200.00	\$ 1,407.00	1.095	\$ 1,540.67	0.97		
1.000	D3 04 3122 3040	Replace fan coil, DX 2-1/2 ton, no heat	15	Q5	Ea.	7.09	\$ 1,287.00	\$ 1,496.00	1.095	\$ 1,638.12	0.97		
1.000	D3 04 3122 4040	Replace fan coil, DX 3 ton, no heat	15	Q5	Ea.	8.21	\$ 1,558.00	\$ 1,823.00	1.095	\$ 1,996.19	0.97		
1.000	D3 04 3122 6060	Replace fan coil, DX 5 ton, no heat	15	Q5	Ea.	10.40	\$ 2,051.00	\$ 2,401.00	1.095	\$ 2,629.10	0.97		
1.000	D3 04 3122 8080	Replace fan coil, DX 10 ton, no heat	15	Q6	Ea.	18.00	\$ 4,135.00	\$ 4,825.00	1.095	\$ 5,283.38	0.97		
1.000	D3 04 3122 9590	Replace fan coil, DX 20 ton, no heat	15	Q6	Ea.	66.89	\$ 9,925.00	\$ 11,775.00	1.095	\$ 12,893.63	0.97		
1.000	D3 04 3124 1010	Replace fan coil, DX 1-1/2 ton, with heat	15	Q5	Ea.	8.79	\$ 1,559.00	\$ 1,842.00	1.095	\$ 2,016.99	0.97		
1.000	D3 04 3124 2010	Replace fan coil, DX 2 ton, with heat	15	Q5	Ea.	9.15	\$ 1,689.00	\$ 1,974.00	1.095	\$ 2,161.53	0.97		
1.000	D3 04 3124 3010	Replace fan coil, DX 2-1/2 ton, with heat	15	Q5	Ea.	9.98	\$ 1,802.00	\$ 2,115.00	1.095	\$ 2,315.93	0.97		
1.000	D3 04 3124 4010	Replace fan coil, DX 3 ton, with heat	15	Q5	Ea.	11.56	\$ 2,176.00	\$ 2,570.00	1.095	\$ 2,814.15	0.97		
1.000	D3 04 3128 1030	Replace unit ventilator, 750 CFM, heat/cool coils	15	Q6	Ea.	23.40	\$ 5,395.00	\$ 6,285.00	1.095	\$ 6,882.08	0.97		
1.000	D3 04 3128 2030	Replace unit ventilator, 1250 CFM, heat/cool coils	15	Q6	Ea.	33.43	\$ 6,870.00	\$ 8,035.00	1.095	\$ 8,798.33	0.97		
1.000	D3 04 3128 2050	Replace unit ventilator, 2000 CFM, heat/cool coils	15	Q6	Ea.	93.55	\$ 11,725.00	\$ 13,950.00	1.095	\$ 15,275.25	0.97		
1.000	D3 04 3140 0030	Replace duct heater	15	1 Elec	Ea.	2.67	\$ 1,965.00	\$ 2,275.00	1.095	\$ 2,491.13	0.97		
1.000	D3 04 3220 1010	Replace fan & motor, propeller exh., 375 CFM exhaust fan	15	Q20	Ea.	3.90	\$ 693.50	\$ 811.50	1.095	\$ 888.59	0.97		
1.000	D3 04 3220 1030	Replace fan & motor, propeller exh., 1000 CFM exhaust fan	15	Q20	Ea.	4.88	\$ 1,006.50	\$ 1,164.00	1.095	\$ 1,274.58	0.97		
1.000	D3 04 3220 1040	Replace fan & motor, propeller exh., 4700 CFM exhaust fan	15	Q20	Ea.	7.80	\$ 1,622.00	\$ 1,883.00	1.095	\$ 2,061.89	0.97		
1.000	D3 04 3320 0030	Replace flash tank 24 gallon	15	Q5	Ea.	2.23	\$ 738.00	\$ 854.00	1.095	\$ 935.13	0.97		

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
10% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	GREEN Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 02 3390 1040	Replace fuel oil 45 GPH pump / motor set	\$ 1,461.11	1.10	\$ 1,656.19	0.97	\$ 1,607.23
1.000	D3 02 3390 1050	Replace fuel oil 90 GPH pump / motor set	\$ 1,541.87	1.10	\$ 1,747.73	0.97	\$ 1,696.06
1.000	D3 02 3390 1060	Replace fuel oil 160 GPH pump / motor set	\$ 1,714.02	1.10	\$ 1,942.86	0.97	\$ 1,885.42
1.000	D3 03 3115 1030	Replace cooling tower, 50 ton	\$ 15,493.12	1.10	\$ 17,561.61	0.97	\$ 17,042.44
1.000	D3 03 3115 2030	Replace cooling tower, 100 ton	\$ 22,713.68	1.10	\$ 25,746.19	0.97	\$ 24,985.05
1.000	D3 03 3115 3030	Replace cooling tower, 300 ton	\$ 42,956.76	1.10	\$ 48,691.91	0.97	\$ 47,252.43
1.000	D3 03 3115 4030	Replace cooling tower, 1000 ton	\$ 108,228.71	1.10	\$ 122,678.33	0.97	\$ 119,051.58
1.000	D3 03 3210 1030	Replace condenser, air cooled, 5 ton	\$ 3,612.94	1.10	\$ 4,095.30	0.97	\$ 3,974.23
1.000	D3 03 3210 2030	Replace condenser, air cooled, 20 ton	\$ 8,846.38	1.10	\$ 10,027.46	0.97	\$ 9,731.02
1.000	D3 03 3210 3030	Replace condenser, air cooled, 50 ton	\$ 27,654.91	1.10	\$ 31,347.11	0.97	\$ 30,420.40
1.000	D3 03 3210 4030	Replace condenser, air cooled, 100 ton	\$ 54,194.05	1.10	\$ 61,429.50	0.97	\$ 59,613.46
1.000	D3 03 3260 1030	Replace evaporative condenser, 20 ton	\$ 13,070.33	1.10	\$ 14,815.35	0.97	\$ 14,377.36
1.000	D3 03 3260 2030	Replace evaporative condenser, 100 ton	\$ 35,943.41	1.10	\$ 40,742.21	0.97	\$ 39,537.75
1.000	D3 03 3260 3030	Replace evaporative condenser, 300 ton	\$ 95,317.78	1.10	\$ 108,043.65	0.97	\$ 104,849.55
1.000	D3 04 3120 1030	Replace fan coil unit, 1 ton	\$ 1,487.68	1.10	\$ 1,686.30	0.97	\$ 1,636.45
1.000	D3 04 3120 2030	Replace fan coil unit, 3 ton	\$ 2,882.91	1.10	\$ 3,267.81	0.97	\$ 3,171.20
1.000	D3 04 3120 3030	Replace fan coil unit, 5 ton	\$ 3,872.22	1.10	\$ 4,389.20	0.97	\$ 4,259.44
1.000	D3 04 3120 4030	Replace fan coil unit, 10 ton	\$ 6,896.46	1.10	\$ 7,817.21	0.97	\$ 7,586.10
1.000	D3 04 3120 5030	Replace fan coil unit, 20 ton	\$ 11,343.56	1.10	\$ 12,858.04	0.97	\$ 12,477.92
1.000	D3 04 3120 6030	Replace fan coil unit, 30 ton	\$ 17,055.19	1.10	\$ 19,332.23	0.97	\$ 18,760.71
1.000	D3 04 3122 1040	Replace fan coil, DX 1-1/2 ton, no heat	\$ 1,407.98	1.10	\$ 1,595.96	0.97	\$ 1,548.78
1.000	D3 04 3122 2040	Replace fan coil, DX 2 ton, no heat	\$ 1,495.12	1.10	\$ 1,694.73	0.97	\$ 1,644.63
1.000	D3 04 3122 3040	Replace fan coil, DX 2-1/2 ton, no heat	\$ 1,589.69	1.10	\$ 1,801.93	0.97	\$ 1,748.66
1.000	D3 04 3122 4040	Replace fan coil, DX 3 ton, no heat	\$ 1,937.17	1.10	\$ 2,195.80	0.97	\$ 2,130.89
1.000	D3 04 3122 6060	Replace fan coil, DX 5 ton, no heat	\$ 2,551.37	1.10	\$ 2,892.00	0.97	\$ 2,806.51
1.000	D3 04 3122 8080	Replace fan coil, DX 10 ton, no heat	\$ 5,127.18	1.10	\$ 5,811.71	0.97	\$ 5,639.90
1.000	D3 04 3122 9590	Replace fan coil, DX 20 ton, no heat	\$ 12,512.45	1.10	\$ 14,182.99	0.97	\$ 13,763.70
1.000	D3 04 3124 1010	Replace fan coil, DX 1-1/2 ton, with heat	\$ 1,957.36	1.10	\$ 2,218.69	0.97	\$ 2,153.10
1.000	D3 04 3124 2010	Replace fan coil, DX 2 ton, with heat	\$ 2,097.63	1.10	\$ 2,377.68	0.97	\$ 2,307.39
1.000	D3 04 3124 3010	Replace fan coil, DX 2-1/2 ton, with heat	\$ 2,247.46	1.10	\$ 2,547.52	0.97	\$ 2,472.21
1.000	D3 04 3124 4010	Replace fan coil, DX 3 ton, with heat	\$ 2,730.96	1.10	\$ 3,095.57	0.97	\$ 3,004.05
1.000	D3 04 3128 1030	Replace unit ventilator, 750 CFM, heat/cool coils	\$ 6,678.62	1.10	\$ 7,570.28	0.97	\$ 7,346.48
1.000	D3 04 3128 2030	Replace unit ventilator, 1250 CFM, heat/cool coils	\$ 8,538.22	1.10	\$ 9,678.16	0.97	\$ 9,392.04
1.000	D3 04 3128 2050	Replace unit ventilator, 2000 CFM, heat/cool coils	\$ 14,823.67	1.10	\$ 16,802.78	0.97	\$ 16,306.03
1.000	D3 04 3140 0030	Replace duct heater	\$ 2,417.48	1.10	\$ 2,740.24	0.97	\$ 2,659.23
1.000	D3 04 3220 1010	Replace fan & motor, propeller exh., 375 CFM exhaust fan	\$ 862.32	1.10	\$ 977.45	0.97	\$ 948.56
1.000	D3 04 3220 1030	Replace fan & motor, propeller exh., 1000 CFM exhaust fan	\$ 1,236.90	1.10	\$ 1,402.04	0.97	\$ 1,360.59
1.000	D3 04 3220 1040	Replace fan & motor, propeller exh., 4700 CFM exhaust fan	\$ 2,000.93	1.10	\$ 2,268.07	0.97	\$ 2,201.02
1.000	D3 04 3320 0030	Replace flash tank 24 gallon	\$ 907.48	1.10	\$ 1,028.64	0.97	\$ 998.23

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹													
10% GF													
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ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN													
Escalation	6%												
De-Escalation to July 2009	1.03												NON-GREEN
De-Escalation Factor to be Applied	0.97												
Green Factor	1.10	Assumed Value											
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor		
1.000	D3 04 3340 0010	Repair condensate meter	15	1 Stpi	Ea.	4.14	\$ 1,164.00	\$ 1,355.00	1.095	\$ 1,483.73	0.97		
1.000	D3 04 3530 1030	Replace circulator pump, 1/12 - 3/4 H.P.	15	Q1	Ea.	7.79	\$ 2,876.00	\$ 3,314.00	1.095	\$ 3,628.83	0.97		
1.000	D3 04 3530 2030	Replace circulator. pump, 1 H.P.	15	Q1	Ea.	7.80	\$ 4,351.00	\$ 5,014.00	1.095	\$ 5,490.33	0.97		
1.000	D3 05 3110 1030	Replace unit heater, 12 MBH, 2 PSI steam	15	Q5	Ea.	2.60	\$ 520.00	\$ 607.50	1.095	\$ 665.21	0.97		
1.000	D3 05 3110 2030	Replace unit heater, 36 MBH, 2 PSI steam	15	Q5	Ea.	3.90	\$ 780.00	\$ 914.00	1.095	\$ 1,000.83	0.97		
1.000	D3 05 3110 3030	Replace unit heater, 85 MBH, 2 PSI steam	15	Q5	Ea.	4.80	\$ 937.50	\$ 1,096.00	1.095	\$ 1,200.12	0.97		
1.000	D3 05 3110 4030	Replace unit heater, 250 MBH, 2 PSI steam	15	Q5	Ea.	12.48	\$ 2,416.00	\$ 2,850.00	1.095	\$ 3,120.75	0.97		
1.000	D3 05 3110 5020	Replace unit heater, 400 MBH, 2 PSI steam	15	Q5	Ea.	19.51	\$ 3,875.00	\$ 4,545.00	1.095	\$ 4,976.78	0.97		
1.000	D3 05 3112 0030	Replace infrared heater suspended, commercial	15	1 Elec	Ea.	2.77	\$ 410.00	\$ 485.00	1.095	\$ 531.08	0.97		
1.000	D3 05 3114 0030	Replace heater standard suspended heater	15	1 Elec	Ea.	3.87	\$ 795.00	\$ 930.00	1.095	\$ 1,018.35	0.97		
1.000	D3 05 3116 0030	Replace heater explosionproof industrial heater	15	1 Elec	Ea.	4.61	\$ 5,923.00	\$ 6,760.00	1.095	\$ 7,402.20	0.97		
1.000	D3 05 3160 0030	Replace heater convactor suspended, commercial	15	1 Elec	Ea.	2.67	\$ 2,165.00	\$ 2,475.00	1.095	\$ 2,710.13	0.97		
1.000	D3 05 3170 1040	Replace terminal reheat, 12" x 24" coil	15	Q5	Ea.	2.57	\$ 924.50	\$ 1,062.00	1.095	\$ 1,162.89	0.97		
1.000	D3 05 3170 2040	Replace terminal reheat, 18" x 24" coil	15	Q5	Ea.	3.85	\$ 1,124.50	\$ 1,318.00	1.095	\$ 1,443.21	0.97		
1.000	D3 05 3170 3040	Replace terminal reheat, 36" x 36" coil	15	Q5	Ea.	11.56	\$ 2,198.00	\$ 2,579.00	1.095	\$ 2,824.01	0.97		
1.000	D3 05 3170 4040	Replace terminal reheat, 48" x 126" coil	15	Q5	Ea.	53.81	\$ 7,850.00	\$ 9,275.00	1.095	\$ 10,156.13	0.97		
1.000	D3 05 3278 1040	Replace multi-zone rooftop unit, 15 ton	15	Q7	Ea.	164.70	\$ 72,800.00	\$ 83,750.00	1.095	\$ 91,706.25	0.97		
1.000	D3 05 3278 2040	Replace multi-zone rooftop unit, 25 ton	15	Q7	Ea.	210.81	\$ 93,550.00	\$ 107,850.00	1.095	\$ 118,095.75	0.97		
1.000	D3 05 3278 3040	Replace multi-zone rooftop unit, 40 ton	15	Q7	Ea.	323.00	\$ 137,500.00	\$ 158,700.00	1.095	\$ 173,776.50	0.97		
1.000	D3 05 3278 4040	Replace multi-zone rooftop unit, 70 ton	15	Q7	Ea.	495.00	\$ 189,100.00	\$ 218,800.00	1.095	\$ 239,586.00	0.97		
1.000	D3 05 3278 5040	Replace multi-zone rooftop unit, 105 ton	15	Q7	Ea.	737.00	\$ 254,700.00	\$ 294,600.00	1.095	\$ 322,587.00	0.97		
1.000	D3 05 3280 1002	Replace single zone rt. unit, 3 ton	15	Q5	Ea.	38.48	\$ 6,040.00	\$ 7,130.00	1.095	\$ 7,807.35	0.97		
1.000	D3 05 3280 1004	Replace single zone rt. unit, 5 ton	15	Q5	Ea.	56.57	\$ 8,600.00	\$ 10,175.00	1.095	\$ 11,141.63	0.97		
1.000	D3 05 3280 1006	Replace single zone rt. unit, 7.5 ton	15	Q5	Ea.	69.03	\$ 12,300.00	\$ 14,475.00	1.095	\$ 15,850.13	0.97		
1.000	D3 05 3280 1008	Replace single zone rt. unit, 10 ton	15	Q6	Ea.	81.90	\$ 16,525.00	\$ 19,450.00	1.095	\$ 21,297.75	0.97		
1.000	D3 05 3280 1040	Replace single zone rooftop unit, 15 ton	15	Q6	Ea.	106.39	\$ 22,925.00	\$ 26,775.00	1.095	\$ 29,318.63	0.97		
1.000	D3 05 3280 2040	Replace single zone rooftop unit, 25 ton	15	Q7	Ea.	153.66	\$ 36,900.00	\$ 43,000.00	1.095	\$ 47,085.00	0.97		
1.000	D3 05 3280 3040	Replace single zone rooftop unit, 60 ton	15	Q7	Ea.	369.00	\$ 75,000.00	\$ 87,900.00	1.095	\$ 96,250.50	0.97		
1.000	D3 05 3280 4040	Replace single zone rooftop unit, 100 ton	15	Q7	Ea.	600.00	\$ 146,600.00	\$ 171,200.00	1.095	\$ 187,464.00	0.97		
1.000	D3 05 3282 1040	Replace multi-zone variable volume, 50 ton	15	Q7	Ea.	379.00	\$ 132,300.00	\$ 152,700.00	1.095	\$ 167,206.50	0.97		
1.000	D3 05 3282 2040	Replace multi-zone variable volume, 70 ton	15	Q7	Ea.	535.00	\$ 185,100.00	\$ 214,300.00	1.095	\$ 234,658.50	0.97		
1.000	D3 05 3282 3040	Replace multi-zone variable volume, 90 ton	15	Q7	Ea.	691.00	\$ 217,100.00	\$ 251,700.00	1.095	\$ 275,611.50	0.97		
1.000	D3 05 3282 4040	Replace multi-zone variable volume, 105 ton	15	Q7	Ea.	791.00	\$ 244,200.00	\$ 283,100.00	1.095	\$ 309,994.50	0.97		
1.000	D3 05 3282 5040	Replace multi-zone variable volume, 140 ton	15	Q7	Ea.	1,108.00	\$ 307,600.00	\$ 357,500.00	1.095	\$ 391,462.50	0.97		
1.000	D3 05 3286 1040	Replace central station A.H.U., 1300 CFM	15	Q5	Ea.	26.00	\$ 7,275.00	\$ 8,450.00	1.095	\$ 9,252.75	0.97		
1.000	D3 05 3286 2040	Replace central station A.H.U., 1900 CFM	15	Q5	Ea.	28.37	\$ 10,520.00	\$ 12,185.00	1.095	\$ 13,342.58	0.97		
1.000	D3 05 3286 3040	Replace central station A.H.U., 5400 CFM	15	Q6	Ea.	58.52	\$ 25,075.00	\$ 28,875.00	1.095	\$ 31,618.13	0.97		
1.000	D3 05 3286 4040	Replace central station A.H.U., 8000 CFM	15	Q6	Ea.	77.92	\$ 39,250.00	\$ 45,150.00	1.095	\$ 49,439.25	0.97		
1.000	D3 05 3286 5040	Replace central station A.H.U., 16,000 CFM	15	Q6	Ea.	123.22	\$ 74,450.00	\$ 85,575.00	1.095	\$ 93,704.63	0.97		

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
10% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value					
				GREEN			
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 04 3340 0010	Repair condensate meter	\$ 1,439.86	1.10	\$ 1,632.10	0.97	\$ 1,583.85
1.000	D3 04 3530 1030	Replace circulator pump, 1/12 - 3/4 H.P.	\$ 3,521.55	1.10	\$ 3,991.71	0.97	\$ 3,873.71
1.000	D3 04 3530 2030	Replace circulator. pump, 1 H.P.	\$ 5,328.02	1.10	\$ 6,039.36	0.97	\$ 5,860.82
1.000	D3 05 3110 1030	Replace unit heater, 12 MBH, 2 PSI steam	\$ 645.55	1.10	\$ 731.73	0.97	\$ 710.10
1.000	D3 05 3110 2030	Replace unit heater, 36 MBH, 2 PSI steam	\$ 971.24	1.10	\$ 1,100.91	0.97	\$ 1,068.37
1.000	D3 05 3110 3030	Replace unit heater, 85 MBH, 2 PSI steam	\$ 1,164.64	1.10	\$ 1,320.13	0.97	\$ 1,281.10
1.000	D3 05 3110 4030	Replace unit heater, 250 MBH, 2 PSI steam	\$ 3,028.49	1.10	\$ 3,432.83	0.97	\$ 3,331.34
1.000	D3 05 3110 5020	Replace unit heater, 400 MBH, 2 PSI steam	\$ 4,829.65	1.10	\$ 5,474.45	0.97	\$ 5,312.61
1.000	D3 05 3112 0030	Replace infrared heater suspended, commercial	\$ 515.37	1.10	\$ 584.18	0.97	\$ 566.91
1.000	D3 05 3114 0030	Replace heater standard suspended heater	\$ 988.24	1.10	\$ 1,120.19	0.97	\$ 1,087.07
1.000	D3 05 3116 0030	Replace heater explosionproof industrial heater	\$ 7,183.37	1.10	\$ 8,142.42	0.97	\$ 7,901.71
1.000	D3 05 3160 0030	Replace heater convactor suspended, commercial	\$ 2,630.01	1.10	\$ 2,981.14	0.97	\$ 2,893.01
1.000	D3 05 3170 1040	Replace terminal reheat, 12" x 24" coil	\$ 1,128.51	1.10	\$ 1,279.18	0.97	\$ 1,241.36
1.000	D3 05 3170 2040	Replace terminal reheat, 18" x 24" coil	\$ 1,400.54	1.10	\$ 1,587.53	0.97	\$ 1,540.60
1.000	D3 05 3170 3040	Replace terminal reheat, 36" x 36" coil	\$ 2,740.52	1.10	\$ 3,106.41	0.97	\$ 3,014.57
1.000	D3 05 3170 4040	Replace terminal reheat, 48" x 126" coil	\$ 9,855.88	1.10	\$ 11,171.74	0.97	\$ 10,841.47
1.000	D3 05 3278 1040	Replace multi-zone rooftop unit, 15 ton	\$ 88,995.14	1.10	\$ 100,876.88	0.97	\$ 97,894.65
1.000	D3 05 3278 2040	Replace multi-zone rooftop unit, 25 ton	\$ 114,604.48	1.10	\$ 129,905.33	0.97	\$ 126,064.93
1.000	D3 05 3278 3040	Replace multi-zone rooftop unit, 40 ton	\$ 168,639.14	1.10	\$ 191,154.15	0.97	\$ 185,503.06
1.000	D3 05 3278 4040	Replace multi-zone rooftop unit, 70 ton	\$ 232,503.12	1.10	\$ 263,544.60	0.97	\$ 255,753.43
1.000	D3 05 3278 5040	Replace multi-zone rooftop unit, 105 ton	\$ 313,050.36	1.10	\$ 354,845.70	0.97	\$ 344,355.39
1.000	D3 05 3280 1002	Replace single zone rt. unit, 3 ton	\$ 7,576.54	1.10	\$ 8,588.09	0.97	\$ 8,334.20
1.000	D3 05 3280 1004	Replace single zone rt. unit, 5 ton	\$ 10,812.24	1.10	\$ 12,255.79	0.97	\$ 11,893.47
1.000	D3 05 3280 1006	Replace single zone rt. unit, 7.5 ton	\$ 15,381.55	1.10	\$ 17,435.14	0.97	\$ 16,919.70
1.000	D3 05 3280 1008	Replace single zone rt. unit, 10 ton	\$ 20,668.12	1.10	\$ 23,427.53	0.97	\$ 22,734.94
1.000	D3 05 3280 1040	Replace single zone rooftop unit, 15 ton	\$ 28,451.88	1.10	\$ 32,250.49	0.97	\$ 31,297.07
1.000	D3 05 3280 2040	Replace single zone rooftop unit, 25 ton	\$ 45,693.03	1.10	\$ 51,793.50	0.97	\$ 50,262.33
1.000	D3 05 3280 3040	Replace single zone rooftop unit, 60 ton	\$ 93,405.05	1.10	\$ 105,875.55	0.97	\$ 102,745.55
1.000	D3 05 3280 4040	Replace single zone rooftop unit, 100 ton	\$ 181,922.00	1.10	\$ 206,210.40	0.97	\$ 200,114.20
1.000	D3 05 3282 1040	Replace multi-zone variable volume, 50 ton	\$ 162,263.37	1.10	\$ 183,927.15	0.97	\$ 178,489.71
1.000	D3 05 3282 2040	Replace multi-zone variable volume, 70 ton	\$ 227,721.29	1.10	\$ 258,124.35	0.97	\$ 250,493.42
1.000	D3 05 3282 3040	Replace multi-zone variable volume, 90 ton	\$ 267,463.59	1.10	\$ 303,172.65	0.97	\$ 294,209.95
1.000	D3 05 3282 4040	Replace multi-zone variable volume, 105 ton	\$ 300,830.13	1.10	\$ 340,993.95	0.97	\$ 330,913.14
1.000	D3 05 3282 5040	Replace multi-zone variable volume, 140 ton	\$ 379,889.69	1.10	\$ 430,608.75	0.97	\$ 417,878.66
1.000	D3 05 3286 1040	Replace central station A.H.U., 1300 CFM	\$ 8,979.21	1.10	\$ 10,178.03	0.97	\$ 9,877.13
1.000	D3 05 3286 2040	Replace central station A.H.U., 1900 CFM	\$ 12,948.13	1.10	\$ 14,676.83	0.97	\$ 14,242.94
1.000	D3 05 3286 3040	Replace central station A.H.U., 5400 CFM	\$ 30,683.40	1.10	\$ 34,779.94	0.97	\$ 33,751.74
1.000	D3 05 3286 4040	Replace central station A.H.U., 8000 CFM	\$ 47,977.68	1.10	\$ 54,383.18	0.97	\$ 52,775.44
1.000	D3 05 3286 5040	Replace central station A.H.U., 16,000 CFM	\$ 90,934.43	1.10	\$ 103,075.09	0.97	\$ 100,027.88

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹													
10% GF													
CostWorks 2010 - EAST HALL													
Based on National Averages													
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN													
Escalation													
	6%												
De-Escalation to July 2009													
	1.03												NON-GREEN
De-Escalation Factor to be Applied													
	0.97												
Green Factor													
	1.10	Assumed Value											
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor		
1.000	D3 05 3286 6040	Replace central station A.H.U., 33,500 CFM	15	Q6	Ea.	246.19	\$ 170,925.00	\$ 196,175.00	1.095	\$ 214,811.63	0.97		
1.000	D3 05 3286 7040	Replace central station A.H.U., 63,000 CFM	15	Q7	Ea.	480.00	\$ 323,300.00	\$ 370,700.00	1.095	\$ 405,916.50	0.97		
1.000	D3 05 3310 1030	Replace furnace, gas, 25 MBH residential	15	Q9	Ea.	6.00	\$ 966.00	\$ 1,133.00	1.095	\$ 1,240.64	0.97		
1.000	D3 05 3310 2030	Replace furnace, gas, 100 MBH residential	15	Q9	Ea.	9.75	\$ 1,305.00	\$ 1,550.00	1.095	\$ 1,697.25	0.97		
1.000	D3 05 3310 3030	Replace furnace, gas, 200 MBH residential	15	Q9	Ea.	12.00	\$ 3,322.00	\$ 3,852.00	1.095	\$ 4,217.94	0.97		
1.000	D3 05 3320 1030	Replace furnace, oil, 55 MBH residential	15	Q9	Ea.	8.67	\$ 2,510.00	\$ 2,925.00	1.095	\$ 3,202.88	0.97		
1.000	D3 05 3320 2030	Replace furnace, oil, 100 MBH residential	15	Q1	Ea.	9.18	\$ 2,570.00	\$ 2,986.00	1.095	\$ 3,269.67	0.97		
1.000	D3 05 3320 3030	Replace furnace, oil, 200 MBH residential	15	Q1	Ea.	12.00	\$ 3,222.00	\$ 3,727.00	1.095	\$ 4,081.07	0.97		
1.000	D3 05 3330 1030	Replace furnace, electric, 25 MBH residential	15	Q20	Ea.	8.48	\$ 1,139.00	\$ 1,349.00	1.095	\$ 1,477.16	0.97		
1.000	D3 05 3330 2030	Replace furnace, electric, 50 MBH residential	15	Q20	Ea.	9.29	\$ 1,249.00	\$ 1,468.00	1.095	\$ 1,607.46	0.97		
1.000	D3 05 3330 3030	Replace furnace, electric, 85 MBH residential	15	Q20	Ea.	10.84	\$ 1,472.00	\$ 1,727.00	1.095	\$ 1,891.07	0.97		
							\$ 3,334,630.57	\$ 3,863,922.72					
1.000	D3 01 3150 0020	Replace remote tank fuel gauge	20	1 Stpi	Ea.	6.25	\$ 4,134.00	\$ 4,742.00	1.095	\$ 5,192.49	0.97		
1.000	D3 01 3170 0020	Install 10' sect. 3/8" type L copper per M.L.F. fuel oil storage	20	1 Plum	Ea.	1.86	\$ 145.00	\$ 178.00	1.095	\$ 194.91	0.97		
1.000	D3 01 3170 0030	Install 10' sect. 1/2" type L copper per M.L.F. fuel oil storage	20	1 Plum	Ea.	1.93	\$ 151.50	\$ 187.00	1.095	\$ 204.77	0.97		
1.000	D3 01 3170 0040	Install 10' sect. 5/8" type L copper per M.L.F. fuel oil storage	20	1 Plum	Ea.	1.98	\$ 170.50	\$ 207.00	1.095	\$ 226.67	0.97		
1.000	D3 01 3170 0050	Install 10' sect. 3/4" type L copper per M.L.F. fuel oil storage	20	1 Plum	Ea.	2.05	\$ 175.00	\$ 213.00	1.095	\$ 233.24	0.97		
1.000	D3 01 3170 0060	Install 10' section 1" type L copper per M.L.F. fuel oil storage	20	1 Plum	Ea.	2.29	\$ 213.50	\$ 259.50	1.095	\$ 284.15	0.97		
1.000	D3 02 3182 1010	Repair boiler, coal, 4600 MBH	20	4 Stpi	Ea.	109.54	\$ 28,117.50	\$ 32,790.00	1.095	\$ 35,905.05	0.97		
1.000	D3 02 3296 1030	Replace deaerator	20	4 Stpi	Ea.	186.50	\$ 41,250.00	\$ 48,365.00	1.095	\$ 52,959.68	0.97		
1.000	D3 03 3130 1030	Replace chiller, water cooled, 20 ton, reciprocating	20	Q7	Ea.	151.63	\$ 29,000.00	\$ 33,975.00	1.095	\$ 37,202.63	0.97		
1.000	D3 03 3130 2030	Replace chiller, water cooled 50 ton, reciprocating	20	Q7	Ea.	222.07	\$ 47,125.00	\$ 55,075.00	1.095	\$ 60,307.13	0.97		
1.000	D3 03 3130 3030	Replace chiller, water cooled, 100 ton, reciprocating	20	Q7	Ea.	349.00	\$ 85,600.00	\$ 99,950.00	1.095	\$ 109,445.25	0.97		
1.000	D3 03 3130 5030	Replace chiller, water cooled, 200 ton, reciprocating	20	Q7	Ea.	489.00	\$ 125,975.00	\$ 147,000.00	1.095	\$ 160,965.00	0.97		
1.000	D3 03 3135 1030	Replace chiller, air cooled, 20 ton	20	Q7	Ea.	160.86	\$ 35,775.00	\$ 41,825.00	1.095	\$ 45,798.38	0.97		
1.000	D3 03 3135 2030	Replace chiller, air cooled, 50 ton	20	Q7	Ea.	219.40	\$ 53,800.00	\$ 62,625.00	1.095	\$ 68,574.38	0.97		
1.000	D3 03 3135 3030	Replace chiller, air cooled, 100 ton	20	Q7	Ea.	252.21	\$ 94,150.00	\$ 108,950.00	1.095	\$ 119,300.25	0.97		
1.000	D3 03 3137 4030	Replace chiller, water cooled, 5 ton, reciprocating	20	Q5	Ea.	54.55	\$ 6,700.00	\$ 7,975.00	1.095	\$ 8,732.63	0.97		
1.000	D3 03 3137 5030	Replace chiller, water cooled, 10 ton, reciprocating	20	Q6	Ea.	130.44	\$ 14,600.00	\$ 17,450.00	1.095	\$ 19,107.75	0.97		
1.000	D3 03 3137 6030	Replace chiller, water cooled, 15 ton, reciprocating	20	Q6	Ea.	128.57	\$ 25,275.00	\$ 29,625.00	1.095	\$ 32,439.38	0.97		
1.000	D3 03 3140 1030	Replace hermetic centrifugal chiller, 100 ton	20	Q7	Ea.	489.00	\$ 119,975.00	\$ 140,000.00	1.095	\$ 153,300.00	0.97		
1.000	D3 03 3140 2030	Replace hermetic centrifugal chiller, 300 ton	20	Q7	Ea.	520.00	\$ 174,100.00	\$ 201,800.00	1.095	\$ 220,971.00	0.97		
1.000	D3 03 3140 3030	Replace hermetic centrifugal chiller, 1000 ton	20	Q7	Ea.	726.00	\$ 502,800.00	\$ 576,100.00	1.095	\$ 630,829.50	0.97		
1.000	D3 03 3142 1030	Replace open centrifugal chiller, 300 ton	20	Q7	Ea.	998.87	\$ 236,600.00	\$ 276,000.00	1.095	\$ 302,220.00	0.97		
1.000	D3 03 3142 2030	Replace open centrifugal chiller, 1000 ton	20	Q7	Ea.	3,417.40	\$ 810,200.00	\$ 944,000.00	1.095	\$ 1,033,680.00	0.97		

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
10% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value					
				GREEN			
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 05 3286 6040	Replace central station A.H.U., 33,500 CFM	\$ 208,461.15	1.10	\$ 236,292.79	0.97	\$ 229,307.26
1.000	D3 05 3286 7040	Replace central station A.H.U., 63,000 CFM	\$ 393,916.38	1.10	\$ 446,508.15	0.97	\$ 433,308.02
1.000	D3 05 3310 1030	Replace furnace, gas, 25 MBH residential	\$ 1,203.96	1.10	\$ 1,364.70	0.97	\$ 1,324.35
1.000	D3 05 3310 2030	Replace furnace, gas, 100 MBH residential	\$ 1,647.07	1.10	\$ 1,866.98	0.97	\$ 1,811.78
1.000	D3 05 3310 3030	Replace furnace, gas, 200 MBH residential	\$ 4,093.24	1.10	\$ 4,639.73	0.97	\$ 4,502.57
1.000	D3 05 3320 1030	Replace furnace, oil, 55 MBH residential	\$ 3,108.19	1.10	\$ 3,523.16	0.97	\$ 3,419.01
1.000	D3 05 3320 2030	Replace furnace, oil, 100 MBH residential	\$ 3,173.01	1.10	\$ 3,596.64	0.97	\$ 3,490.31
1.000	D3 05 3320 3030	Replace furnace, oil, 200 MBH residential	\$ 3,960.42	1.10	\$ 4,489.17	0.97	\$ 4,356.46
1.000	D3 05 3330 1030	Replace furnace, electric, 25 MBH residential	\$ 1,433.49	1.10	\$ 1,624.87	0.97	\$ 1,576.83
1.000	D3 05 3330 2030	Replace furnace, electric, 50 MBH residential	\$ 1,559.94	1.10	\$ 1,768.21	0.97	\$ 1,715.93
1.000	D3 05 3330 3030	Replace furnace, electric, 85 MBH residential	\$ 1,835.16	1.10	\$ 2,080.17	0.97	\$ 2,018.68
			\$ 4,105,914.40				\$ 4,516,505.84
			\$ 1,231,774.32	Assume 30% required		Assume 30% required	\$ 1,354,951.75
				PER 15 YEARS		PER 15 YEARS	
1.000	D3 01 3150 0020	Replace remote tank fuel gauge	\$ 5,038.98	1.10	\$ 5,711.74	0.97	\$ 5,542.88
1.000	D3 01 3170 0020	install 10' sect. 3/8" type L copper per M.L.F. fuel oil storage	\$ 189.15	1.10	\$ 214.40	0.97	\$ 208.06
1.000	D3 01 3170 0030	install 10' sect. 1/2" type L copper per M.L.F. fuel oil storage	\$ 198.71	1.10	\$ 225.24	0.97	\$ 218.58
1.000	D3 01 3170 0040	install 10' sect. 5/8" type L copper per M.L.F. fuel oil storage	\$ 219.96	1.10	\$ 249.33	0.97	\$ 241.96
1.000	D3 01 3170 0050	install 10' sect. 3/4" type L copper per M.L.F. fuel oil storage	\$ 226.34	1.10	\$ 256.56	0.97	\$ 248.97
1.000	D3 01 3170 0060	install 10' section 1" type L copper per M.L.F. fuel oil storage	\$ 275.75	1.10	\$ 312.57	0.97	\$ 303.33
1.000	D3 02 3182 1010	Repair boiler, coal, 4600 MBH	\$ 34,843.59	1.10	\$ 39,495.56	0.97	\$ 38,327.95
1.000	D3 02 3296 1030	Replace deaerator	\$ 51,394.03	1.10	\$ 58,255.64	0.97	\$ 56,533.43
1.000	D3 03 3130 1030	Replace chiller, water cooled, 20 ton, reciprocating	\$ 36,102.80	1.10	\$ 40,922.89	0.97	\$ 39,713.08
1.000	D3 03 3130 2030	Replace chiller, water cooled 50 ton, reciprocating	\$ 58,524.26	1.10	\$ 66,337.84	0.97	\$ 64,376.69
1.000	D3 03 3130 3030	Replace chiller, water cooled, 100 ton, reciprocating	\$ 106,209.72	1.10	\$ 120,389.78	0.97	\$ 116,830.69
1.000	D3 03 3130 5030	Replace chiller, water cooled, 200 ton, reciprocating	\$ 156,206.39	1.10	\$ 177,061.50	0.97	\$ 171,827.03
1.000	D3 03 3135 1030	Replace chiller, air cooled, 20 ton	\$ 44,444.44	1.10	\$ 50,378.21	0.97	\$ 48,888.88
1.000	D3 03 3135 2030	Replace chiller, air cooled, 50 ton	\$ 66,547.11	1.10	\$ 75,431.81	0.97	\$ 73,201.82
1.000	D3 03 3135 3030	Replace chiller, air cooled, 100 ton	\$ 115,773.38	1.10	\$ 131,230.28	0.97	\$ 127,350.71
1.000	D3 03 3137 4030	Replace chiller, water cooled, 5 ton, reciprocating	\$ 8,474.46	1.10	\$ 9,605.89	0.97	\$ 9,321.91
1.000	D3 03 3137 5030	Replace chiller, water cooled, 10 ton, reciprocating	\$ 18,542.87	1.10	\$ 21,018.53	0.97	\$ 20,397.15
1.000	D3 03 3137 6030	Replace chiller, water cooled, 15 ton, reciprocating	\$ 31,480.37	1.10	\$ 35,683.31	0.97	\$ 34,628.41
1.000	D3 03 3140 1030	Replace hermetic centrifugal chiller, 100 ton	\$ 148,767.99	1.10	\$ 168,630.00	0.97	\$ 163,644.79
1.000	D3 03 3140 2030	Replace hermetic centrifugal chiller, 300 ton	\$ 214,438.43	1.10	\$ 243,068.10	0.97	\$ 235,882.27
1.000	D3 03 3140 3030	Replace hermetic centrifugal chiller, 1000 ton	\$ 612,180.28	1.10	\$ 693,912.45	0.97	\$ 673,398.31
1.000	D3 03 3142 1030	Replace open centrifugal chiller, 300 ton	\$ 293,285.47	1.10	\$ 332,442.00	0.97	\$ 322,614.01
1.000	D3 03 3142 2030	Replace open centrifugal chiller, 1000 ton	\$ 1,003,121.30	1.10	\$ 1,137,048.00	0.97	\$ 1,103,433.43

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹													
10% GF													
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Escalation													
		6%											
De-Escalation to July 2009													
		1.03											
De-Escalation Factor to be Applied													
		0.97											
Green Factor													
		1.10		Assumed Value									
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor		
1.000	D3 03 3145 1030	Replace chiller, absorption, 100 ton	20	Q7	Ea.	465.00	\$ 166,000.00	\$ 191,900.00	1.095	\$ 210,130.50	0.97		
1.000	D3 03 3145 2030	Replace chiller, absorption, 350 ton	20	Q7	Ea.	600.00	\$ 364,700.00	\$ 418,300.00	1.095	\$ 458,038.50	0.97		
1.000	D3 03 3145 3030	Replace chiller, absorption, 950 ton	20	Q7	Ea.	799.00	\$ 719,300.00	\$ 822,900.00	1.095	\$ 901,075.50	0.97		
1.000	D3 04 3210 1030	Replace fan, induced draft, 2000 CFM	20	Q9	Ea.	9.46	\$ 5,050.00	\$ 5,818.00	1.095	\$ 6,370.71	0.97		
1.000	D3 04 3210 2030	Replace fan, induced draft, 6700 CFM	20	Q9	Ea.	13.57	\$ 6,776.00	\$ 7,790.00	1.095	\$ 8,530.05	0.97		
1.000	D3 04 3210 3030	Replace fan, induced draft, 17,700 CFM	20	Q9	Ea.	39.01	\$ 13,620.00	\$ 15,700.00	1.095	\$ 17,191.50	0.97		
1.000	D3 04 3220 2030	Replace roof mounted exhaust fan, 800 CFM exhaust fan	20	Q20	Ea.	7.80	\$ 1,272.00	\$ 1,483.00	1.095	\$ 1,623.89	0.97		
1.000	D3 04 3220 2040	Replace roof mounted exhaust fan, 2000 CFM exhaust fan	20	Q20	Ea.	9.75	\$ 2,133.00	\$ 2,504.00	1.095	\$ 2,741.88	0.97		
1.000	D3 04 3220 2050	Replace roof mounted exhaust fan, 8500 CFM exhaust fan	20	Q20	Ea.	13.00	\$ 3,369.00	\$ 3,905.00	1.095	\$ 4,275.98	0.97		
1.000	D3 04 3220 2060	Replace roof mounted exhaust fan, 20,300 CFM exhaust fan	20	Q20	Ea.	39.01	\$ 9,485.00	\$ 11,015.00	1.095	\$ 12,061.43	0.97		
1.000	D3 04 3430 0010	Replace radiator, baseboard 10' section	20	Q5	Ea.	6.78	\$ 751.00	\$ 894.00	1.095	\$ 978.93	0.97		
1.000	D3 04 3440 0010	Replace finned radiator wall, 10' section	20	Q5	Ea.	10.40	\$ 1,135.00	\$ 1,350.00	1.095	\$ 1,478.25	0.97		
1.000	D3 04 3520 1020	Replace gate valve, partial, 3/8" - 1 - 1/2" valves	20	1 Stpi	Ea.	1.35	\$ 243.09	\$ 285.87	1.095	\$ 313.03	0.97		
1.000	D3 04 3520 2020	Replace gate valve, partial, 2" - 3" valves	20	Q1	Ea.	2.06	\$ 739.59	\$ 851.87	1.095	\$ 932.80	0.97		
1.000	D3 04 3520 3030	Replace drain valve, 3/4" valves	20	1 Stpi	Ea.	0.63	\$ 50.89	\$ 62.37	1.095	\$ 68.30	0.97		
1.000	D3 05 3150 0030	Replace heater wall mounted/recessed heater, with fan	20	1 Elec	Ea.	3.33	\$ 395.00	\$ 470.00	1.095	\$ 514.65	0.97		
1.000	D3 05 3245 1030	Replace heat pump, 1.5 ton, air to air split	20	Q5	Ea.	12.99	\$ 3,026.00	\$ 3,540.00	1.095	\$ 3,876.30	0.97		
1.000	D3 05 3245 2030	Replace heat pump, 5 ton, air to air split	20	Q5	Ea.	62.37	\$ 7,375.00	\$ 8,775.00	1.095	\$ 9,608.63	0.97		
1.000	D3 05 3245 3030	Replace heat pump, 10 ton, air to air split	20	Q6	Ea.	73.47	\$ 13,075.00	\$ 15,425.00	1.095	\$ 16,890.38	0.97		
1.000	D3 05 3245 4030	Replace heat pump, 25 ton, air to air split	20	Q7	Ea.	184.54	\$ 31,975.00	\$ 37,600.00	1.095	\$ 41,172.00	0.97		
1.000	D3 05 3245 5030	Replace heat pump, 50 ton, air to air split	20	Q7	Ea.	303.97	\$ 69,925.00	\$ 81,925.00	1.095	\$ 89,707.88	0.97		
1.000	D3 05 3245 6030	Replace heat pump, thru-wall unit, 1.5 ton	20	Q5	Ea.	20.13	\$ 3,965.00	\$ 4,635.00	1.095	\$ 5,075.33	0.97		
1.000	D3 05 3245 7030	Replace heat pump, thru-wall unit, 5 ton	20	Q5	Ea.	48.00	\$ 7,350.00	\$ 8,675.00	1.095	\$ 9,499.13	0.97		
1.000	D3 05 3272 1030	Replace air conditioner, DX, 5 ton	20	Q6	Ea.	39.00	\$ 6,655.00	\$ 7,825.00	1.095	\$ 8,568.38	0.97		
1.000	D3 05 3272 2030	Replace air conditioner, DX, 20 ton	20	Q7	Ea.	69.35	\$ 19,125.00	\$ 22,175.00	1.095	\$ 24,281.63	0.97		
1.000	D3 05 3272 3030	Replace air conditioner, DX, 50 ton	20	Q7	Ea.	124.68	\$ 53,550.00	\$ 61,675.00	1.095	\$ 67,534.13	0.97		
1.000	D3 05 3274 1015	Replace computer room A/C, incl. remote air cooled cond, 5 ton	20	Q6	Ea.	48.56	\$ 21,780.00	\$ 25,075.00	1.095	\$ 27,457.13	0.97		
1.000	D3 05 3274 1025	Replace computer room A/C, incl. remote air cooled cond, 10 ton	20	Q6	Ea.	97.90	\$ 42,925.00	\$ 49,450.00	1.095	\$ 54,147.75	0.97		
1.000	D3 05 3274 1035	Replace computer room A/C, incl. remote air cooled cond, 15 ton	20	Q6	Ea.	123.04	\$ 48,125.00	\$ 55,775.00	1.095	\$ 61,073.63	0.97		
1.000	D3 05 3274 1045	Replace computer room A/C, incl. remote air cooled cond, 20 ton	20	Q6	Ea.	123.11	\$ 56,925.00	\$ 65,775.00	1.095	\$ 72,023.63	0.97		
1.000	D3 05 3276 1015	Replace computer room A/C, chilled water, 5 ton	20	Q6	Ea.	41.07	\$ 15,980.00	\$ 18,375.00	1.095	\$ 20,120.63	0.97		
1.000	D3 05 3276 1025	Replace computer room A/C, chilled water, 10 ton	20	Q6	Ea.	76.00	\$ 18,325.00	\$ 21,350.00	1.095	\$ 23,378.25	0.97		
1.000	D3 05 3276 1035	Replace computer room A/C, chilled water, 15 ton	20	Q6	Ea.	94.76	\$ 20,225.00	\$ 23,675.00	1.095	\$ 25,924.13	0.97		
1.000	D3 05 3276 1045	Replace computer room A/C, chilled water, 20 ton	20	Q6	Ea.	70.16	\$ 19,525.00	\$ 22,675.00	1.095	\$ 24,829.13	0.97		
1.000	D3 05 3410 0030	Replace baseboard heater units	20	1 Elec	Ea.	2.53	\$ 227.00	\$ 275.00	1.095	\$ 301.13	0.97		
1.000	D4 01 3310 1030	Replace sprinkler head	20	1 Plum	Ea.	0.98	\$ 71.00	\$ 87.00	1.095	\$ 95.27	0.97		
							\$ 4,191,180.57	\$ 4,849,282.61					

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
10% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value					
				GREEN			
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 03 3145 1030	Replace chiller, absorption, 100 ton	\$ 203,918.41	1.10	\$ 231,143.55	0.97	\$ 224,310.25
1.000	D3 03 3145 2030	Replace chiller, absorption, 350 ton	\$ 444,497.50	1.10	\$ 503,842.35	0.97	\$ 488,947.25
1.000	D3 03 3145 3030	Replace chiller, absorption, 950 ton	\$ 874,436.99	1.10	\$ 991,183.05	0.97	\$ 961,880.69
1.000	D3 04 3210 1030	Replace fan, induced draft, 2000 CFM	\$ 6,182.37	1.10	\$ 7,007.78	0.97	\$ 6,800.61
1.000	D3 04 3210 2030	Replace fan, induced draft, 6700 CFM	\$ 8,277.88	1.10	\$ 9,383.06	0.97	\$ 9,105.66
1.000	D3 04 3210 3030	Replace fan, induced draft, 17,700 CFM	\$ 16,683.27	1.10	\$ 18,910.65	0.97	\$ 18,351.59
1.000	D3 04 3220 2030	Replace roof mounted exhaust fan, 800 CFM exhaust fan	\$ 1,575.88	1.10	\$ 1,786.27	0.97	\$ 1,733.47
1.000	D3 04 3220 2040	Replace roof mounted exhaust fan, 2000 CFM exhaust fan	\$ 2,660.82	1.10	\$ 3,016.07	0.97	\$ 2,926.90
1.000	D3 04 3220 2050	Replace roof mounted exhaust fan, 8500 CFM exhaust fan	\$ 4,149.56	1.10	\$ 4,703.57	0.97	\$ 4,564.52
1.000	D3 04 3220 2060	Replace roof mounted exhaust fan, 20,300 CFM exhaust fan	\$ 11,704.85	1.10	\$ 13,267.57	0.97	\$ 12,875.34
1.000	D3 04 3430 0010	Replace radiator, baseboard 10' section	\$ 949.99	1.10	\$ 1,076.82	0.97	\$ 1,044.99
1.000	D3 04 3440 0010	Replace finned radiator wall, 10' section	\$ 1,434.55	1.10	\$ 1,626.08	0.97	\$ 1,578.00
1.000	D3 04 3520 1020	Replace gate valve, partial, 3/8" - 1 - 1/2" valves	\$ 303.77	1.10	\$ 344.33	0.97	\$ 334.15
1.000	D3 04 3520 2020	Replace gate valve, partial, 2" - 3" valves	\$ 905.22	1.10	\$ 1,026.08	0.97	\$ 995.74
1.000	D3 04 3520 3030	Replace drain valve, 3/4" valves	\$ 66.28	1.10	\$ 75.12	0.97	\$ 72.90
1.000	D3 05 3150 0030	Replace heater wall mounted/recessed heater, with fan	\$ 499.44	1.10	\$ 566.12	0.97	\$ 549.38
1.000	D3 05 3245 1030	Replace heat pump, 1.5 ton, air to air split	\$ 3,761.70	1.10	\$ 4,263.93	0.97	\$ 4,137.88
1.000	D3 05 3245 2030	Replace heat pump, 5 ton, air to air split	\$ 9,324.57	1.10	\$ 10,569.49	0.97	\$ 10,257.02
1.000	D3 05 3245 3030	Replace heat pump, 10 ton, air to air split	\$ 16,391.04	1.10	\$ 18,579.41	0.97	\$ 18,030.15
1.000	D3 05 3245 4030	Replace heat pump, 25 ton, air to air split	\$ 39,954.83	1.10	\$ 45,289.20	0.97	\$ 43,950.31
1.000	D3 05 3245 5030	Replace heat pump, 50 ton, air to air split	\$ 87,055.84	1.10	\$ 98,678.66	0.97	\$ 95,761.42
1.000	D3 05 3245 6030	Replace heat pump, thru-wall unit, 1.5 ton	\$ 4,925.28	1.10	\$ 5,582.86	0.97	\$ 5,417.81
1.000	D3 05 3245 7030	Replace heat pump, thru-wall unit, 5 ton	\$ 9,218.30	1.10	\$ 10,449.04	0.97	\$ 10,140.13
1.000	D3 05 3272 1030	Replace air conditioner, DX, 5 ton	\$ 8,315.07	1.10	\$ 9,425.21	0.97	\$ 9,146.57
1.000	D3 05 3272 2030	Replace air conditioner, DX, 20 ton	\$ 23,563.79	1.10	\$ 26,709.79	0.97	\$ 25,920.17
1.000	D3 05 3272 3030	Replace air conditioner, DX, 50 ton	\$ 65,537.61	1.10	\$ 74,287.54	0.97	\$ 72,091.37
1.000	D3 05 3274 1015	Replace computer room A/C, incl. remote air cooled cond, 5 ton	\$ 26,645.41	1.10	\$ 30,202.84	0.97	\$ 29,309.95
1.000	D3 05 3274 1025	Replace computer room A/C, incl. remote air cooled cond, 10 ton	\$ 52,546.98	1.10	\$ 59,562.53	0.97	\$ 57,801.68
1.000	D3 05 3274 1035	Replace computer room A/C, incl. remote air cooled cond, 15 ton	\$ 59,268.10	1.10	\$ 67,180.99	0.97	\$ 65,194.92
1.000	D3 05 3274 1045	Replace computer room A/C, incl. remote air cooled cond, 20 ton	\$ 69,894.39	1.10	\$ 79,225.99	0.97	\$ 76,883.83
1.000	D3 05 3276 1015	Replace computer room A/C, chilled water, 5 ton	\$ 19,525.80	1.10	\$ 22,132.69	0.97	\$ 21,478.38
1.000	D3 05 3276 1025	Replace computer room A/C, chilled water, 10 ton	\$ 22,687.12	1.10	\$ 25,716.08	0.97	\$ 24,955.83
1.000	D3 05 3276 1035	Replace computer room A/C, chilled water, 15 ton	\$ 25,157.73	1.10	\$ 28,516.54	0.97	\$ 27,673.50
1.000	D3 05 3276 1045	Replace computer room A/C, chilled water, 20 ton	\$ 24,095.10	1.10	\$ 27,312.04	0.97	\$ 26,504.61
1.000	D3 05 3410 0030	Replace baseboard heater units	\$ 292.22	1.10	\$ 331.24	0.97	\$ 321.45
1.000	D4 01 3310 1030	Replace sprinkler head	\$ 92.45	1.10	\$ 104.79	0.97	\$ 101.69
			\$ 5,152,985.90				\$ 5,668,284.49
			\$ 1,545,895.77	Assume 30% required		Assume 30% required	\$ 1,700,485.35

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
10% GF												
CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation	6%											
De-Escalation to July 2009	1.03										NON-GREEN	
De-Escalation Factor to be Applied	0.97											
Green Factor	1.10	Assumed Value										
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 01 3170 0130	Replace 1000' type L 3/8" copper, fuel oil storage	25	1 Plum	M.L.F.	185.72	\$ 14,500.00	\$ 17,800.00	1.095	\$ 19,491.00	0.97	
1.000	D3 01 3170 0140	Replace 1000' type L 1/2" copper, fuel oil storage	25	1 Plum	M.L.F.	192.61	\$ 15,150.00	\$ 18,700.00	1.095	\$ 20,476.50	0.97	
1.000	D3 01 3170 0150	Replace 1000' type L 5/8" copper, fuel oil storage	25	1 Plum	M.L.F.	197.48	\$ 17,050.00	\$ 20,700.00	1.095	\$ 22,666.50	0.97	
1.000	D3 01 3170 0160	Replace 1000' type L 3/4" copper, fuel oil storage	25	1 Plum	M.L.F.	205.29	\$ 17,500.00	\$ 21,300.00	1.095	\$ 23,323.50	0.97	
1.000	D3 01 3170 0170	Replace 1000' type L 1" copper, fuel oil storage	25	1 Plum	M.L.F.	229.41	\$ 21,325.00	\$ 25,950.00	1.095	\$ 28,415.25	0.97	
1.000	D3 04 3450 1020	Replace coil, hot water boost, 12" x 24" duct coil, 1-row	25	Q5	Ea.	1.97	\$ 474.50	\$ 557.00	1.095	\$ 609.92	0.97	
1.000	D3 04 3450 1030	Replace coil, hot water boost, 24" x 24" duct coil, 1-row	25	Q5	Ea.	5.15	\$ 744.50	\$ 879.00	1.095	\$ 962.51	0.97	
1.000	D3 04 3450 1040	Replace coil, hot water boost, 24" x 36" duct coil, 1-row	25	Q5	Ea.	7.74	\$ 1,084.00	\$ 1,287.00	1.095	\$ 1,409.27	0.97	
1.000	D3 04 3450 1050	Replace coil, hot water boost, 36" x 36" duct coil, 1-row	25	Q5	Ea.	11.60	\$ 1,474.00	\$ 1,730.00	1.095	\$ 1,894.35	0.97	
1.000	D3 04 3510 0010	install new gasket, 4" pipe size, steel/iron	25	1 Plum	Ea.	2.60	\$ 178.00	\$ 221.00	1.095	\$ 242.00	0.97	
							\$ 89,480.00	\$ 109,124.00				
1.000	D3 01 3110 0010	Replace 275 gallon fuel oil storage tank	30	Q5	Ea.	6.24	\$ 775.00	\$ 921.00	1.095	\$ 1,008.50	0.97	
1.000	D3 01 3160 0020	Replace oil filter housing	30	1 Stpi	Ea.	0.52	\$ 54.50	\$ 66.00	1.095	\$ 72.27	0.97	
1.000	D3 01 3210 0010	install new 2" gasket, 1 per M.L.F. natural gas, steel/iron	30	1 Stpi	Ea.	1.60	\$ 108.50	\$ 135.00	1.095	\$ 147.83	0.97	
1.000	D3 01 3210 0020	install new 3" gasket, 1 per M.L.F. natural gas, steel/iron	30	1 Stpi	Ea.	1.89	\$ 127.50	\$ 158.50	1.095	\$ 173.56	0.97	
1.000	D3 01 3210 0030	install new 4" gasket, 1 per M.L.F. natural gas, steel/iron	30	1 Stpi	Ea.	2.60	\$ 177.50	\$ 221.00	1.095	\$ 242.00	0.97	
1.000	D3 01 3210 0040	install new 6" gasket, 1 per M.L.F. natural gas, steel/iron	30	1 Stpi	Ea.	3.47	\$ 239.00	\$ 297.00	1.095	\$ 325.22	0.97	
1.000	D3 02 3180 1060	Replace boiler, gas, 250 MBH	30	Q7	Ea.	65.66	\$ 7,450.00	\$ 8,900.00	1.095	\$ 9,745.50	0.97	
1.000	D3 02 3180 2070	Replace boiler, gas, 2000 MBH	30	Q7	Ea.	166.76	\$ 29,925.00	\$ 35,225.00	1.095	\$ 38,571.38	0.97	
1.000	D3 02 3180 3070	Replace boiler, gas, 10,000 MBH	30	Q7	Ea.	1,086.40	\$ 211,300.00	\$ 247,900.00	1.095	\$ 271,450.50	0.97	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
10% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor PER 20 YEARS	Total Adjusted Green OH&P Location	De-Escalation Factor PER 20 YEARS	Total Green with All Adjustments
					GREEN		
1.000	D3 01 3170 0130	Replace 1000' type L 3/8" copper, fuel oil storage	\$ 18,914.79	1.10	\$ 21,440.10	0.97	\$ 20,806.27
1.000	D3 01 3170 0140	Replace 1000' type L 1/2" copper, fuel oil storage	\$ 19,871.15	1.10	\$ 22,524.15	0.97	\$ 21,858.27
1.000	D3 01 3170 0150	Replace 1000' type L 5/8" copper, fuel oil storage	\$ 21,996.41	1.10	\$ 24,933.15	0.97	\$ 24,196.05
1.000	D3 01 3170 0160	Replace 1000' type L 3/4" copper, fuel oil storage	\$ 22,633.99	1.10	\$ 25,655.85	0.97	\$ 24,897.39
1.000	D3 01 3170 0170	Replace 1000' type L 1" copper, fuel oil storage	\$ 27,575.21	1.10	\$ 31,256.78	0.97	\$ 30,332.73
1.000	D3 04 3450 1020	Replace coil, hot water boost, 12" x 24" duct coil, 1-row	\$ 591.88	1.10	\$ 670.91	0.97	\$ 651.07
1.000	D3 04 3450 1030	Replace coil, hot water boost, 24" x 24" duct coil, 1-row	\$ 934.05	1.10	\$ 1,058.76	0.97	\$ 1,027.46
1.000	D3 04 3450 1040	Replace coil, hot water boost, 24" x 36" duct coil, 1-row	\$ 1,367.60	1.10	\$ 1,550.19	0.97	\$ 1,504.36
1.000	D3 04 3450 1050	Replace coil, hot water boost, 36" x 36" duct coil, 1-row	\$ 1,838.35	1.10	\$ 2,083.79	0.97	\$ 2,022.18
1.000	D3 04 3510 0010	install new gasket, 4" pipe size, steel/iron	\$ 234.84	1.10	\$ 266.19	0.97	\$ 258.32
			\$ 115,958.27				\$ 127,554.10
			\$ 34,787.48	Assume 30% required		Assume 30% required	\$ 38,266.23
				PER 25 YEARS		PER 25 YEARS	
1.000	D3 01 3110 0010	Replace 275 gallon fuel oil storage tank	\$ 978.68	1.10	\$ 1,109.34	0.97	\$ 1,076.55
1.000	D3 01 3160 0020	Replace oil filter housing	\$ 70.13	1.10	\$ 79.50	0.97	\$ 77.15
1.000	D3 01 3210 0010	install new 2" gasket, 1 per M.L.F. natural gas, steel/iron	\$ 143.45	1.10	\$ 162.61	0.97	\$ 157.80
1.000	D3 01 3210 0020	install new 3" gasket, 1 per M.L.F. natural gas, steel/iron	\$ 168.43	1.10	\$ 190.91	0.97	\$ 185.27
1.000	D3 01 3210 0030	install new 4" gasket, 1 per M.L.F. natural gas, steel/iron	\$ 234.84	1.10	\$ 266.19	0.97	\$ 258.32
1.000	D3 01 3210 0040	install new 6" gasket, 1 per M.L.F. natural gas, steel/iron	\$ 315.60	1.10	\$ 357.74	0.97	\$ 347.16
1.000	D3 02 3180 1060	Replace boiler, gas, 250 MBH	\$ 9,457.39	1.10	\$ 10,720.05	0.97	\$ 10,403.13
1.000	D3 02 3180 2070	Replace boiler, gas, 2000 MBH	\$ 37,431.09	1.10	\$ 42,428.51	0.97	\$ 41,174.20
1.000	D3 02 3180 3070	Replace boiler, gas, 10,000 MBH	\$ 263,425.61	1.10	\$ 298,595.55	0.97	\$ 289,768.17

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
10% GF												
CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation 6%												
De-Escalation to July 2009 1.03												
De-Escalation Factor to be Applied 0.97												
Green Factor 1.10 Assumed Value												
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 02 3182 1050	Replace boiler, coal, 4600 MBH	30	5 Stpi	Ea.	366.91	\$ 119,850.00	\$ 138,825.00	1.095	\$ 152,013.38	0.97	
1.000	D3 02 3184 1060	Replace boiler, oil, 250 MBH	30	Q7	Ea.	73.39	\$ 8,050.00	\$ 9,650.00	1.095	\$ 10,566.75	0.97	
1.000	D3 02 3184 2060	Replace boiler, oil, 2000 MBH	30	Q7	Ea.	205.76	\$ 31,625.00	\$ 37,425.00	1.095	\$ 40,980.38	0.97	
1.000	D3 02 3184 3060	Replace boiler, oil, 10,000 MBH	30	Q7	Ea.	894.01	\$ 193,800.00	\$ 226,100.00	1.095	\$ 247,579.50	0.97	
1.000	D3 02 3186 1050	Replace boiler, gas/oil, 2000 MBH	30	Q7	Ea.	172.76	\$ 41,725.00	\$ 48,625.00	1.095	\$ 53,244.38	0.97	
1.000	D3 02 3186 2050	Replace boiler, gas/oil, 20,000 MBH	30	Q7	Ea.	4,684.20	\$ 515,000.00	\$ 619,000.00	1.095	\$ 677,805.00	0.97	
1.000	D3 04 3310 0030	Replace steam converter	30	Q5	Ea.	6.24	\$ 3,220.00	\$ 3,701.00	1.095	\$ 4,052.60	0.97	
1.000	D3 04 3340 0030	Replace condensate meter 500 lb./hr.	30	1 Stpi	Ea.	1.11	\$ 2,649.00	\$ 3,030.00	1.095	\$ 3,317.85	0.97	
1.000	D3 04 3340 0130	Replace condensate meter 1500 lb./hr.	30	1 Stpi	Ea.	2.23	\$ 2,948.00	\$ 3,359.50	1.095	\$ 3,678.65	0.97	
							\$ 1,169,024.00	\$ 1,383,539.00				
1.000	D3 04 3252 0020	Replace metal pipe flue, architectural fireplace	50	2 Sswk	L.F.	0.31	\$ 25.10	\$ 30.22	1.095	\$ 33.09	0.97	
1.000	D3 04 3410 0010	Replace radiator valve 1/2" angle union	50	1 Stpi	Ea.	0.65	\$ 80.45	\$ 96.45	1.095	\$ 105.61	0.97	
1.000	D3 04 3410 0020	Replace radiator valve 3/4" angle union	50	1 Stpi	Ea.	0.78	\$ 91.70	\$ 110.50	1.095	\$ 121.00	0.97	
1.000	D3 04 3410 0030	Replace radiator valve 1" angle union	50	1 Stpi	Ea.	0.82	\$ 101.10	\$ 121.00	1.095	\$ 132.50	0.97	
1.000	D3 04 3410 0040	Replace radiator valve 1-1/4" angle union	50	1 Stpi	Ea.	1.04	\$ 129.50	\$ 154.00	1.095	\$ 168.63	0.97	
1.000	D3 04 3420 0010	Replace C.I. radiator 4 tube 25"H 10' section	50	Q5	Section	3.25	\$ 482.50	\$ 573.50	1.095	\$ 627.98	0.97	
1.000	D3 04 3540 0020	Replace expansion tank, 24 gal capacity	50	Q5	Ea.	2.23	\$ 1,268.00	\$ 1,453.50	1.095	\$ 1,591.58	0.97	
1.000	D3 04 3540 0120	Replace expansion tank, 60 gal capacity	50	Q5	Ea.	3.90	\$ 1,850.00	\$ 2,119.00	1.095	\$ 2,320.31	0.97	
1.000	D3 04 3540 0220	Replace expansion tank, 175 gal capacity	50	Q5	Ea.	7.79	\$ 4,900.00	\$ 5,638.00	1.095	\$ 6,173.61	0.97	
1.000	D3 04 3540 0320	Replace expansion tank, 400 gal capacity	50	Q5	Ea.	11.16	\$ 10,165.00	\$ 11,669.00	1.095	\$ 12,777.56	0.97	
							\$ 19,093.35	\$ 21,965.17				
NOTES:												
REPORT RECOMMENDATIONS												
SHALL INDICATE THAT THE ITEMS MENTIONED ABOVE												
HAVE NOT BEEN QUANTIFIED												
THEREFORE IT IS FOR ANALYSIS ONLY AND DOES NOT												
DEPICT CURRENT OR APPLICABLE CONDITIONS												
FOOTNOTES:												
1												
RS Means CostWorks 2010 Operations and Maintenance												

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
10% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10		Assumed Value				
				GREEN			
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 02 3182 1050	Replace boiler, coal, 4600 MBH	\$ 147,519.40	1.10	\$ 167,214.71	0.97	\$ 162,271.34
1.000	D3 02 3184 1060	Replace boiler, oil, 250 MBH	\$ 10,254.37	1.10	\$ 11,623.43	0.97	\$ 11,279.80
1.000	D3 02 3184 2060	Replace boiler, oil, 2000 MBH	\$ 39,768.87	1.10	\$ 45,078.41	0.97	\$ 43,745.76
1.000	D3 02 3184 3060	Replace boiler, oil, 10,000 MBH	\$ 240,260.30	1.10	\$ 272,337.45	0.97	\$ 264,286.33
1.000	D3 02 3186 1050	Replace boiler, gas/oil, 2000 MBH	\$ 51,670.31	1.10	\$ 58,568.81	0.97	\$ 56,837.34
1.000	D3 02 3186 2050	Replace boiler, gas/oil, 20,000 MBH	\$ 657,767.04	1.10	\$ 745,585.50	0.97	\$ 723,543.75
1.000	D3 04 3310 0030	Replace steam converter	\$ 3,932.79	1.10	\$ 4,457.85	0.97	\$ 4,326.07
1.000	D3 04 3340 0030	Replace condensate meter 500 lb./hr.	\$ 3,219.76	1.10	\$ 3,649.64	0.97	\$ 3,541.74
1.000	D3 04 3340 0130	Replace condensate meter 1500 lb./hr.	\$ 3,569.90	1.10	\$ 4,046.52	0.97	\$ 3,926.89
			\$ 1,470,187.97				\$ 1,617,206.77
			\$ 735,093.99	Assume 50% required		Assume 50% required	\$ 808,603.38
				PER 30 YEARS		PER 30 YEARS	
1.000	D3 04 3252 0020	Replace metal pipe flue, architectural fireplace	\$ 32.11	1.10	\$ 36.40	0.97	\$ 35.32
1.000	D3 04 3410 0010	Replace radiator valve 1/2" angle union	\$ 102.49	1.10	\$ 116.17	0.97	\$ 112.74
1.000	D3 04 3410 0020	Replace radiator valve 3/4" angle union	\$ 117.42	1.10	\$ 133.10	0.97	\$ 129.16
1.000	D3 04 3410 0030	Replace radiator valve 1" angle union	\$ 128.58	1.10	\$ 145.74	0.97	\$ 141.44
1.000	D3 04 3410 0040	Replace radiator valve 1-1/4" angle union	\$ 163.64	1.10	\$ 185.49	0.97	\$ 180.01
1.000	D3 04 3420 0010	Replace C.I. radiator 4 tube 25"H 10' section	\$ 609.42	1.10	\$ 690.78	0.97	\$ 670.36
1.000	D3 04 3540 0020	Replace expansion tank, 24 gal capacity	\$ 1,544.53	1.10	\$ 1,750.74	0.97	\$ 1,698.98
1.000	D3 04 3540 0120	Replace expansion tank, 60 gal capacity	\$ 2,251.71	1.10	\$ 2,552.34	0.97	\$ 2,476.88
1.000	D3 04 3540 0220	Replace expansion tank, 175 gal capacity	\$ 5,991.10	1.10	\$ 6,790.97	0.97	\$ 6,590.21
1.000	D3 04 3540 0320	Replace expansion tank, 400 gal capacity	\$ 12,399.81	1.10	\$ 14,055.31	0.97	\$ 13,639.79
			\$ 23,340.82				\$ 25,674.90
			\$ 11,670.41	Assume 50% required		Assume 50% required	\$ 12,837.45
				PER 50 YEARS		PER 50 YEARS	
NOTES:							
REPORT RECOMMENDATIONS							
SHALL INDICATE THAT THE ITEMS MENTIONED ABOVE							
HAVE NOT BEEN QUANTIFIED							
THEREFORE IT IS FOR ANALYSIS ONLY AND DOES NOT							
DEPICT CURRENT OR APPLICABLE CONDITIONS							
FOOTNOTES:							
1							
RS Means CostWorks 2010 Operations and Maintenance							

Appendix C-SM9 10% GF Summary of FMRRC

Summary of Green versus Non-Green Major Repair and Replacement Costs based on Frequency (HVAC & FP) 10% GF			
Type of Construction	Description	TOTAL COST	COMMENTS
Non-Green	Up to 10 Years	\$ 748,879.83	
Non-Green	10 th yr on till 25 th Year	\$ 2,831,875.84	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
Non-Green	25 th yr on till 50 th Year	\$ 746,764.39	
Green	Up to 10 Years	\$ 823,767.81	
Green	10 th yr on till 25 th Year	\$ 3,115,063.42	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
Green	25 th yr on till 50 th Year	\$ 821,440.83	
SUMMARY OF FINDINGS			
Green v. Non-Green	9.09%	Green Major Repair and Replacement is 9.09% higher in cost than that of a traditional building	

Appendix C-SM10 5% GF Analysis of YPM

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹									
ANNUALIZED-5% GF									
PROJECT:	EAST HALL								
LOCATION:	US NATIONAL AVERAGES								
Escalation	6%								
De-Escalation to July 2009	1.03								
De-Escalation Factor to be Applied	0.97								
Green Factor	1.05	Assumed Value							
Qty	Assembly Number	Description	Labor Hours	Total In-House	Total Incl. O&P	Location Factor	Location Adjusted Total O&P	De-Escalation Factor to July 2009 Costs	
1.000	D3 02 5130 1950	Boiler, hot water, oil, gas, or comb. fired, up to 120 MBH, annualized	12.53	\$ 885.00	\$ 1,100.00	1.095	\$ 1,204.50	0.97	
1.000	D3 02 5110 1950	Boiler, electric, to 1500 gal., annualized	3.83	\$ 315.00	\$ 390.00	1.095	\$ 427.05	0.97	
1.000	D3 02 5130 2950	Boiler, hot water, oil, gas, or comb. fired, 120 - 500 MBH, annualized	15.45	\$ 1,100.00	\$ 1,375.00	1.095	\$ 1,505.63	0.97	
1.000	D3 02 5130 3950	Boiler, hot water, oil, gas, or comb. fired, 500 -1000 MBH, annualized	17.38	\$ 1,225.00	\$ 1,525.00	1.095	\$ 1,669.88	0.97	
1.000	D3 02 5130 4950	Boiler, hot water, oil, gas, or comb. fired, over 1000 MBH, annualized	19.70	\$ 1,400.00	\$ 1,725.00	1.095	\$ 1,888.88	0.97	
1.000	D3 02 5140 1950	Boiler, steam, oil, gas, or comb. fired, up to 120 MBH, annualized	16.19	\$ 1,200.00	\$ 1,475.00	1.095	\$ 1,615.13	0.97	
1.000	D3 02 5140 2950	Boiler, steam, oil, gas, or comb. fired, 120 to 500 MBH, annualized	18.98	\$ 1,425.00	\$ 1,750.00	1.095	\$ 1,916.25	0.97	
1.000	D3 02 5140 3950	Boiler, steam, oil, gas, or comb. fired, 500 to 1000 MBH, annualized	20.70	\$ 1,550.00	\$ 1,925.00	1.095	\$ 2,107.88	0.97	
1.000	D3 02 5140 4950	Boiler, steam, oil, gas, or comb. fired, over 1000 MBH, annualized	22.45	\$ 1,675.00	\$ 2,075.00	1.095	\$ 2,272.13	0.97	
1.000	D3 02 5210 1950	Deaerator tank, annualized	1.51	\$ 138.00	\$ 167.00	1.095	\$ 182.87	0.97	
1.000	D3 02 5310 1950	Pump, boiler fuel oil, annualized	1.23	\$ 132.00	\$ 159.00	1.095	\$ 174.11	0.97	
1.000	D3 02 5310 2950	Pump, condensate return, over 1 H.P., annualized	1.12	\$ 125.00	\$ 151.00	1.095	\$ 165.35	0.97	
1.000	D3 02 5310 3950	Pump, condensate return unit, 2 pumps, annualized	1.14	\$ 180.00	\$ 212.00	1.095	\$ 232.14	0.97	
1.000	D3 03 5110 1950	Water cooling tower, up to 50 tons, annualized	4.55	\$ 330.00	\$ 410.00	1.095	\$ 448.95	0.97	
1.000	D3 03 5110 2950	Water cooling tower, 50 thru 500 tons, annualized	9.91	\$ 705.00	\$ 870.00	1.095	\$ 952.65	0.97	
1.000	D3 03 5110 3950	Water cooling tower, 500 thru 1000 tons, annualized	17.73	\$ 1,300.00	\$ 1,600.00	1.095	\$ 1,752.00	0.97	
1.000	D3 03 5130 1950	Chiller, recip., air cooled, up to 25 tons, annualized	9.71	\$ 680.00	\$ 840.00	1.095	\$ 919.80	0.97	
1.000	D3 03 5130 2950	Chiller, recip., air cooled, over 25 tons, annualized	12.89	\$ 905.00	\$ 1,100.00	1.095	\$ 1,204.50	0.97	
1.000	D3 03 5135 1950	Chiller, recip., water cooled, up to 50 tons, annualized	7.94	\$ 570.00	\$ 700.00	1.095	\$ 766.50	0.97	
1.000	D3 03 5135 2950	Chiller, recip., water cooled, over 50 tons, annualized	10.91	\$ 760.00	\$ 945.00	1.095	\$ 1,034.78	0.97	
1.000	D3 03 5140 1950	Chiller, centrif., water cooled, up to 100 tons, annualized	26.76	\$ 1,975.00	\$ 2,425.00	1.095	\$ 2,655.38	0.97	
1.000	D3 03 5140 2950	Chiller, centrif., water cooled, over 100 tons, annualized	33.36	\$ 2,425.00	\$ 3,000.00	1.095	\$ 3,285.00	0.97	
1.000	D3 03 5150 1950	Chiller, absorption unit, up to 500 tons, annualized	6.22	\$ 490.00	\$ 600.00	1.095	\$ 657.00	0.97	
1.000	D3 03 5150 2950	Chiller, absorption unit, 500 to 5000 tons, annualized	9.42	\$ 835.00	\$ 1,025.00	1.095	\$ 1,122.38	0.97	
1.000	D3 03 5160 1950	Chiller, screw, water cooled, up to 100 tons, annualized	14.77	\$ 1,200.00	\$ 1,475.00	1.095	\$ 1,615.13	0.97	
1.000	D3 03 5160 2950	Chiller, screw, water cooled, over 100 tons, annualized	16.72	\$ 1,350.00	\$ 1,675.00	1.095	\$ 1,834.13	0.97	
1.000	D3 03 5170 1950	Evaporative cooler, annualized	1.25	\$ 110.00	\$ 134.00	1.095	\$ 146.73	0.97	
1.000	D3 03 5180 1950	Evaporative cooler, rotating drum, annualized	1.31	\$ 122.00	\$ 148.00	1.095	\$ 162.06	0.97	
1.000	D3 03 5210 1950	Condenser, air cooled, 3 tons to 25 tons, annualized	1.76	\$ 152.00	\$ 185.00	1.095	\$ 202.58	0.97	

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹							
ANNUALIZED-5% GF							
PROJECT:	EAST HALL						
LOCATION:	US NATIONAL AVERAGES						
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green	GREEN FACTOR	Adjusted Total with Green Factor OH&P	De-Escalation Factor to July 2009 Costs	Total with All Adjustments
1.000	D3 02 5130 1950	Boiler, hot water, oil, gas, or comb. fired, up to 120 MBH, annualized	\$ 1,168.89	1.05	\$ 1,264.73	0.97	\$ 1,227.34
1.000	D3 02 5110 1950	Boiler, electric, to 1500 gal., annualized	\$ 414.43	1.05	\$ 448.40	0.97	\$ 435.15
1.000	D3 02 5130 2950	Boiler, hot water, oil, gas, or comb. fired, 120 - 500 MBH, annualized	\$ 1,461.11	1.05	\$ 1,580.91	0.97	\$ 1,534.17
1.000	D3 02 5130 3950	Boiler, hot water, oil, gas, or comb. fired, 500 -1000 MBH, annualized	\$ 1,620.51	1.05	\$ 1,753.37	0.97	\$ 1,701.53
1.000	D3 02 5130 4950	Boiler, hot water, oil, gas, or comb. fired, over 1000 MBH, annualized	\$ 1,833.03	1.05	\$ 1,983.32	0.97	\$ 1,924.69
1.000	D3 02 5140 1950	Boiler, steam, oil, gas, or comb. fired, up to 120 MBH, annualized	\$ 1,567.38	1.05	\$ 1,695.88	0.97	\$ 1,645.75
1.000	D3 02 5140 2950	Boiler, steam, oil, gas, or comb. fired, 120 to 500 MBH, annualized	\$ 1,859.60	1.05	\$ 2,012.06	0.97	\$ 1,952.58
1.000	D3 02 5140 3950	Boiler, steam, oil, gas, or comb. fired, 500 to 1000 MBH, annualized	\$ 2,045.56	1.05	\$ 2,213.27	0.97	\$ 2,147.84
1.000	D3 02 5140 4950	Boiler, steam, oil, gas, or comb. fired, over 1000 MBH, annualized	\$ 2,204.95	1.05	\$ 2,385.73	0.97	\$ 2,315.20
1.000	D3 02 5210 1950	Deaerator tank, annualized	\$ 177.46	1.05	\$ 192.01	0.97	\$ 186.33
1.000	D3 02 5310 1950	Pump, boiler fuel oil, annualized	\$ 168.96	1.05	\$ 182.81	0.97	\$ 177.41
1.000	D3 02 5310 2950	Pump, condensate return, over 1 H.P., annualized	\$ 160.46	1.05	\$ 173.61	0.97	\$ 168.48
1.000	D3 02 5310 3950	Pump, condensate return unit, 2 pumps, annualized	\$ 225.28	1.05	\$ 243.75	0.97	\$ 236.54
1.000	D3 03 5110 1950	Water cooling tower, up to 50 tons, annualized	\$ 435.68	1.05	\$ 471.40	0.97	\$ 457.46
1.000	D3 03 5110 2950	Water cooling tower, 50 thru 500 tons, annualized	\$ 924.49	1.05	\$ 1,000.28	0.97	\$ 970.71
1.000	D3 03 5110 3950	Water cooling tower, 500 thru 1000 tons, annualized	\$ 1,700.21	1.05	\$ 1,839.60	0.97	\$ 1,785.22
1.000	D3 03 5130 1950	Chiller, recip., air cooled, up to 25 tons, annualized	\$ 892.61	1.05	\$ 965.79	0.97	\$ 937.24
1.000	D3 03 5130 2950	Chiller, recip., air cooled, over 25 tons, annualized	\$ 1,168.89	1.05	\$ 1,264.73	0.97	\$ 1,227.34
1.000	D3 03 5135 1950	Chiller, recip., water cooled, up to 50 tons, annualized	\$ 743.84	1.05	\$ 804.83	0.97	\$ 781.03
1.000	D3 03 5135 2950	Chiller, recip., water cooled, over 50 tons, annualized	\$ 1,004.18	1.05	\$ 1,086.51	0.97	\$ 1,054.39
1.000	D3 03 5140 1950	Chiller, centrif., water cooled, up to 100 tons, annualized	\$ 2,576.87	1.05	\$ 2,788.14	0.97	\$ 2,705.72
1.000	D3 03 5140 2950	Chiller, centrif., water cooled, over 100 tons, annualized	\$ 3,187.89	1.05	\$ 3,449.25	0.97	\$ 3,347.28
1.000	D3 03 5150 1950	Chiller, absorption unit, up to 500 tons, annualized	\$ 637.58	1.05	\$ 689.85	0.97	\$ 669.46
1.000	D3 03 5150 2950	Chiller, absorption unit, 500 to 5000 tons, annualized	\$ 1,089.19	1.05	\$ 1,178.49	0.97	\$ 1,143.65
1.000	D3 03 5160 1950	Chiller, screw, water cooled, up to 100 tons, annualized	\$ 1,567.38	1.05	\$ 1,695.88	0.97	\$ 1,645.75
1.000	D3 03 5160 2950	Chiller, screw, water cooled, over 100 tons, annualized	\$ 1,779.90	1.05	\$ 1,925.83	0.97	\$ 1,868.90
1.000	D3 03 5170 1950	Evaporative cooler, annualized	\$ 142.39	1.05	\$ 154.07	0.97	\$ 149.51
1.000	D3 03 5180 1950	Evaporative cooler, rotating drum, annualized	\$ 157.27	1.05	\$ 170.16	0.97	\$ 165.13
1.000	D3 03 5210 1950	Condenser, air cooled, 3 tons to 25 tons, annualized	\$ 196.59	1.05	\$ 212.70	0.97	\$ 206.42

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹								
ANNUALIZED-5% GF								
PROJECT:	EAST HALL							
LOCATION:	US NATIONAL AVERAGES							
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.05	Assumed Value						
Qty	Assembly Number	Description	Labor Hours	Total In-House	Total Incl. O&P	Location Factor	Location Adjusted Total O&P	De-Escalation Factor to July 2009 Costs
1.000	D3 03 5210 2950	Condenser, air cooled, 26 tons through 100 tons, annualized	1.99	\$ 200.00	\$ 242.00	1.095	\$ 264.99	0.97
1.000	D3 03 5210 3950	Condenser, air cooled, over 100 tons, annualized	2.19	\$ 245.00	\$ 294.00	1.095	\$ 321.93	0.97
1.000	D3 03 5220 1950	Condensing unit, air cooled, 3 to 25 tons, annualized	2.56	\$ 254.00	\$ 310.00	1.095	\$ 339.45	0.97
1.000	D3 03 5220 2950	Condensing unit, air cooled, 26 to 100 tons, annualized	2.98	\$ 310.00	\$ 375.00	1.095	\$ 410.63	0.97
1.000	D3 03 5220 3950	Condensing unit, air cooled, over 100 tons, annualized	3.51	\$ 375.00	\$ 450.00	1.095	\$ 492.75	0.97
1.000	D3 03 5240 1950	Condensing unit, water cooled, 3 to 24 tons, annualized	1.32	\$ 115.00	\$ 140.00	1.095	\$ 153.30	0.97
1.000	D3 03 5240 2950	Condensing unit, water cooled, 25 to 100 tons, annualized	2.85	\$ 258.00	\$ 315.00	1.095	\$ 344.93	0.97
1.000	D3 03 5240 3950	Condensing unit, water cooled, over 100 tons, annualized	2.85	\$ 305.00	\$ 365.00	1.095	\$ 399.68	0.97
1.000	D3 03 5260 1950	Compressor, DX Refrigeration, to 25 tons, annualized	2.44	\$ 173.00	\$ 214.00	1.095	\$ 234.33	0.97
1.000	D3 03 5260 2950	Compressor, DX refrigeration, 25 to 100 tons, annualized	3.14	\$ 216.00	\$ 269.00	1.095	\$ 294.56	0.97
1.000	D3 03 5290 1950	Fluid cooler, annualized	1.12	\$ 87.00	\$ 108.00	1.095	\$ 118.26	0.97
1.000	D3 04 5110 1950	Air handling unit, 3 thru 24 tons, annualized	2.06	\$ 232.00	\$ 279.00	1.095	\$ 305.51	0.97
1.000	D3 04 5110 2950	Air handling unit, 25 thru 50 tons, annualized	2.14	\$ 530.00	\$ 615.00	1.095	\$ 673.43	0.97
1.000	D3 04 5110 3950	Air handling unit, over 50 tons, annualized	3.27	\$ 715.00	\$ 840.00	1.095	\$ 919.80	0.97
1.000	D3 04 5112 1950	Air handling unit, computer room, annualized	3.42	\$ 281.00	\$ 345.00	1.095	\$ 377.78	0.97
1.000	D3 04 5120 1950	Fan coil unit, annualized	3.34	\$ 242.00	\$ 299.00	1.095	\$ 327.41	0.97
1.000	D3 04 5150 1950	Air filter, electrostatic, annualized	8.77	\$ 515.00	\$ 635.00	1.095	\$ 695.33	0.97
1.000	D3 04 5160 1950	VAV Boxes, annualized	0.93	\$ 68.00	\$ 84.00	1.095	\$ 91.98	0.97
1.000	D3 04 5170 1950	Fire dampers, annualized	1.16	\$ 80.50	\$ 100.00	1.095	\$ 109.50	0.97
1.000	D3 04 5210 1950	Fan, axial, up to 5,000 CFM, annualized	1.24	\$ 77.00	\$ 94.00	1.095	\$ 102.93	0.97

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹							
ANNUALIZED-5% GF							
PROJECT:	EAST HALL						
LOCATION:	US NATIONAL AVERAGES						
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green	GREEN FACTOR	Adjusted Total with Green Factor OH&P	De-Escalation Factor to July 2009 Costs	Total with All Adjustments
1.000	D3 03 5210 2950	Condenser, air cooled, 26 tons through 100 tons, annualized	\$ 257.16	1.05	\$ 278.24	0.97	\$ 270.01
1.000	D3 03 5210 3950	Condenser, air cooled, over 100 tons, annualized	\$ 312.41	1.05	\$ 338.03	0.97	\$ 328.03
1.000	D3 03 5220 1950	Condensing unit, air cooled, 3 to 25 tons, annualized	\$ 329.41	1.05	\$ 356.42	0.97	\$ 345.89
1.000	D3 03 5220 2950	Condensing unit, air cooled, 26 to 100 tons, annualized	\$ 398.49	1.05	\$ 431.16	0.97	\$ 418.41
1.000	D3 03 5220 3950	Condensing unit, air cooled, over 100 tons, annualized	\$ 478.18	1.05	\$ 517.39	0.97	\$ 502.09
1.000	D3 03 5240 1950	Condensing unit, water cooled, 3 to 24 tons, annualized	\$ 148.77	1.05	\$ 160.97	0.97	\$ 156.21
1.000	D3 03 5240 2950	Condensing unit, water cooled, 25 to 100 tons, annualized	\$ 334.73	1.05	\$ 362.17	0.97	\$ 351.46
1.000	D3 03 5240 3950	Condensing unit, water cooled, over 100 tons, annualized	\$ 387.86	1.05	\$ 419.66	0.97	\$ 407.25
1.000	D3 03 5260 1950	Compressor, DX Refrigeration, to 25 tons, annualized	\$ 227.40	1.05	\$ 246.05	0.97	\$ 238.77
1.000	D3 03 5260 2950	Compressor, DX refrigeration, 25 to 100 tons, annualized	\$ 285.85	1.05	\$ 309.28	0.97	\$ 300.14
1.000	D3 03 5290 1950	Fluid cooler, annualized	\$ 114.76	1.05	\$ 124.17	0.97	\$ 120.50
1.000	D3 04 5110 1950	Air handling unit, 3 thru 24 tons, annualized	\$ 296.47	1.05	\$ 320.78	0.97	\$ 311.30
1.000	D3 04 5110 2950	Air handling unit, 25 thru 50 tons, annualized	\$ 653.52	1.05	\$ 707.10	0.97	\$ 686.19
1.000	D3 04 5110 3950	Air handling unit, over 50 tons, annualized	\$ 892.61	1.05	\$ 965.79	0.97	\$ 937.24
1.000	D3 04 5112 1950	Air handling unit, computer room, annualized	\$ 366.61	1.05	\$ 396.66	0.97	\$ 384.94
1.000	D3 04 5120 1950	Fan coil unit, annualized	\$ 317.73	1.05	\$ 343.78	0.97	\$ 333.61
1.000	D3 04 5150 1950	Air filter, electrostatic, annualized	\$ 674.77	1.05	\$ 730.09	0.97	\$ 708.51
1.000	D3 04 5160 1950	VAV Boxes, annualized	\$ 89.26	1.05	\$ 96.58	0.97	\$ 93.72
1.000	D3 04 5170 1950	Fire dampers, annualized	\$ 106.26	1.05	\$ 114.98	0.97	\$ 111.58
1.000	D3 04 5210 1950	Fan, axial, up to 5,000 CFM, annualized	\$ 99.89	1.05	\$ 108.08	0.97	\$ 104.88

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹									
ANNUALIZED-5% GF									
PROJECT:	EAST HALL								
LOCATION:	US NATIONAL AVERAGES								
Escalation	6%								
De-Escalation to July 2009	1.03								
De-Escalation Factor to be Applied	0.97								
Green Factor	1.05	Assumed Value							
Qty	Assembly Number	Description	Labor Hours	Total In-House	Total Incl. O&P	Location Factor	Location Adjusted Total O&P	De-Escalation Factor to July 2009 Costs	
1.000	D3 04 5210 2950	Fan, axial, 5,000 to 10,000 CFM, annualized	1.29	\$ 79.50	\$ 97.50	1.095	\$ 106.76	0.97	
1.000	D3 04 5210 3950	Fan, axial, over 10,000 CFM, annualized	1.39	\$ 85.00	\$ 105.00	1.095	\$ 114.98	0.97	
1.000	D3 04 5220 1950	Fan, centrifugal, up to 5,000 CFM, annualized	1.08	\$ 67.50	\$ 83.00	1.095	\$ 90.89	0.97	
1.000	D3 04 5220 2950	Fan, centrifugal, 5,000 to 10,000 CFM, annualized	1.14	\$ 71.00	\$ 87.00	1.095	\$ 95.27	0.97	
1.000	D3 04 5220 3950	Fan, centrifugal, over 10,000 CFM, annualized	1.18	\$ 73.50	\$ 90.00	1.095	\$ 98.55	0.97	
1.000	D3 04 5250 1950	Hood and blower, annualized	2.32	\$ 218.00	\$ 259.00	1.095	\$ 283.61	0.97	
1.000	D3 04 5410 1950	Centrifugal, over 1 HP, annualized	1.20	\$ 92.50	\$ 114.00	1.095	\$ 124.83	0.97	
1.000	D3 04 5410 2950	Centrifugal, w/ reduction gear, over 1 H.P., annualized	1.28	\$ 98.00	\$ 121.00	1.095	\$ 132.50	0.97	
1.000	D3 04 5420 1950	Pump w/ oil reservoir, electric, annualized	1.20	\$ 92.50	\$ 114.00	1.095	\$ 124.83	0.97	
1.000	D3 04 5600 1950	Heat exchanger, steam, annualized	0.92	\$ 85.50	\$ 104.00	1.095	\$ 113.88	0.97	
1.000	D3 05 5110 1950	Unit heater, gas radiant, annualized	1.01	\$ 68.00	\$ 84.50	1.095	\$ 92.53	0.97	
1.000	D3 05 5110 2950	Unit heater, gas infrared, annualized	1.50	\$ 128.00	\$ 156.00	1.095	\$ 170.82	0.97	
1.000	D3 05 5110 3950	Unit heater, steam, annualized	0.84	\$ 85.00	\$ 103.00	1.095	\$ 112.79	0.97	
1.000	D3 05 5122 1950	Forced air heater, oil or gas fired, up to 120 MBH, annualized	5.80	\$ 490.00	\$ 600.00	1.095	\$ 657.00	0.97	
1.000	D3 05 5122 2950	Forced air heater, oil or gas fired, over 120 MBH, annualized	7.41	\$ 635.00	\$ 775.00	1.095	\$ 848.63	0.97	
1.000	D3 05 5210 1950	Package unit, air cooled, 3 thru 24 ton, annualized	2.40	\$ 229.00	\$ 278.00	1.095	\$ 304.41	0.97	
1.000	D3 05 5210 2950	Package unit, air cooled, 25 thru 50 ton, annualized	3.25	\$ 315.00	\$ 380.00	1.095	\$ 416.10	0.97	
1.000	D3 05 5220 1950	Package unit, water cooled, 3 thru 24 ton, annualized	2.40	\$ 229.00	\$ 278.00	1.095	\$ 304.41	0.97	
1.000	D3 05 5220 2950	Package unit, water cooled, 25 thru 50 ton, annualized	3.25	\$ 315.00	\$ 380.00	1.095	\$ 416.10	0.97	
1.000	D3 05 5230 1950	Package unit, computer room, annualized	4.34	\$ 340.00	\$ 420.00	1.095	\$ 459.90	0.97	
1.000	D3 05 5240 1950	Package unit with duct gas heater, annualized	4.96	\$ 385.00	\$ 475.00	1.095	\$ 520.13	0.97	
1.000	D3 05 5250 1950	Air conditioning, split system, DX air cooled, to 10 tons, annualized	3.54	\$ 305.00	\$ 370.00	1.095	\$ 405.15	0.97	
1.000	D3 05 5250 2950	Air conditioning, split system, DX air cooled, over 10 tons, annualized	3.57	\$ 335.00	\$ 410.00	1.095	\$ 448.95	0.97	
1.000	D3 05 5310 1950	Heat pump, air cooled, up to 5 ton, annualized	3.20	\$ 251.00	\$ 310.00	1.095	\$ 339.45	0.97	
1.000	D3 05 5310 2950	Heat pump, air cooled, over 5 ton, annualized	3.59	\$ 305.00	\$ 375.00	1.095	\$ 410.63	0.97	
1.000	D3 05 5320 1950	Heat pump, water cooled, up to 5 ton, annualized	3.56	\$ 274.00	\$ 335.00	1.095	\$ 366.83	0.97	
1.000	D3 05 5320 2950	Heat pump, water cooled, over 5 ton, annualized	3.23	\$ 283.00	\$ 345.00	1.095	\$ 377.78	0.97	
1.000	D3 06 5100 1950	Controls, central system, electro/pneumatic, annualized	1.92	\$ 168.00	\$ 205.00	1.095	\$ 224.48	0.97	
1.000	D3 09 5110 1950	Air compressor, gas engine powered, annualized	16.57	\$ 1,325.00	\$ 1,600.00	1.095	\$ 1,752.00	0.97	

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹							
ANNUALIZED-5% GF							
PROJECT:	EAST HALL						
LOCATION:	US NATIONAL AVERAGES						
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green	GREEN FACTOR	Adjusted Total with Green Factor OH&P	De-Escalation Factor to July 2009 Costs	Total with All Adjustments
1.000	D3 04 5210 2950	Fan, axial, 5,000 to 10,000 CFM, annualized	\$ 103.61	1.05	\$ 112.10	0.97	\$ 108.79
1.000	D3 04 5210 3950	Fan, axial, over 10,000 CFM, annualized	\$ 111.58	1.05	\$ 120.72	0.97	\$ 117.15
1.000	D3 04 5220 1950	Fan, centrifugal, up to 5,000 CFM, annualized	\$ 88.20	1.05	\$ 95.43	0.97	\$ 92.61
1.000	D3 04 5220 2950	Fan, centrifugal, 5,000 to 10,000 CFM, annualized	\$ 92.45	1.05	\$ 100.03	0.97	\$ 97.07
1.000	D3 04 5220 3950	Fan, centrifugal, over 10,000 CFM, annualized	\$ 95.64	1.05	\$ 103.48	0.97	\$ 100.42
1.000	D3 04 5250 1950	Hood and blower, annualized	\$ 275.22	1.05	\$ 297.79	0.97	\$ 288.98
1.000	D3 04 5410 1950	Centrifugal, over 1 HP, annualized	\$ 121.14	1.05	\$ 131.07	0.97	\$ 127.20
1.000	D3 04 5410 2950	Centrifugal, w/ reduction gear, over 1 H.P., annualized	\$ 128.58	1.05	\$ 139.12	0.97	\$ 135.01
1.000	D3 04 5420 1950	Pump w/ oil reservoir, electric, annualized	\$ 121.14	1.05	\$ 131.07	0.97	\$ 127.20
1.000	D3 04 5600 1950	Heat exchanger, steam, annualized	\$ 110.51	1.05	\$ 119.57	0.97	\$ 116.04
1.000	D3 05 5110 1950	Unit heater, gas radiant, annualized	\$ 89.79	1.05	\$ 97.15	0.97	\$ 94.28
1.000	D3 05 5110 2950	Unit heater, gas infrared, annualized	\$ 165.77	1.05	\$ 179.36	0.97	\$ 174.06
1.000	D3 05 5110 3950	Unit heater, steam, annualized	\$ 109.45	1.05	\$ 118.42	0.97	\$ 114.92
1.000	D3 05 5122 1950	Forced air heater, oil or gas fired, up to 120 MBH, annualized	\$ 637.58	1.05	\$ 689.85	0.97	\$ 669.46
1.000	D3 05 5122 2950	Forced air heater, oil or gas fired, over 120 MBH, annualized	\$ 823.54	1.05	\$ 891.06	0.97	\$ 864.71
1.000	D3 05 5210 1950	Package unit, air cooled, 3 thru 24 ton, annualized	\$ 295.41	1.05	\$ 319.63	0.97	\$ 310.18
1.000	D3 05 5210 2950	Package unit, air cooled, 25 thru 50 ton, annualized	\$ 403.80	1.05	\$ 436.91	0.97	\$ 423.99
1.000	D3 05 5220 1950	Package unit, water cooled, 3 thru 24 ton, annualized	\$ 295.41	1.05	\$ 319.63	0.97	\$ 310.18
1.000	D3 05 5220 2950	Package unit, water cooled, 25 thru 50 ton, annualized	\$ 403.80	1.05	\$ 436.91	0.97	\$ 423.99
1.000	D3 05 5230 1950	Package unit, computer room, annualized	\$ 446.30	1.05	\$ 482.90	0.97	\$ 468.62
1.000	D3 05 5240 1950	Package unit with duct gas heater, annualized	\$ 504.75	1.05	\$ 546.13	0.97	\$ 529.99
1.000	D3 05 5250 1950	Air conditioning, split system, DX air cooled, to 10 tons, annualized	\$ 393.17	1.05	\$ 425.41	0.97	\$ 412.83
1.000	D3 05 5250 2950	Air conditioning, split system, DX air cooled, over 10 tons, annualized	\$ 435.68	1.05	\$ 471.40	0.97	\$ 457.46
1.000	D3 05 5310 1950	Heat pump, air cooled, up to 5 ton, annualized	\$ 329.41	1.05	\$ 356.42	0.97	\$ 345.89
1.000	D3 05 5310 2950	Heat pump, air cooled, over 5 ton, annualized	\$ 398.49	1.05	\$ 431.16	0.97	\$ 418.41
1.000	D3 05 5320 1950	Heat pump, water cooled, up to 5 ton, annualized	\$ 355.98	1.05	\$ 385.17	0.97	\$ 373.78
1.000	D3 05 5320 2950	Heat pump, water cooled, over 5 ton, annualized	\$ 366.61	1.05	\$ 396.66	0.97	\$ 384.94
1.000	D3 06 5100 1950	Controls, central system, electro/pneumatic, annualized	\$ 217.84	1.05	\$ 235.70	0.97	\$ 228.73
1.000	D3 09 5110 1950	Air compressor, gas engine powered, annualized	\$ 1,700.21	1.05	\$ 1,839.60	0.97	\$ 1,785.22

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹								
ANNUALIZED-5% GF								
PROJECT:	EAST HALL							
LOCATION:	US NATIONAL AVERAGES							
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.05	Assumed Value						
Qty	Assembly Number	Description	Labor Hours	Total In-House	Total Incl. O&P	Location Factor	Location Adjusted Total O&P	De-Escalation Factor to July 2009 Costs
1.000	D3 09 5114 1950	Air compressor, centrifugal, to 40 H.P., annualized	3.41	\$ 286.00	\$ 350.00	1.095	\$ 383.25	0.97
1.000	D3 09 5114 2950	Air compressor, centrifugal, over 40 H.P., annualized	14.89	\$ 1,175.00	\$ 1,425.00	1.095	\$ 1,560.38	0.97
1.000	D3 09 5118 1950	Air compressor, reciprocating, less than 5 H.P., annualized	4.80	\$ 395.00	\$ 485.00	1.095	\$ 531.08	0.97
1.000	D3 09 5118 2950	Air compressor, reciprocating, 5 to 40 H.P., annualized	4.86	\$ 400.00	\$ 490.00	1.095	\$ 536.55	0.97
1.000	D3 09 5118 3950	Air compressor, reciprocating, over 40 H.P., annualized	5.72	\$ 455.00	\$ 560.00	1.095	\$ 613.20	0.97
1.000	D3 09 5210 1950	Steam humidification system, annualized	2.54	\$ 208.00	\$ 255.00	1.095	\$ 279.23	0.97
1.000	D3 09 5210 2950	Evaporative pan with heating coil humidification system, annualized	1.89	\$ 151.00	\$ 186.00	1.095	\$ 203.67	0.97
1.000	D3 09 5220 1950	Dehumidifier, desiccant wheel, annualized	5.06	\$ 430.00	\$ 515.00	1.095	\$ 563.93	0.97
1.000	D4 01 5100 1950	Backflow prevention device, up to 4", annualized	0.33	\$ 21.50	\$ 27.00	1.095	\$ 29.57	0.97
1.000	D4 01 5100 2950	Backflow prevention device, over 4", annualized	0.49	\$ 32.00	\$ 40.00	1.095	\$ 43.80	0.97
1.000	D4 01 5150 1950	Extinguishing system, wet pipe, annualized	11.34	\$ 870.00	\$ 1,075.00	1.095	\$ 1,177.13	0.97
1.000	D4 01 5180 1950	Extinguishing system, deluge / preaction, annualized	11.57	\$ 885.00	\$ 1,075.00	1.095	\$ 1,177.13	0.97
1.000	D4 01 5210 1950	Fire pump, electric motor driven, annualized	47.74	\$ 3,100.00	\$ 3,875.00	1.095	\$ 4,243.13	0.97
1.000	D4 01 5250 1950	Fire pump, motor/engine driven, annualized	69.88	\$ 4,575.00	\$ 5,700.00	1.095	\$ 6,241.50	0.97
1.000	D4 01 5310 1950	Extinguishing system, dry pipe, annualized	13.02	\$ 1,025.00	\$ 1,250.00	1.095	\$ 1,368.75	0.97
1.000	D4 09 5100 1950	Extinguishing system, CO2, annualized	9.47	\$ 795.00	\$ 975.00	1.095	\$ 1,067.63	0.97
1.000	D4 09 5200 1950	Extinguishing system, foam bottle, annualized	3.71	\$ 231.00	\$ 289.00	1.095	\$ 316.46	0.97
1.000	D4 09 5210 1950	Extinguishing system, foam pump electric, annualized	17.76	\$ 1,275.00	\$ 1,575.00	1.095	\$ 1,724.63	0.97
1.000	D4 09 5220 1950	Extinguishing system, foam pump diesel, annualized	22.16	\$ 1,625.00	\$ 2,000.00	1.095	\$ 2,190.00	0.97
1.000	D4 09 5400 1950	Extinguishing system, dry chemical, annualized	5.61	\$ 555.00	\$ 670.00	1.095	\$ 733.65	0.97
1.000	D4 09 5450 1950	Extinguishing system, FM200, annualized	9.26	\$ 740.00	\$ 905.00	1.095	\$ 990.98	0.97

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹							
ANNUALIZED-5% GF							
PROJECT:	EAST HALL						
LOCATION:	US NATIONAL AVERAGES						
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green	GREEN FACTOR	Adjusted Total with Green Factor OH&P	De-Escalation Factor to July 2009 Costs	Total with All Adjustments
1.000	D3 09 5114 1950	Air compressor, centrifugal, to 40 H.P., annualized	\$ 371.92	1.05	\$ 402.41	0.97	\$ 390.52
1.000	D3 09 5114 2950	Air compressor, centrifugal, over 40 H.P., annualized	\$ 1,514.25	1.05	\$ 1,638.39	0.97	\$ 1,589.96
1.000	D3 09 5118 1950	Air compressor, reciprocating, less than 5 H.P., annualized	\$ 515.37	1.05	\$ 557.63	0.97	\$ 541.14
1.000	D3 09 5118 2950	Air compressor, reciprocating, 5 to 40 H.P., annualized	\$ 520.69	1.05	\$ 563.38	0.97	\$ 546.72
1.000	D3 09 5118 3950	Air compressor, reciprocating, over 40 H.P., annualized	\$ 595.07	1.05	\$ 643.86	0.97	\$ 624.83
1.000	D3 09 5210 1950	Steam humidification system, annualized	\$ 270.97	1.05	\$ 293.19	0.97	\$ 284.52
1.000	D3 09 5210 2950	Evaporative pan with heating coil humidification system, annualized	\$ 197.65	1.05	\$ 213.85	0.97	\$ 207.53
1.000	D3 09 5220 1950	Dehumidifier, desiccant wheel, annualized	\$ 547.25	1.05	\$ 592.12	0.97	\$ 574.62
1.000	D4 01 5100 1950	Backflow prevention device, up to 4", annualized	\$ 28.69	1.05	\$ 31.04	0.97	\$ 30.13
1.000	D4 01 5100 2950	Backflow prevention device, over 4", annualized	\$ 42.51	1.05	\$ 45.99	0.97	\$ 44.63
1.000	D4 01 5150 1950	Extinguishing system, wet pipe, annualized	\$ 1,142.33	1.05	\$ 1,235.98	0.97	\$ 1,199.44
1.000	D4 01 5180 1950	Extinguishing system, deluge / preaction, annualized	\$ 1,142.33	1.05	\$ 1,235.98	0.97	\$ 1,199.44
1.000	D4 01 5210 1950	Fire pump, electric motor driven, annualized	\$ 4,117.69	1.05	\$ 4,455.28	0.97	\$ 4,323.57
1.000	D4 01 5250 1950	Fire pump, motor/engine driven, annualized	\$ 6,056.98	1.05	\$ 6,553.58	0.97	\$ 6,359.83
1.000	D4 01 5310 1950	Extinguishing system, dry pipe, annualized	\$ 1,328.29	1.05	\$ 1,437.19	0.97	\$ 1,394.70
1.000	D4 09 5100 1950	Extinguishing system, CO2, annualized	\$ 1,036.06	1.05	\$ 1,121.01	0.97	\$ 1,087.87
1.000	D4 09 5200 1950	Extinguishing system, foam bottle, annualized	\$ 307.10	1.05	\$ 332.28	0.97	\$ 322.45
1.000	D4 09 5210 1950	Extinguishing system, foam pump electric, annualized	\$ 1,673.64	1.05	\$ 1,810.86	0.97	\$ 1,757.32
1.000	D4 09 5220 1950	Extinguishing system, foam pump diesel, annualized	\$ 2,125.26	1.05	\$ 2,299.50	0.97	\$ 2,231.52
1.000	D4 09 5400 1950	Extinguishing system, dry chemical, annualized	\$ 711.96	1.05	\$ 770.33	0.97	\$ 747.56
1.000	D4 09 5450 1950	Extinguishing system, FM200, annualized	\$ 961.68	1.05	\$ 1,040.52	0.97	\$ 1,009.76
			\$ 74,713.41				\$ 78,449.08
			\$ 18,678.35	Assumed 25%		Assumed 25%	\$ 19,612.27
			Non-Green	Of Total per year		Of Total per year	Green

HVAC AND FIRE PROTECTION PREVENTATIVE MAINTENANCE ¹								
ANNUALIZED-5% GF								
PROJECT:	EAST HALL							
LOCATION:	US NATIONAL AVERAGES							
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.05	Assumed Value						
Qty	Assembly Number	Description	Labor Hours	Total In-House	Total Incl. O&P	Location Factor	Location Adjusted Total O&P	De-Escalation Factor to July 2009 Costs
SUMMARY OF FINDINGS								
		Description	Cost	% Difference	Comments			
		Yearly Non-Green Preventative Maintenance Costs	\$ 18,678.35					
		Yearly Green Preventative Maintenance Costs	\$ 19,612.27	4.76%	Green Costs are 4.76% higher than Non-Green based on this analysis			
FOOTNOTES:								
1	RS Means CostWorks 2010 Operations and Maintenance							

Appendix C-SM11 5% GF Analysis of FMRRC

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
5% GF												
CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation	6%											
De-Escalation to July 2009	1.03											NON-GREEN
De-Escalation Factor to be Applied	0.97											
Green Factor	1.05	Assumed Value										
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 04 3140 0020	Maintenance and inspection duct heater	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
1.000	D3 05 3112 0020	Maintenance and inspection infrared heater suspended, commercial	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
1.000	D3 05 3114 0020	Maintenance and inspection standard suspended heater	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
1.000	D3 05 3116 0020	Maintenance and inspection explosionproof industrial heater	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
1.000	D3 05 3160 0020	Maintenance and inspection convector suspended, commercial	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
1.000	D3 05 3410 0020	Maintenance and inspection baseboard heating units	0.5	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
							\$ 411.00	\$ 516.00				
1.000	D3 01 3160 0010	Preventive maintenance oil filter	1	1 Stpi	Ea.	0.05	\$ 5.45	\$ 6.60	1.095	\$ 7.23	0.97	
1.000	D3 05 3112 0010	Maintenance and repair infrared heater suspended, commercial	1	1 Elec	Ea.	0.62	\$ 37.00	\$ 46.50	1.095	\$ 50.92	0.97	
1.000	D3 05 3150 0020	Maintenance and inspection wall mounted/recessed heater, with fan	1	1 Elec	Ea.	1.14	\$ 68.50	\$ 86.00	1.095	\$ 94.17	0.97	
1.000	D4 01 3310 1020	Inspect sprinkler system	1	1 Plum	Ea.	0.47	\$ 30.20	\$ 37.80	1.095	\$ 41.39	0.97	
1.000	D4 01 3310 1040	Rebuild double check 3" backflow preventer sprinkler system	1	1 Plum	Ea.	5.21	\$ 694.00	\$ 825.00	1.095	\$ 903.38	0.97	
1.000	D4 01 3310 1050	Rebuild double check 4" backflow preventer sprinkler system	1	1 Plum	Ea.	5.86	\$ 864.00	\$ 1,025.00	1.095	\$ 1,122.38	0.97	
1.000	D4 01 3310 1060	Rebuild double check 6" backflow preventer sprinkler system	1	1 Plum	Ea.	6.50	\$ 994.00	\$ 1,180.00	1.095	\$ 1,292.10	0.97	
1.000	D4 01 3310 1070	Rebuild reduced pressure 3" backflow preventer sprinkler system	1	1 Plum	Ea.	5.21	\$ 694.00	\$ 825.00	1.095	\$ 903.38	0.97	
1.000	D4 01 3310 1080	Rebuild reduced pressure 4" backflow preventer sprinkler system	1	1 Plum	Ea.	5.86	\$ 864.00	\$ 1,025.00	1.095	\$ 1,122.38	0.97	
1.000	D4 01 3310 1090	Rebuild reduced pressure 6" backflow preventer sprinkler system	1	1 Plum	Ea.	6.50	\$ 994.00	\$ 1,180.00	1.095	\$ 1,292.10	0.97	
							\$ 5,245.15	\$ 6,236.90				
1.000	D3 04 3310 0020	Inspect for leaks steam converter	2	1 Stpi	Ea.	0.09	\$ 5.94	\$ 7.42	1.095	\$ 8.12	0.97	
1.000	D3 05 3114 0010	Maintenance and repair standard suspended heater	2	1 Elec	Ea.	0.60	\$ 94.55	\$ 111.35	1.095	\$ 121.93	0.97	
1.000	D3 05 3116 0010	Maintenance and repair explosionproof industrial heater	2	1 Elec	Ea.	0.82	\$ 132.00	\$ 156.05	1.095	\$ 170.87	0.97	
1.000	D3 05 3160 0010	Maintenance and repair convector suspended, commercial	2	1 Elec	Ea.	0.62	\$ 37.00	\$ 46.50	1.095	\$ 50.92	0.97	
1.000	D3 05 3410 0010	Maintenance and repair baseboard heating units	2	1 Elec	Ea.	0.62	\$ 37.00	\$ 46.50	1.095	\$ 50.92	0.97	
							\$ 306.49	\$ 367.82				
1.000	D3 04 3520 3010	Repack drain valve gland, 3/4" valves	3	1 Stpi	Ea.	0.22	\$ 23.00	\$ 27.50	1.095	\$ 30.11	0.97	
							\$ 23.00	\$ 27.50				

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹								
5% GF								
CostWorks 2010 - EAST HALL								
Based on National Averages								
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN								
Escalation								
	6%							
De-Escalation to July 2009								
	1.03							
De-Escalation Factor to be Applied								
	0.97							
Green Factor								
	1.05	Assumed Value						
				Total Non-Green with All Adjustments	Green Factor	GREEN	De-Escalation Factor	Total Green with All Adjustments
Qty	Assembly Number	Description				Total Adjusted Green OH&P Location		
1.000	D3 04 3140 0020	Maintenance and inspection duct heater	\$	91.39	1.05	\$ 98.88	0.97	\$ 95.96
1.000	D3 05 3112 0020	Maintenance and inspection infrared heater suspended, commercial	\$	91.39	1.05	\$ 98.88	0.97	\$ 95.96
1.000	D3 05 3114 0020	Maintenance and inspection standard suspended heater	\$	91.39	1.05	\$ 98.88	0.97	\$ 95.96
1.000	D3 05 3116 0020	Maintenance and inspection explosionproof industrial heater	\$	91.39	1.05	\$ 98.88	0.97	\$ 95.96
1.000	D3 05 3160 0020	Maintenance and inspection convector suspended, commercial	\$	91.39	1.05	\$ 98.88	0.97	\$ 95.96
1.000	D3 05 3410 0020	Maintenance and inspection baseboard heating units	\$	91.39	1.05	\$ 98.88	0.97	\$ 95.96
			\$	548.32				\$ 575.73
			\$	274.16	Assume 50% required		Assume 50% required	\$ 287.87
					PER 0.5 YEAR		PER 0.5 YEAR	
1.000	D3 01 3160 0010	Preventive maintenance oil filter	\$	7.01	1.05	\$ 7.59	0.97	\$ 7.36
1.000	D3 05 3112 0010	Maintenance and repair infrared heater suspended, commercial	\$	49.41	1.05	\$ 53.46	0.97	\$ 51.88
1.000	D3 05 3150 0020	Maintenance and inspection wall mounted/recessed heater, with fan	\$	91.39	1.05	\$ 98.88	0.97	\$ 95.96
1.000	D4 01 3310 1020	Inspect sprinkler system	\$	40.17	1.05	\$ 43.46	0.97	\$ 42.18
1.000	D4 01 3310 1040	Rebuild double check 3" backflow preventer sprinkler system	\$	876.67	1.05	\$ 948.54	0.97	\$ 920.50
1.000	D4 01 3310 1050	Rebuild double check 4" backflow preventer sprinkler system	\$	1,089.19	1.05	\$ 1,178.49	0.97	\$ 1,143.65
1.000	D4 01 3310 1060	Rebuild double check 6" backflow preventer sprinkler system	\$	1,253.90	1.05	\$ 1,356.71	0.97	\$ 1,316.60
1.000	D4 01 3310 1070	Rebuild reduced pressure 3" backflow preventer sprinkler system	\$	876.67	1.05	\$ 948.54	0.97	\$ 920.50
1.000	D4 01 3310 1080	Rebuild reduced pressure 4" backflow preventer sprinkler system	\$	1,089.19	1.05	\$ 1,178.49	0.97	\$ 1,143.65
1.000	D4 01 3310 1090	Rebuild reduced pressure 6" backflow preventer sprinkler system	\$	1,253.90	1.05	\$ 1,356.71	0.97	\$ 1,316.60
			\$	6,627.51				\$ 6,958.88
			\$	3,313.75	Assume 50% required		Assume 50% required	\$ 3,479.44
					PER YEAR		PER YEAR	
1.000	D3 04 3310 0020	Inspect for leaks steam converter	\$	7.88	1.05	\$ 8.53	0.97	\$ 8.28
1.000	D3 05 3114 0010	Maintenance and repair standard suspended heater	\$	118.32	1.05	\$ 128.02	0.97	\$ 124.24
1.000	D3 05 3116 0010	Maintenance and repair explosionproof industrial heater	\$	165.82	1.05	\$ 179.42	0.97	\$ 174.11
1.000	D3 05 3160 0010	Maintenance and repair convector suspended, commercial	\$	49.41	1.05	\$ 53.46	0.97	\$ 51.88
1.000	D3 05 3410 0010	Maintenance and repair baseboard heating units	\$	49.41	1.05	\$ 53.46	0.97	\$ 51.88
			\$	390.86				\$ 410.40
			\$	195.43	Assume 50% required		Assume 50% required	\$ 205.20
					PER 2 YEARS		PER 2 YEARS	
1.000	D3 04 3520 3010	Repack drain valve gland, 3/4" valves	\$	29.22	1.05	\$ 31.62	0.97	\$ 30.68
			\$	29.22				\$ 30.68
			\$	14.61	Assume 50% required		Assume 50% required	\$ 15.34

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
5% GF												
CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation	6%											
De-Escalation to July 2009	1.03											NON-GREEN
De-Escalation Factor to be Applied	0.97											
Green Factor	1.05	Assumed Value										
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 01 3150 0010	Preventive maintenance fuel level meter	5	1 Stpi	Ea.	0.50	\$ 32.00	\$ 40.00	1.095	\$ 43.80	0.97	
1.000	D3 01 3240 0010	Check gas pressure natural gas, pressure reducing valve	5	1 Stpi	Ea.	0.13	\$ 8.35	\$ 10.45	1.095	\$ 11.44	0.97	
1.000	D3 04 3310 0010	Repair steam converter	5	1 Stpi	Ea.	5.94	\$ 380.00	\$ 480.00	1.095	\$ 525.60	0.97	
1.000	D3 04 3320 0010	Repair flash tank 24 gallon	5	1 Stpi	Ea.	5.94	\$ 380.00	\$ 480.00	1.095	\$ 525.60	0.97	
1.000	D3 04 3530 1010	Repair circulator pump, 1/12 - 3/4 H.P.	5	1 Stpi	Ea.	0.51	\$ 80.33	\$ 94.55	1.095	\$ 103.53	0.97	
1.000	D3 04 3530 2010	Repair circulator pump, 1 H.P.	5	1 Stpi	Ea.	0.51	\$ 80.53	\$ 94.80	1.095	\$ 103.81	0.97	
1.000	D3 04 3540 0010	Refill expansion tank	5	1 Stpi	Ea.	0.20	\$ 12.85	\$ 16.10	1.095	\$ 17.63	0.97	
1.000	D3 04 3550 1010	Repair damaged pipe insulation, fiberglass 1/2"	5	Q14	Ea.	0.26	\$ 15.88	\$ 19.50	1.095	\$ 21.35	0.97	
1.000	D3 04 3550 1110	Repair damaged pipe insulation, fiberglass 3/4"	5	Q14	Ea.	0.27	\$ 16.70	\$ 20.45	1.095	\$ 22.39	0.97	
1.000	D3 04 3550 1120	Repair damaged pipe insulation, fiberglass 1"	5	Q14	Ea.	0.28	\$ 17.50	\$ 21.40	1.095	\$ 23.43	0.97	
1.000	D3 04 3550 1130	Repair damaged pipe insulation, fbgs 1-1/4"	5	Q14	Ea.	0.30	\$ 18.35	\$ 22.55	1.095	\$ 24.69	0.97	
1.000	D3 04 3550 1140	Repair damaged pipe insulation, fbgs 1-1/2"	5	Q14	Ea.	0.30	\$ 18.65	\$ 22.80	1.095	\$ 24.97	0.97	
1.000	D3 04 3550 1150	Repair damaged pipe insulation, fiberglass 2"	5	Q14	Ea.	0.31	\$ 19.60	\$ 24.10	1.095	\$ 26.39	0.97	
1.000	D3 04 3550 1160	Repair damaged pipe insulation, fiberglass 3"	5	Q14	Ea.	0.35	\$ 22.25	\$ 27.10	1.095	\$ 29.67	0.97	
1.000	D3 04 3550 1170	Repair damaged pipe insulation, fiberglass 4"	5	Q14	Ea.	0.42	\$ 27.20	\$ 33.15	1.095	\$ 36.30	0.97	
1.000	D3 04 3550 1180	Repair damaged pipe insulation, fiberglass 6"	5	Q14	Ea.	0.52	\$ 33.70	\$ 40.90	1.095	\$ 44.79	0.97	
1.000	D3 04 3550 1220	Replace pipe insulation, fiberglass 1/2"	5	Q14	M.L.F.	100.00	\$ 6,375.00	\$ 7,775.00	1.095	\$ 8,513.63	0.97	
1.000	D3 04 3550 1230	Replace pipe insulation, fiberglass 3/4"	5	Q14	M.L.F.	104.35	\$ 6,675.00	\$ 8,175.00	1.095	\$ 8,951.63	0.97	
1.000	D3 04 3550 1240	Replace pipe insulation, fiberglass 1"	5	Q14	M.L.F.	109.09	\$ 7,025.00	\$ 8,575.00	1.095	\$ 9,389.63	0.97	
1.000	D3 04 3550 1250	Replace pipe insulation, fiberglass 1-1/4"	5	Q14	M.L.F.	114.29	\$ 7,375.00	\$ 9,025.00	1.095	\$ 9,882.38	0.97	
1.000	D3 04 3550 1260	Replace pipe insulation, fiberglass 1-1/2"	5	Q14	M.L.F.	114.29	\$ 7,525.00	\$ 9,150.00	1.095	\$ 10,019.25	0.97	
1.000	D3 04 3550 1270	Replace pipe insulation, fiberglass 2"	5	Q14	M.L.F.	120.00	\$ 7,925.00	\$ 9,650.00	1.095	\$ 10,566.75	0.97	
1.000	D3 04 3550 1280	Replace pipe insulation, fiberglass 3"	5	Q14	M.L.F.	133.33	\$ 8,950.00	\$ 10,925.00	1.095	\$ 11,962.88	0.97	
1.000	D3 04 3550 1290	Replace pipe insulation, fiberglass 4"	5	Q14	M.L.F.	160.00	\$ 10,975.00	\$ 13,350.00	1.095	\$ 14,618.25	0.97	
1.000	D3 04 3550 1300	Replace pipe insulation, fiberglass 6"	5	Q14	M.L.F.	200.00	\$ 13,650.00	\$ 16,575.00	1.095	\$ 18,149.63	0.97	
1.000	D3 04 3550 1410	Repair damaged pipe insulation rubber 1/2"	5	1 Asbe	Ea.	0.35	\$ 22.90	\$ 28.20	1.095	\$ 30.88	0.97	
1.000	D3 04 3550 1420	Repair damaged pipe insulation rubber 3/4"	5	1 Asbe	Ea.	0.35	\$ 23.40	\$ 28.55	1.095	\$ 31.26	0.97	
1.000	D3 04 3550 1430	Repair damaged pipe insulation rubber 1"	5	1 Asbe	Ea.	0.36	\$ 23.95	\$ 29.65	1.095	\$ 32.47	0.97	
1.000	D3 04 3550 1440	Repair damaged pipe insulation rubber 1-1/4"	5	1 Asbe	Ea.	0.36	\$ 25.35	\$ 31.25	1.095	\$ 34.22	0.97	
1.000	D3 04 3550 1450	Repair damaged pipe insulation rubber 1-1/2"	5	1 Asbe	Ea.	0.36	\$ 25.85	\$ 31.75	1.095	\$ 34.77	0.97	
1.000	D3 04 3550 1460	Repair damaged pipe insulation rubber 2"	5	1 Asbe	Ea.	0.36	\$ 26.95	\$ 32.85	1.095	\$ 35.97	0.97	
1.000	D3 04 3550 1470	Repair damaged pipe insulation rubber 3"	5	1 Asbe	Ea.	0.37	\$ 30.20	\$ 36.45	1.095	\$ 39.91	0.97	
1.000	D3 04 3550 1480	Repair damaged pipe insulation rubber 4"	5	1 Asbe	Ea.	0.39	\$ 33.65	\$ 40.50	1.095	\$ 44.35	0.97	
1.000	D3 04 3550 1490	Repair damaged pipe insulation rubber 6"	5	1 Asbe	Ea.	0.39	\$ 38.65	\$ 46.50	1.095	\$ 50.92	0.97	
1.000	D3 04 3550 1510	Replace pipe insulation foam rubber 1/2"	5	1 Asbe	L.F.	0.27	\$ 18.10	\$ 22.20	1.095	\$ 24.31	0.97	
1.000	D3 04 3550 1520	Replace pipe insulation foam rubber 3/4"	5	1 Asbe	L.F.	0.27	\$ 18.60	\$ 22.75	1.095	\$ 24.91	0.97	
1.000	D3 04 3550 1530	Replace pipe insulation foam rubber 1"	5	1 Asbe	L.F.	0.27	\$ 19.15	\$ 23.50	1.095	\$ 25.73	0.97	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
5% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor PER 3 YEARS	GREEN Total Adjusted Green OH&P Location	De-Escalation Factor PER 3 YEARS	Total Green with All Adjustments
1.000	D3 01 3150 0010	Preventive maintenance fuel level meter	\$ 42.51	1.05	\$ 45.99	0.97	\$ 44.63
1.000	D3 01 3240 0010	Check gas pressure natural gas, pressure reducing valve	\$ 11.10	1.05	\$ 12.01	0.97	\$ 11.66
1.000	D3 04 3310 0010	Repair steam converter	\$ 510.06	1.05	\$ 551.88	0.97	\$ 535.56
1.000	D3 04 3320 0010	Repair flash tank 24 gallon	\$ 510.06	1.05	\$ 551.88	0.97	\$ 535.56
1.000	D3 04 3530 1010	Repair circulator pump, 1/12 - 3/4 H.P.	\$ 100.47	1.05	\$ 108.71	0.97	\$ 105.50
1.000	D3 04 3530 2010	Repair circulator pump, 1 H.P.	\$ 100.74	1.05	\$ 109.00	0.97	\$ 105.77
1.000	D3 04 3540 0010	Refill expansion tank	\$ 17.11	1.05	\$ 18.51	0.97	\$ 17.96
1.000	D3 04 3550 1010	Repair damaged pipe insulation, fiberglass 1/2"	\$ 20.72	1.05	\$ 22.42	0.97	\$ 21.76
1.000	D3 04 3550 1110	Repair damaged pipe insulation, fiberglass 3/4"	\$ 21.73	1.05	\$ 23.51	0.97	\$ 22.82
1.000	D3 04 3550 1120	Repair damaged pipe insulation, fiberglass 1"	\$ 22.74	1.05	\$ 24.60	0.97	\$ 23.88
1.000	D3 04 3550 1130	Repair damaged pipe insulation, fbgs 1-1/4"	\$ 23.96	1.05	\$ 25.93	0.97	\$ 25.16
1.000	D3 04 3550 1140	Repair damaged pipe insulation, fbgs 1-1/2"	\$ 24.23	1.05	\$ 26.21	0.97	\$ 25.44
1.000	D3 04 3550 1150	Repair damaged pipe insulation, fiberglass 2"	\$ 25.61	1.05	\$ 27.71	0.97	\$ 26.89
1.000	D3 04 3550 1160	Repair damaged pipe insulation, fiberglass 3"	\$ 28.80	1.05	\$ 31.16	0.97	\$ 30.24
1.000	D3 04 3550 1170	Repair damaged pipe insulation, fiberglass 4"	\$ 35.23	1.05	\$ 38.11	0.97	\$ 36.99
1.000	D3 04 3550 1180	Repair damaged pipe insulation, fiberglass 6"	\$ 43.46	1.05	\$ 47.02	0.97	\$ 45.63
1.000	D3 04 3550 1220	Replace pipe insulation, fiberglass 1/2"	\$ 8,261.94	1.05	\$ 8,939.31	0.97	\$ 8,675.03
1.000	D3 04 3550 1230	Replace pipe insulation, fiberglass 3/4"	\$ 8,686.99	1.05	\$ 9,399.21	0.97	\$ 9,121.34
1.000	D3 04 3550 1240	Replace pipe insulation, fiberglass 1"	\$ 9,112.04	1.05	\$ 9,859.11	0.97	\$ 9,567.64
1.000	D3 04 3550 1250	Replace pipe insulation, fiberglass 1-1/4"	\$ 9,590.22	1.05	\$ 10,376.49	0.97	\$ 10,069.73
1.000	D3 04 3550 1260	Replace pipe insulation, fiberglass 1-1/2"	\$ 9,723.05	1.05	\$ 10,520.21	0.97	\$ 10,209.20
1.000	D3 04 3550 1270	Replace pipe insulation, fiberglass 2"	\$ 10,254.37	1.05	\$ 11,095.09	0.97	\$ 10,767.08
1.000	D3 04 3550 1280	Replace pipe insulation, fiberglass 3"	\$ 11,609.22	1.05	\$ 12,561.02	0.97	\$ 12,189.68
1.000	D3 04 3550 1290	Replace pipe insulation, fiberglass 4"	\$ 14,186.09	1.05	\$ 15,349.16	0.97	\$ 14,895.39
1.000	D3 04 3550 1300	Replace pipe insulation, fiberglass 6"	\$ 17,613.07	1.05	\$ 19,057.11	0.97	\$ 18,493.72
1.000	D3 04 3550 1410	Repair damaged pipe insulation rubber 1/2"	\$ 29.97	1.05	\$ 32.42	0.97	\$ 31.46
1.000	D3 04 3550 1420	Repair damaged pipe insulation rubber 3/4"	\$ 30.34	1.05	\$ 32.83	0.97	\$ 31.85
1.000	D3 04 3550 1430	Repair damaged pipe insulation rubber 1"	\$ 31.51	1.05	\$ 34.09	0.97	\$ 33.08
1.000	D3 04 3550 1440	Repair damaged pipe insulation rubber 1-1/4"	\$ 33.21	1.05	\$ 35.93	0.97	\$ 34.87
1.000	D3 04 3550 1450	Repair damaged pipe insulation rubber 1-1/2"	\$ 33.74	1.05	\$ 36.50	0.97	\$ 35.43
1.000	D3 04 3550 1460	Repair damaged pipe insulation rubber 2"	\$ 34.91	1.05	\$ 37.77	0.97	\$ 36.65
1.000	D3 04 3550 1470	Repair damaged pipe insulation rubber 3"	\$ 38.73	1.05	\$ 41.91	0.97	\$ 40.67
1.000	D3 04 3550 1480	Repair damaged pipe insulation rubber 4"	\$ 43.04	1.05	\$ 46.56	0.97	\$ 45.19
1.000	D3 04 3550 1490	Repair damaged pipe insulation rubber 6"	\$ 49.41	1.05	\$ 53.46	0.97	\$ 51.88
1.000	D3 04 3550 1510	Replace pipe insulation foam rubber 1/2"	\$ 23.59	1.05	\$ 25.52	0.97	\$ 24.77
1.000	D3 04 3550 1520	Replace pipe insulation foam rubber 3/4"	\$ 24.17	1.05	\$ 26.16	0.97	\$ 25.38
1.000	D3 04 3550 1530	Replace pipe insulation foam rubber 1"	\$ 24.97	1.05	\$ 27.02	0.97	\$ 26.22

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹													
5% GF													
CostWorks 2010 - EAST HALL													
Based on National Averages													
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN													
Escalation	6%												
De-Escalation to July 2009	1.03												NON-GREEN
De-Escalation Factor to be Applied	0.97												
Green Factor	1.05	Assumed Value											
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor		
1.000	D3 04 3550 1540	Replace pipe insulation foam rubber 1-1/4"	5	1 Asbe	L.F.	0.28	\$ 20.40	\$ 24.85	1.095	\$ 27.21	0.97		
1.000	D3 04 3550 1550	Replace pipe insulation foam rubber 1-1/2"	5	1 Asbe	L.F.	0.28	\$ 21.00	\$ 25.50	1.095	\$ 27.92	0.97		
1.000	D3 04 3550 1560	Replace pipe insulation foam rubber 2"	5	1 Asbe	L.F.	0.28	\$ 22.00	\$ 26.70	1.095	\$ 29.24	0.97		
1.000	D3 04 3550 1570	Replace pipe insulation foam rubber 3"	5	1 Asbe	L.F.	0.28	\$ 25.15	\$ 30.40	1.095	\$ 33.29	0.97		
1.000	D3 04 3550 1580	Replace pipe insulation foam rubber 4"	5	1 Asbe	L.F.	0.30	\$ 28.40	\$ 34.30	1.095	\$ 37.56	0.97		
1.000	D3 04 3550 1590	Replace pipe insulation foam rubber 6"	5	1 Asbe	L.F.	0.30	\$ 33.40	\$ 39.80	1.095	\$ 43.58	0.97		
1.000	D3 05 3150 0010	Maintenance and repair wall mounted/recessed heater, with fan	5	1 Elec	Ea.	0.98	\$ 136.05	\$ 161.85	1.095	\$ 177.23	0.97		
							\$ 78,232.04	\$ 95,365.40					
1.000	D3 04 3330 0010	Replace steam regulator valve 1-1/2" diameter	6	1 Stpi	Ea.	1.20	\$ 2,200.50	\$ 2,507.00	1.095	\$ 2,745.17	0.97		
1.000	D3 04 3330 0110	Replace steam regulator valve 2" diameter	6	1 Stpi	Ea.	1.42	\$ 2,680.50	\$ 3,063.00	1.095	\$ 3,353.99	0.97		
1.000	D3 04 3330 0210	Replace steam regulator valve 2-1/2" diameter	6	Q5	Ea.	2.60	\$ 3,400.00	\$ 3,887.50	1.095	\$ 4,256.81	0.97		
1.000	D3 04 3330 0310	Replace steam regulator valve 3" diameter	6	Q5	Ea.	2.84	\$ 4,229.50	\$ 4,818.50	1.095	\$ 5,276.26	0.97		
							\$ 12,510.50	\$ 14,276.00					
1.000	D3 02 3180 1010	Repair boiler, gas, 250 MBH	7	1 Stpi	Ea.	9.87	\$ 1,724.80	\$ 2,035.70	1.095	\$ 2,229.09	0.97		
1.000	D3 02 3180 2010	Repair boiler, gas, 2000 MBH	7	Q5	Ea.	19.53	\$ 4,553.55	\$ 5,294.20	1.095	\$ 5,797.15	0.97		
1.000	D3 02 3180 3010	Repair boiler, gas, 10,000 MBH	7	Q5	Ea.	38.04	\$ 14,628.05	\$ 16,867.20	1.095	\$ 18,469.58	0.97		
1.000	D3 02 3184 1010	Repair boiler, oil, 250 MBH	7	Q5	Ea.	10.49	\$ 1,325.20	\$ 1,585.70	1.095	\$ 1,736.34	0.97		
1.000	D3 02 3184 2010	Repair boiler, oil, 2000 MBH	7	1 Stpi	Ea.	10.78	\$ 1,337.45	\$ 1,597.70	1.095	\$ 1,749.48	0.97		
1.000	D3 02 3184 3010	Repair boiler, oil, 10,000 MBH	7	1 Stpi	Ea.	11.16	\$ 1,494.10	\$ 1,778.20	1.095	\$ 1,947.13	0.97		
1.000	D3 02 3186 1010	Repair boiler, gas/oil, 2000 MBH	7	Q5	Ea.	22.94	\$ 4,958.60	\$ 5,780.20	1.095	\$ 6,329.32	0.97		
1.000	D3 02 3186 2010	Repair boiler, gas/oil, 20,000 MBH	7	Q5	Ea.	43.27	\$ 15,233.40	\$ 17,587.60	1.095	\$ 19,258.42	0.97		
1.000	D3 04 3350 1030	Replace steam trap, 15 PSIG, 3/4" threaded	7	1 Stpi	Ea.	0.98	\$ 178.00	\$ 210.00	1.095	\$ 229.95	0.97		
1.000	D3 04 3350 1040	Replace steam trap, 15 PSIG, 1" threaded	7	1 Stpi	Ea.	1.04	\$ 206.50	\$ 243.00	1.095	\$ 266.09	0.97		
1.000	D3 04 3350 1050	Replace steam trap, 15 PSIG, 1-1/4" threaded	7	1 Stpi	Ea.	1.20	\$ 246.50	\$ 289.00	1.095	\$ 316.46	0.97		
1.000	D3 04 3350 1060	Replace steam trap, 15 PSIG, 1-1/2" threaded	7	1 Stpi	Ea.	1.73	\$ 357.00	\$ 416.50	1.095	\$ 456.07	0.97		
1.000	D3 04 3350 1070	Replace steam trap, 15 PSIG, 2" threaded	7	1 Stpi	Ea.	2.60	\$ 615.50	\$ 719.50	1.095	\$ 787.85	0.97		
							\$ 46,858.65	\$ 54,404.50					

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹								
5% GF								
CostWorks 2010 - EAST HALL								
Based on National Averages								
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN								
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.05	Assumed Value						
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments	
1.000	D3 04 3550 1540	Replace pipe insulation foam rubber 1-1/4"	\$ 26.41	1.05	\$ 28.57	0.97	\$ 27.73	
1.000	D3 04 3550 1550	Replace pipe insulation foam rubber 1-1/2"	\$ 27.10	1.05	\$ 29.32	0.97	\$ 28.45	
1.000	D3 04 3550 1560	Replace pipe insulation foam rubber 2"	\$ 28.37	1.05	\$ 30.70	0.97	\$ 29.79	
1.000	D3 04 3550 1570	Replace pipe insulation foam rubber 3"	\$ 32.30	1.05	\$ 34.95	0.97	\$ 33.92	
1.000	D3 04 3550 1580	Replace pipe insulation foam rubber 4"	\$ 36.45	1.05	\$ 39.44	0.97	\$ 38.27	
1.000	D3 04 3550 1590	Replace pipe insulation foam rubber 6"	\$ 42.29	1.05	\$ 45.76	0.97	\$ 44.41	
1.000	D3 05 3150 0010	Maintenance and repair wall mounted/recessed heater, with fan	\$ 171.99	1.05	\$ 186.09	0.97	\$ 180.59	
			\$ 101,337.99				\$ 106,404.89	
			\$ 50,669.00	Assume 50% required		Assume 50% required	\$ 53,202.45	
				PER 5 YEARS		PER 5 YEARS		
1.000	D3 04 3330 0010	Replace steam regulator valve 1-1/2" diameter	\$ 2,664.01	1.05	\$ 2,882.42	0.97	\$ 2,797.21	
1.000	D3 04 3330 0110	Replace steam regulator valve 2" diameter	\$ 3,254.83	1.05	\$ 3,521.68	0.97	\$ 3,417.57	
1.000	D3 04 3330 0210	Replace steam regulator valve 2-1/2" diameter	\$ 4,130.97	1.05	\$ 4,469.65	0.97	\$ 4,337.52	
1.000	D3 04 3330 0310	Replace steam regulator valve 3" diameter	\$ 5,120.28	1.05	\$ 5,540.07	0.97	\$ 5,376.29	
			\$ 15,170.08				\$ 15,928.59	
			\$ 7,585.04	Assume 50% required		Assume 50% required	\$ 7,964.29	
				PER 6 YEARS		PER 6 YEARS		
1.000	D3 02 3180 1010	Repair boiler, gas, 250 MBH	\$ 2,163.19	1.05	\$ 2,340.55	0.97	\$ 2,271.35	
1.000	D3 02 3180 2010	Repair boiler, gas, 2000 MBH	\$ 5,625.77	1.05	\$ 6,087.01	0.97	\$ 5,907.06	
1.000	D3 02 3180 3010	Repair boiler, gas, 10,000 MBH	\$ 17,923.57	1.05	\$ 19,393.06	0.97	\$ 18,819.75	
1.000	D3 02 3184 1010	Repair boiler, oil, 250 MBH	\$ 1,685.01	1.05	\$ 1,823.16	0.97	\$ 1,769.26	
1.000	D3 02 3184 2010	Repair boiler, oil, 2000 MBH	\$ 1,697.76	1.05	\$ 1,836.96	0.97	\$ 1,782.65	
1.000	D3 02 3184 3010	Repair boiler, oil, 10,000 MBH	\$ 1,889.57	1.05	\$ 2,044.49	0.97	\$ 1,984.04	
1.000	D3 02 3186 1010	Repair boiler, gas/oil, 2000 MBH	\$ 6,142.21	1.05	\$ 6,645.78	0.97	\$ 6,449.32	
1.000	D3 02 3186 2010	Repair boiler, gas/oil, 20,000 MBH	\$ 18,689.08	1.05	\$ 20,221.34	0.97	\$ 19,623.54	
1.000	D3 04 3350 1030	Replace steam trap, 15 PSIG, 3/4" threaded	\$ 223.15	1.05	\$ 241.45	0.97	\$ 234.31	
1.000	D3 04 3350 1040	Replace steam trap, 15 PSIG, 1" threaded	\$ 258.22	1.05	\$ 279.39	0.97	\$ 271.13	
1.000	D3 04 3350 1050	Replace steam trap, 15 PSIG, 1-1/4" threaded	\$ 307.10	1.05	\$ 332.28	0.97	\$ 322.45	
1.000	D3 04 3350 1060	Replace steam trap, 15 PSIG, 1-1/2" threaded	\$ 442.58	1.05	\$ 478.87	0.97	\$ 464.71	
1.000	D3 04 3350 1070	Replace steam trap, 15 PSIG, 2" threaded	\$ 764.56	1.05	\$ 827.25	0.97	\$ 802.79	
			\$ 57,811.77				\$ 60,702.36	
			\$ 28,905.89	Assume 50% required		Assume 50% required	\$ 30,351.18	
				PER 7 YEARS		PER 7 YEARS		

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
5% GF												
CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation	6%											
De-Escalation to July 2009	1.03											NON-GREEN
De-Escalation Factor to be Applied	0.97											
Green Factor	1.05		Assumed Value									
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 04 3520 3020	Replace drain valve stem assembly, 3/4" valves	8	1 Stpi	Ea.	0.55	\$ 45.74	\$ 56.37	1.095	\$ 61.73	0.97	
1.000	D3 05 3265 1010	Repair air conditioner, window, 1 ton	8	1 Stpi	Ea.	1.07	\$ 75.75	\$ 93.65	1.095	\$ 102.55	0.97	
1.000	D3 05 3266 2010	Repair air conditioner, window, 2 ton	8	1 Stpi	Ea.	1.13	\$ 87.00	\$ 107.00	1.095	\$ 117.17	0.97	
							\$ 208.49	\$ 257.02				
1.000	D3 01 3170 0010	Remake flare type joint fuel oil storage: pipe & fittings, copper	10	1 Stpi	M.L.F.	0.29	\$ 18.35	\$ 23.00	1.095	\$ 25.19	0.97	
1.000	D3 02 3198 1010	Repair boiler blowoff system	10	1 Stpi	Ea.	1.00	\$ 64.50	\$ 80.50	1.095	\$ 88.15	0.97	
1.000	D3 02 3296 1010	Repair deaerator	10	1 Stpi	Ea.	1.00	\$ 64.50	\$ 80.50	1.095	\$ 88.15	0.97	
1.000	D3 02 3388 1010	Repair spreader, pneumatic coal	10	2 Stpi	Ea.	22.33	\$ 4,949.50	\$ 5,776.00	1.095	\$ 6,324.72	0.97	
1.000	D3 02 3390 1010	Repair fuel oil equipment, pump	10	1 Stpi	Ea.	5.42	\$ 392.05	\$ 485.50	1.095	\$ 531.62	0.97	
1.000	D3 03 3115 1010	Repair cooling tower, 50 ton	10	2 Stpi	Ea.	8.17	\$ 960.00	\$ 1,148.00	1.095	\$ 1,257.06	0.97	
1.000	D3 03 3115 2010	Repair cooling tower, 100 ton	10	2 Stpi	Ea.	28.25	\$ 3,491.00	\$ 4,170.50	1.095	\$ 4,566.70	0.97	
1.000	D3 03 3115 3010	Repair cooling tower, 300 ton	10	2 Stpi	Ea.	43.58	\$ 5,947.50	\$ 7,097.50	1.095	\$ 7,771.76	0.97	
1.000	D3 03 3115 4010	Repair cooling tower, 1000 ton	10	2 Stpi	Ea.	76.41	\$ 13,669.50	\$ 16,111.50	1.095	\$ 17,642.09	0.97	
1.000	D3 03 3130 1010	Repair water cooled chiller, 20 ton, reciprocating	10	Q6	Ea.	79.24	\$ 21,967.50	\$ 25,490.50	1.095	\$ 27,912.10	0.97	
1.000	D3 03 3130 2010	Repair water cooled chiller, 50 ton, reciprocating	10	Q6	Ea.	190.33	\$ 53,667.50	\$ 62,505.50	1.095	\$ 68,443.52	0.97	
1.000	D3 03 3130 3010	Repair water cooled chiller, 100 ton, reciprocating	10	Q6	Ea.	484.44	\$ 69,624.50	\$ 82,555.50	1.095	\$ 90,398.27	0.97	
1.000	D3 03 3130 5010	Repair water cooled chiller, 200 ton, reciprocating	10	Q7	Ea.	489.03	\$ 71,339.50	\$ 84,655.50	1.095	\$ 92,697.77	0.97	
1.000	D3 03 3135 1010	Repair recip. chiller, air cooled, 20 ton	10	2 Stpi	Ea.	95.12	\$ 23,680.50	\$ 27,565.50	1.095	\$ 30,184.22	0.97	
1.000	D3 03 3135 2010	Repair recip. chiller, air cooled, 50 ton	10	Q6	Ea.	215.43	\$ 56,231.50	\$ 65,533.50	1.095	\$ 71,759.18	0.97	
1.000	D3 03 3135 3010	Repair chiller, air cooled, 100 ton chiller	10	Q6	Ea.	425.64	\$ 55,498.50	\$ 66,039.50	1.095	\$ 72,313.25	0.97	
1.000	D3 03 3137 4010	Repair water cooled chiller, 5 ton, reciprocating	10	1 Stpi	Ea.	11.80	\$ 1,379.00	\$ 1,654.50	1.095	\$ 1,811.68	0.97	
1.000	D3 03 3137 5010	Repair water cooled chiller, 10 ton, reciprocating	10	2 Stpi	Ea.	26.79	\$ 3,025.50	\$ 3,633.50	1.095	\$ 3,978.68	0.97	
1.000	D3 03 3137 6010	Repair water cooled chiller, 15 ton, reciprocating	10	Q5	Ea.	53.80	\$ 5,714.50	\$ 6,850.50	1.095	\$ 7,501.30	0.97	
1.000	D3 03 3140 1010	Repair hermetic centrifugal chiller, 100 ton	10	Q7	Ea.	242.03	\$ 41,653.00	\$ 48,961.00	1.095	\$ 53,612.30	0.97	
1.000	D3 03 3140 2010	Repair hermetic centrifugal chiller, 300 ton	10	Q7	Ea.	560.26	\$ 96,365.00	\$ 113,192.50	1.095	\$ 123,945.79	0.97	
1.000	D3 03 3140 3010	Repair hermetic centrifugal chiller, 1000 ton	10	Q7	Ea.	1,767.34	\$ 303,562.50	\$ 356,854.50	1.095	\$ 390,755.68	0.97	
1.000	D3 03 3142 1010	Repair open centrifugal chiller, 300 ton	10	Q7	Ea.	578.94	\$ 97,404.50	\$ 114,460.50	1.095	\$ 125,334.25	0.97	
1.000	D3 03 3142 2010	Repair open centrifugal chiller, 1000 ton	10	Q7	Ea.	1,808.56	\$ 307,714.50	\$ 361,880.50	1.095	\$ 396,259.15	0.97	
1.000	D3 03 3145 1010	Repair chiller, absorption, 100 ton	10	2 Stpi	Ea.	35.51	\$ 15,938.50	\$ 18,353.50	1.095	\$ 20,097.08	0.97	
1.000	D3 03 3145 2010	Repair chiller, absorption, 350 ton	10	2 Stpi	Ea.	39.71	\$ 16,837.50	\$ 19,424.50	1.095	\$ 21,269.83	0.97	
1.000	D3 03 3145 3010	Repair chiller, absorption, 950 ton	10	4 Stpi	Ea.	54.20	\$ 20,777.50	\$ 23,959.50	1.095	\$ 26,235.65	0.97	
1.000	D3 03 3210 1010	Repair condenser, air cooled, 5 ton	10	1 Stpi	Ea.	4.61	\$ 598.00	\$ 715.00	1.095	\$ 782.93	0.97	
1.000	D3 03 3210 2010	Repair condenser, air cooled, 20 ton	10	2 Stpi	Ea.	7.93	\$ 1,213.50	\$ 1,441.50	1.095	\$ 1,578.44	0.97	
1.000	D3 03 3210 3010	Repair condenser, air cooled, 50 ton	10	2 Stpi	Ea.	11.40	\$ 1,838.50	\$ 2,159.50	1.095	\$ 2,364.65	0.97	
1.000	D3 03 3210 4010	Repair condenser, air cooled, 100 ton	10	2 Stpi	Ea.	21.80	\$ 3,609.50	\$ 4,240.50	1.095	\$ 4,643.35	0.97	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
5% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 04 3520 3020	Replace drain valve stem assembly, 3/4" valves	\$ 59.90	1.05	\$ 64.81	0.97	\$ 62.90
1.000	D3 05 3265 1010	Repair air conditioner, window, 1 ton	\$ 99.52	1.05	\$ 107.67	0.97	\$ 104.49
1.000	D3 05 3266 2010	Repair air conditioner, window, 2 ton	\$ 113.70	1.05	\$ 123.02	0.97	\$ 119.39
			\$ 273.12				\$ 286.77
			\$ 136.56	Assume 50% required		Assume 50% required	\$ 143.39
				PER 8 YEARS		PER 8 YEARS	
1.000	D3 01 3170 0010	Remake flare type joint fuel oil storage: pipe & fittings, copper	\$ 24.44	1.05	\$ 26.44	0.97	\$ 25.66
1.000	D3 02 3198 1010	Repair boiler blowoff system	\$ 85.54	1.05	\$ 92.55	0.97	\$ 89.82
1.000	D3 02 3296 1010	Repair deaerator	\$ 85.54	1.05	\$ 92.55	0.97	\$ 89.82
1.000	D3 02 3388 1010	Repair spreader, pneumatic coal	\$ 6,137.74	1.05	\$ 6,640.96	0.97	\$ 6,444.63
1.000	D3 02 3390 1010	Repair fuel oil equipment, pump	\$ 515.91	1.05	\$ 558.20	0.97	\$ 541.70
1.000	D3 03 3115 1010	Repair cooling tower, 50 ton	\$ 1,219.90	1.05	\$ 1,319.91	0.97	\$ 1,280.89
1.000	D3 03 3115 2010	Repair cooling tower, 100 ton	\$ 4,431.69	1.05	\$ 4,795.03	0.97	\$ 4,653.28
1.000	D3 03 3115 3010	Repair cooling tower, 300 ton	\$ 7,542.01	1.05	\$ 8,160.35	0.97	\$ 7,919.11
1.000	D3 03 3115 4010	Repair cooling tower, 1000 ton	\$ 17,120.54	1.05	\$ 18,524.20	0.97	\$ 17,976.57
1.000	D3 03 3130 1010	Repair water cooled chiller, 20 ton, reciprocating	\$ 27,086.93	1.05	\$ 29,307.70	0.97	\$ 28,441.28
1.000	D3 03 3130 2010	Repair water cooled chiller, 50 ton, reciprocating	\$ 66,420.13	1.05	\$ 71,865.70	0.97	\$ 69,741.13
1.000	D3 03 3130 3010	Repair water cooled chiller, 100 ton, reciprocating	\$ 87,725.83	1.05	\$ 94,918.19	0.97	\$ 92,112.12
1.000	D3 03 3130 5010	Repair water cooled chiller, 200 ton, reciprocating	\$ 89,957.35	1.05	\$ 97,332.66	0.97	\$ 94,455.21
1.000	D3 03 3135 1010	Repair recip. chiller, air cooled, 20 ton	\$ 29,291.89	1.05	\$ 31,693.43	0.97	\$ 30,756.48
1.000	D3 03 3135 2010	Repair recip. chiller, air cooled, 50 ton	\$ 69,637.76	1.05	\$ 75,347.14	0.97	\$ 73,119.65
1.000	D3 03 3135 3010	Repair chiller, air cooled, 100 ton chiller	\$ 70,175.45	1.05	\$ 75,928.92	0.97	\$ 73,684.23
1.000	D3 03 3137 4010	Repair water cooled chiller, 5 ton, reciprocating	\$ 1,758.12	1.05	\$ 1,902.26	0.97	\$ 1,846.02
1.000	D3 03 3137 5010	Repair water cooled chiller, 10 ton, reciprocating	\$ 3,861.06	1.05	\$ 4,177.62	0.97	\$ 4,054.11
1.000	D3 03 3137 6010	Repair water cooled chiller, 15 ton, reciprocating	\$ 7,279.54	1.05	\$ 7,876.36	0.97	\$ 7,643.51
1.000	D3 03 3140 1010	Repair hermetic centrifugal chiller, 100 ton	\$ 52,027.35	1.05	\$ 56,292.91	0.97	\$ 54,628.72
1.000	D3 03 3140 2010	Repair hermetic centrifugal chiller, 300 ton	\$ 120,281.58	1.05	\$ 130,143.08	0.97	\$ 126,295.66
1.000	D3 03 3140 3010	Repair hermetic centrifugal chiller, 1000 ton	\$ 379,203.76	1.05	\$ 410,293.46	0.97	\$ 398,163.95
1.000	D3 03 3142 1010	Repair open centrifugal chiller, 300 ton	\$ 121,628.99	1.05	\$ 131,600.96	0.97	\$ 127,710.44
1.000	D3 03 3142 2010	Repair open centrifugal chiller, 1000 ton	\$ 384,544.53	1.05	\$ 416,072.10	0.97	\$ 403,771.76
1.000	D3 03 3145 1010	Repair chiller, absorption, 100 ton	\$ 19,502.95	1.05	\$ 21,101.94	0.97	\$ 20,478.10
1.000	D3 03 3145 2010	Repair chiller, absorption, 350 ton	\$ 20,641.03	1.05	\$ 22,333.32	0.97	\$ 21,673.08
1.000	D3 03 3145 3010	Repair chiller, absorption, 950 ton	\$ 25,460.05	1.05	\$ 27,547.44	0.97	\$ 26,733.05
1.000	D3 03 3210 1010	Repair condenser, air cooled, 5 ton	\$ 759.78	1.05	\$ 822.07	0.97	\$ 797.77
1.000	D3 03 3210 2010	Repair condenser, air cooled, 20 ton	\$ 1,531.78	1.05	\$ 1,657.36	0.97	\$ 1,608.37
1.000	D3 03 3210 3010	Repair condenser, air cooled, 50 ton	\$ 2,294.75	1.05	\$ 2,482.89	0.97	\$ 2,409.48
1.000	D3 03 3210 4010	Repair condenser, air cooled, 100 ton	\$ 4,506.08	1.05	\$ 4,875.51	0.97	\$ 4,731.38

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹													
5% GF													
CostWorks 2010 - EAST HALL													
Based on National Averages													
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN													
Escalation													
6%													
De-Escalation to July 2009													
1.03													
De-Escalation Factor to be Applied													
0.97													
Green Factor													
1.05 Assumed Value													
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor		
1.000	D3 03 3260 1010	Repair evaporative condenser, 20 ton	10	2 Stpi	Ea.	75.77	\$ 8,799.50	\$ 10,542.50	1.095	\$	11,544.04	0.97	
1.000	D3 03 3260 2010	Repair evaporative condenser, 100 ton	10	2 Stpi	Ea.	109.64	\$ 12,635.50	\$ 15,101.50	1.095	\$	16,536.14	0.97	
1.000	D3 03 3260 3010	Repair evaporative condenser, 300 ton	10	2 Stpi	Ea.	116.45	\$ 15,611.50	\$ 18,507.50	1.095	\$	20,265.71	0.97	
1.000	D3 04 3120 1010	Repair fan coil unit, 1 ton	10	1 Stpi	Ea.	3.15	\$ 387.00	\$ 461.50	1.095	\$	505.34	0.97	
1.000	D3 04 3120 2010	Repair fan coil unit, 3 ton	10	1 Stpi	Ea.	3.15	\$ 497.00	\$ 586.50	1.095	\$	642.22	0.97	
1.000	D3 04 3120 3010	Repair fan coil unit, 5 ton	10	1 Stpi	Ea.	3.51	\$ 527.00	\$ 626.50	1.095	\$	686.02	0.97	
1.000	D3 04 3120 4010	Repair fan coil unit, 10 ton	10	1 Stpi	Ea.	3.71	\$ 605.00	\$ 713.00	1.095	\$	780.74	0.97	
1.000	D3 04 3120 5010	Repair fan coil unit, 20 ton	10	1 Stpi	Ea.	3.91	\$ 713.00	\$ 839.00	1.095	\$	918.71	0.97	
1.000	D3 04 3120 6010	Repair fan coil unit, 30 ton	10	1 Stpi	Ea.	4.40	\$ 996.00	\$ 1,170.00	1.095	\$	1,281.15	0.97	
1.000	D3 04 3122 1010	Repair fan coil, DX 1-1/2 ton, cooling only	10	1 Stpi	Ea.	13.52	\$ 1,397.30	\$ 1,692.50	1.095	\$	1,853.29	0.97	
1.000	D3 04 3122 2010	Repair fan coil, DX 2 ton, cooling only	10	1 Stpi	Ea.	13.93	\$ 1,439.80	\$ 1,739.00	1.095	\$	1,904.21	0.97	
1.000	D3 04 3122 3010	Repair fan coil, DX 2-1/2 ton, cooling only	10	1 Stpi	Ea.	14.40	\$ 1,637.30	\$ 1,965.00	1.095	\$	2,151.68	0.97	
1.000	D3 04 3122 4010	Repair fan coil, DX 3 ton, cooling only	10	1 Stpi	Ea.	13.91	\$ 1,587.30	\$ 1,900.00	1.095	\$	2,080.50	0.97	
1.000	D3 04 3122 5050	Repair fan coil, DX 5 ton, cooling only	10	1 Stpi	Ea.	15.02	\$ 1,852.30	\$ 2,215.00	1.095	\$	2,425.43	0.97	
1.000	D3 04 3122 7070	Repair fan coil, DX 10 ton, cooling only	10	Q6	Ea.	51.44	\$ 13,478.30	\$ 15,704.00	1.095	\$	17,195.88	0.97	
1.000	D3 04 3122 9090	Repair fan coil, DX 20 ton, cooling only	10	Q6	Ea.	74.75	\$ 20,248.30	\$ 23,539.00	1.095	\$	25,775.21	0.97	
1.000	D3 04 3124 5010	Replace fan coil, DX 5 ton, with heat	10	Q5	Ea.	14.64	\$ 2,873.00	\$ 3,379.00	1.095	\$	3,700.01	0.97	
1.000	D3 04 3124 6010	Replace fan coil, DX 10 ton, with heat	10	Q6	Ea.	25.33	\$ 5,800.00	\$ 6,750.00	1.095	\$	7,391.25	0.97	
1.000	D3 04 3124 7010	Replace fan coil, DX 20 ton, with heat	10	Q6	Ea.	94.22	\$ 14,000.00	\$ 16,450.00	1.095	\$	18,012.75	0.97	
1.000	D3 04 3128 1010	Repair unit ventilator, 750 CFM, 2 ton	10	1 Stpi	Ea.	3.96	\$ 434.35	\$ 520.60	1.095	\$	570.06	0.97	
1.000	D3 04 3128 2010	Repair unit ventilator, 1250 CFM, 3 ton	10	1 Stpi	Ea.	3.96	\$ 544.35	\$ 645.60	1.095	\$	706.93	0.97	
1.000	D3 04 3128 2040	Repair unit ventilator, 2000 CFM, 5 ton	10	1 Stpi	Ea.	4.42	\$ 580.80	\$ 693.50	1.095	\$	759.38	0.97	
1.000	D3 04 3210 1010	Repair fan, induced draft, 2000 CFM	10	1 Stpi	Ea.	3.00	\$ 242.50	\$ 297.50	1.095	\$	325.76	0.97	
1.000	D3 04 3210 2010	Repair fan, induced draft, 6700 CFM	10	1 Stpi	Ea.	3.00	\$ 242.50	\$ 297.50	1.095	\$	325.76	0.97	
1.000	D3 04 3210 3010	Repair fan, induced draft, 17,700 CFM	10	1 Stpi	Ea.	3.22	\$ 262.50	\$ 322.50	1.095	\$	353.14	0.97	
1.000	D3 04 3220 3010	Replace utility set, belt drive, 800 CFM exhaust fan	10	Q20	Ea.	6.50	\$ 1,222.00	\$ 1,427.00	1.095	\$	1,562.57	0.97	
1.000	D3 04 3220 3020	Replace utility set, belt drive, 3600 CFM exhaust fan	10	Q20	Ea.	9.75	\$ 2,308.00	\$ 2,679.00	1.095	\$	2,933.51	0.97	
1.000	D3 04 3220 3030	Replace utility set, belt drive, 11,000 CFM exhaust fan	10	Q20	Ea.	19.50	\$ 5,740.00	\$ 6,655.00	1.095	\$	7,287.23	0.97	
1.000	D3 04 3220 3040	Replace utility set, belt drive, 3600 CFM exhaust fan	10	Q20	Ea.	48.77	\$ 8,990.00	\$ 10,550.00	1.095	\$	11,552.25	0.97	
1.000	D3 04 3220 4010	Replace axial flow fan, 3800 CFM exhaust fan	10	Q20	Ea.	11.47	\$ 5,590.00	\$ 6,444.00	1.095	\$	7,056.18	0.97	
1.000	D3 04 3220 4020	Replace axial flow fan, 6400 CFM exhaust fan	10	Q20	Ea.	13.93	\$ 6,312.00	\$ 7,250.00	1.095	\$	7,938.75	0.97	
1.000	D3 04 3220 4030	Replace axial flow fan, 15,600 CFM exhaust fan	10	Q20	Ea.	24.37	\$ 10,035.00	\$ 11,570.00	1.095	\$	12,669.15	0.97	
1.000	D3 04 3220 4040	Replace axial flow fan, 28,000 CFM exhaust fan	10	Q20	Ea.	97.46	\$ 20,325.00	\$ 23,800.00	1.095	\$	26,061.00	0.97	
1.000	D3 04 3520 1010	Repack gate valve gland, 3/8" - 1 - 1/2" valves	10	1 Stpi	Ea.	0.22	\$ 23.00	\$ 27.50	1.095	\$	30.11	0.97	
1.000	D3 04 3520 2010	Repack gate valve gland, 2" - 3" valves	10	1 Stpi	Ea.	0.29	\$ 30.50	\$ 36.50	1.095	\$	39.97	0.97	
1.000	D3 05 3110 1010	Repair unit heater, 12 MBH, 2 PSI steam	10	1 Stpi	Ea.	3.13	\$ 385.35	\$ 459.60	1.095	\$	503.26	0.97	
1.000	D3 05 3110 2010	Repair unit heater, 36 MBH, 2 PSI steam	10	1 Stpi	Ea.	3.13	\$ 485.35	\$ 574.60	1.095	\$	629.19	0.97	
1.000	D3 05 3110 3010	Repair unit heater, 85 MBH, 2 PSI steam	10	1 Stpi	Ea.	3.13	\$ 495.35	\$ 584.60	1.095	\$	640.14	0.97	
1.000	D3 05 3110 4010	Repair unit heater, 250 MBH, 2 PSI steam	10	1 Stpi	Ea.	3.67	\$ 532.35	\$ 633.10	1.095	\$	693.24	0.97	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
5% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 03 3260 1010	Repair evaporative condenser, 20 ton	\$ 11,202.76	1.05	\$ 12,121.24	0.97	\$ 11,762.90
1.000	D3 03 3260 2010	Repair evaporative condenser, 100 ton	\$ 16,047.28	1.05	\$ 17,362.95	0.97	\$ 16,849.65
1.000	D3 03 3260 3010	Repair evaporative condenser, 300 ton	\$ 19,666.60	1.05	\$ 21,279.00	0.97	\$ 20,649.93
1.000	D3 04 3120 1010	Repair fan coil unit, 1 ton	\$ 490.40	1.05	\$ 530.61	0.97	\$ 514.92
1.000	D3 04 3120 2010	Repair fan coil unit, 3 ton	\$ 623.23	1.05	\$ 674.33	0.97	\$ 654.39
1.000	D3 04 3120 3010	Repair fan coil unit, 5 ton	\$ 665.74	1.05	\$ 720.32	0.97	\$ 699.02
1.000	D3 04 3120 4010	Repair fan coil unit, 10 ton	\$ 757.65	1.05	\$ 819.77	0.97	\$ 795.54
1.000	D3 04 3120 5010	Repair fan coil unit, 20 ton	\$ 891.55	1.05	\$ 964.64	0.97	\$ 936.12
1.000	D3 04 3120 6010	Repair fan coil unit, 30 ton	\$ 1,243.28	1.05	\$ 1,345.21	0.97	\$ 1,305.44
1.000	D3 04 3122 1010	Repair fan coil, DX 1-1/2 ton, cooling only	\$ 1,798.50	1.05	\$ 1,945.95	0.97	\$ 1,888.42
1.000	D3 04 3122 2010	Repair fan coil, DX 2 ton, cooling only	\$ 1,847.91	1.05	\$ 1,999.42	0.97	\$ 1,940.31
1.000	D3 04 3122 3010	Repair fan coil, DX 2-1/2 ton, cooling only	\$ 2,088.07	1.05	\$ 2,259.26	0.97	\$ 2,192.47
1.000	D3 04 3122 4010	Repair fan coil, DX 3 ton, cooling only	\$ 2,018.99	1.05	\$ 2,184.53	0.97	\$ 2,119.94
1.000	D3 04 3122 5050	Repair fan coil, DX 5 ton, cooling only	\$ 2,353.72	1.05	\$ 2,546.70	0.97	\$ 2,471.41
1.000	D3 04 3122 7070	Repair fan coil, DX 10 ton, cooling only	\$ 16,687.52	1.05	\$ 18,055.67	0.97	\$ 17,521.89
1.000	D3 04 3122 9090	Repair fan coil, DX 20 ton, cooling only	\$ 25,013.21	1.05	\$ 27,063.97	0.97	\$ 26,263.87
1.000	D3 04 3124 5010	Replace fan coil, DX 5 ton, with heat	\$ 3,590.62	1.05	\$ 3,885.01	0.97	\$ 3,770.15
1.000	D3 04 3124 6010	Replace fan coil, DX 10 ton, with heat	\$ 7,172.74	1.05	\$ 7,760.81	0.97	\$ 7,531.38
1.000	D3 04 3124 7010	Replace fan coil, DX 20 ton, with heat	\$ 17,480.24	1.05	\$ 18,913.39	0.97	\$ 18,354.25
1.000	D3 04 3128 1010	Repair unit ventilator, 750 CFM, 2 ton	\$ 553.20	1.05	\$ 598.56	0.97	\$ 580.86
1.000	D3 04 3128 2010	Repair unit ventilator, 1250 CFM, 3 ton	\$ 686.03	1.05	\$ 742.28	0.97	\$ 720.33
1.000	D3 04 3128 2040	Repair unit ventilator, 2000 CFM, 5 ton	\$ 736.93	1.05	\$ 797.35	0.97	\$ 773.78
1.000	D3 04 3210 1010	Repair fan, induced draft, 2000 CFM	\$ 316.13	1.05	\$ 342.05	0.97	\$ 331.94
1.000	D3 04 3210 2010	Repair fan, induced draft, 6700 CFM	\$ 316.13	1.05	\$ 342.05	0.97	\$ 331.94
1.000	D3 04 3210 3010	Repair fan, induced draft, 17,700 CFM	\$ 342.70	1.05	\$ 370.79	0.97	\$ 359.83
1.000	D3 04 3220 3010	Replace utility set, belt drive, 800 CFM exhaust fan	\$ 1,516.37	1.05	\$ 1,640.69	0.97	\$ 1,592.19
1.000	D3 04 3220 3020	Replace utility set, belt drive, 3600 CFM exhaust fan	\$ 2,846.78	1.05	\$ 3,080.18	0.97	\$ 2,989.12
1.000	D3 04 3220 3030	Replace utility set, belt drive, 11,000 CFM exhaust fan	\$ 7,071.79	1.05	\$ 7,651.59	0.97	\$ 7,425.38
1.000	D3 04 3220 3040	Replace utility set, belt drive, 3600 CFM exhaust fan	\$ 11,210.73	1.05	\$ 12,129.86	0.97	\$ 11,771.27
1.000	D3 04 3220 4010	Replace axial flow fan, 3800 CFM exhaust fan	\$ 6,847.58	1.05	\$ 7,408.99	0.97	\$ 7,189.96
1.000	D3 04 3220 4020	Replace axial flow fan, 6400 CFM exhaust fan	\$ 7,704.06	1.05	\$ 8,335.69	0.97	\$ 8,089.26
1.000	D3 04 3220 4030	Replace axial flow fan, 15,600 CFM exhaust fan	\$ 12,294.61	1.05	\$ 13,302.61	0.97	\$ 12,909.34
1.000	D3 04 3220 4040	Replace axial flow fan, 28,000 CFM exhaust fan	\$ 25,290.56	1.05	\$ 27,364.05	0.97	\$ 26,555.09
1.000	D3 04 3520 1010	Repack gate valve gland, 3/8" - 1 - 1/2" valves	\$ 29.22	1.05	\$ 31.62	0.97	\$ 30.68
1.000	D3 04 3520 2010	Repack gate valve gland, 2" - 3" valves	\$ 38.79	1.05	\$ 41.97	0.97	\$ 40.73
1.000	D3 05 3110 1010	Repair unit heater, 12 MBH, 2 PSI steam	\$ 488.38	1.05	\$ 528.43	0.97	\$ 512.80
1.000	D3 05 3110 2010	Repair unit heater, 36 MBH, 2 PSI steam	\$ 610.59	1.05	\$ 660.65	0.97	\$ 641.12
1.000	D3 05 3110 3010	Repair unit heater, 85 MBH, 2 PSI steam	\$ 621.21	1.05	\$ 672.14	0.97	\$ 652.27
1.000	D3 05 3110 4010	Repair unit heater, 250 MBH, 2 PSI steam	\$ 672.75	1.05	\$ 727.91	0.97	\$ 706.39

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
5% GF												
CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation												
		6%										
De-Escalation to July 2009												
		1.03										
De-Escalation Factor to be Applied												
		0.97										
Green Factor												
		1.05		Assumed Value								
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 05 3110 5010	Repair unit heater, 400 MBH, 2 PSI steam	10	1 Stpi	Ea.	3.67	\$ 582.35	\$ 688.10	1.095	\$ 753.47	0.97	
1.000	D3 05 3170 1010	Repair terminal reheat, 12" x 24" coil	10	1 Stpi	Ea.	1.20	\$ 77.00	\$ 96.50	1.095	\$ 105.67	0.97	
1.000	D3 05 3170 2010	Repair terminal reheat, 18" x 24" coil	10	1 Stpi	Ea.	1.40	\$ 90.00	\$ 113.00	1.095	\$ 123.74	0.97	
1.000	D3 05 3170 3010	Repair terminal reheat, 36" x 36" coil	10	1 Stpi	Ea.	2.20	\$ 141.00	\$ 177.00	1.095	\$ 193.82	0.97	
1.000	D3 05 3170 4010	Repair terminal reheat, 48" x 126" coil	10	1 Stpi	Ea.	4.00	\$ 257.00	\$ 320.00	1.095	\$ 350.40	0.97	
1.000	D3 05 3245 1010	Repair heat pump, 1.5 ton, air to air split	10	1 Stpi	Ea.	15.66	\$ 1,662.00	\$ 2,008.50	1.095	\$ 2,199.31	0.97	
1.000	D3 05 3245 2010	Repair heat pump, 5 ton, air to air split	10	1 Stpi	Ea.	17.68	\$ 2,172.50	\$ 2,597.00	1.095	\$ 2,843.72	0.97	
1.000	D3 05 3245 3010	Repair heat pump, 10 ton, air to air split	10	Q5	Ea.	23.74	\$ 3,525.50	\$ 4,177.00	1.095	\$ 4,573.82	0.97	
1.000	D3 05 3245 4010	Repair heat pump, 25 ton, air to air split	10	Q5	Ea.	43.48	\$ 6,931.50	\$ 8,175.50	1.095	\$ 8,952.17	0.97	
1.000	D3 05 3245 5010	Repair heat pump, 50 ton, air to air split	10	Q6	Ea.	253.91	\$ 37,759.50	\$ 44,695.00	1.095	\$ 48,941.03	0.97	
1.000	D3 05 3245 6010	Repair heat pump, thru-wall unit, 1.5 ton	10	1 Stpi	Ea.	15.66	\$ 1,662.00	\$ 2,008.50	1.095	\$ 2,199.31	0.97	
1.000	D3 05 3245 7010	Repair heat pump, thru-wall unit, 5 ton	10	1 Stpi	Ea.	17.68	\$ 2,172.50	\$ 2,597.00	1.095	\$ 2,843.72	0.97	
1.000	D3 05 3265 1030	Replace air conditioner, window, 1 ton	10	L2	Ea.	3.30	\$ 853.00	\$ 988.00	1.095	\$ 1,081.86	0.97	
1.000	D3 05 3266 2030	Replace air conditioner, window, 2 ton	10	L2	Ea.	7.80	\$ 1,551.00	\$ 1,806.00	1.095	\$ 1,977.57	0.97	
1.000	D3 05 3272 1010	Repair air conditioner, DX, 5 ton	10	1 Stpi	Ea.	27.64	\$ 3,668.00	\$ 4,368.00	1.095	\$ 4,782.96	0.97	
1.000	D3 05 3272 2010	Repair air conditioner, DX, 20 ton	10	Q6	Ea.	97.65	\$ 25,654.00	\$ 29,831.50	1.095	\$ 32,665.49	0.97	
1.000	D3 05 3272 3010	Repair air conditioner, DX, 50 ton	10	Q6	Ea.	265.86	\$ 43,711.50	\$ 51,544.50	1.095	\$ 56,441.23	0.97	
1.000	D3 05 3274 1010	Repair computer room air conditioner, air cooled, 5 ton	10	1 Stpi	Ea.	28.44	\$ 3,779.00	\$ 4,500.00	1.095	\$ 4,927.50	0.97	
1.000	D3 05 3274 1020	Repair computer room air conditioner, air cooled, 10 ton	10	1 Stpi	Ea.	66.20	\$ 15,726.50	\$ 18,367.00	1.095	\$ 20,111.87	0.97	
1.000	D3 05 3274 1030	Repair computer room air conditioner, air cooled, 15 ton	10	1 Stpi	Ea.	89.56	\$ 22,293.00	\$ 25,997.00	1.095	\$ 28,466.72	0.97	
1.000	D3 05 3274 1040	Repair computer room air conditioner, air cooled, 20 ton	10	1 Stpi	Ea.	99.78	\$ 25,990.00	\$ 30,225.50	1.095	\$ 33,096.92	0.97	
1.000	D3 05 3276 1010	Repair computer room A/C, chilled water, 5 ton	10	1 Stpi	Ea.	34.12	\$ 6,773.00	\$ 7,931.00	1.095	\$ 8,684.45	0.97	
1.000	D3 05 3276 1020	Repair computer room A/C, chilled water, 10 ton	10	1 Stpi	Ea.	34.12	\$ 6,822.50	\$ 7,986.00	1.095	\$ 8,744.67	0.97	
1.000	D3 05 3276 1030	Repair computer room A/C, chilled water, 15 ton	10	1 Stpi	Ea.	34.22	\$ 6,844.00	\$ 8,009.00	1.095	\$ 8,769.86	0.97	
1.000	D3 05 3276 1040	Repair computer room A/C, chilled water, 20 ton	10	1 Stpi	Ea.	54.46	\$ 18,669.00	\$ 21,559.00	1.095	\$ 23,607.11	0.97	
1.000	D3 05 3278 1010	Repair multi-zone rooftop unit, 15 ton	10	Q6	Ea.	73.34	\$ 19,768.00	\$ 23,005.50	1.095	\$ 25,191.02	0.97	
1.000	D3 05 3278 2010	Repair multi-zone rooftop unit, 25 ton	10	Q6	Ea.	97.07	\$ 27,388.00	\$ 31,844.50	1.095	\$ 34,869.73	0.97	
1.000	D3 05 3278 3010	Repair multi-zone rooftop unit, 40 ton	10	Q6	Ea.	123.97	\$ 27,378.50	\$ 32,003.50	1.095	\$ 35,043.83	0.97	
1.000	D3 05 3278 4010	Repair multi-zone rooftop unit, 70 ton	10	Q7	Ea.	251.23	\$ 39,529.50	\$ 46,743.50	1.095	\$ 51,184.13	0.97	
1.000	D3 05 3278 5010	Repair multi-zone rooftop unit, 105 ton	10	Q7	Ea.	273.02	\$ 41,014.50	\$ 48,531.50	1.095	\$ 53,141.99	0.97	
1.000	D3 05 3280 1001	Repair single zone rt. unit, 3 ton	10	2 Stpi	Ea.	17.84	\$ 1,966.80	\$ 2,365.00	1.095	\$ 2,589.68	0.97	
1.000	D3 05 3280 1003	Repair single zone rt. unit, 5 ton	10	2 Stpi	Ea.	18.27	\$ 2,136.80	\$ 2,565.00	1.095	\$ 2,808.68	0.97	
1.000	D3 05 3280 1005	Repair single zone rt. unit, 7.5 ton	10	2 Stpi	Ea.	21.83	\$ 2,953.00	\$ 3,507.00	1.095	\$ 3,840.17	0.97	
1.000	D3 05 3280 1007	Repair single zone rt. unit, 10 ton	10	2 Stpi	Ea.	54.79	\$ 13,769.00	\$ 16,062.00	1.095	\$ 17,587.89	0.97	
1.000	D3 05 3280 1010	Repair single zone rooftop unit, 15 ton	10	2 Stpi	Ea.	76.72	\$ 20,010.50	\$ 23,315.00	1.095	\$ 25,529.93	0.97	
1.000	D3 05 3280 2010	Repair single zone rooftop unit, 25 ton	10	Q6	Ea.	96.57	\$ 27,355.50	\$ 31,804.00	1.095	\$ 34,825.38	0.97	
1.000	D3 05 3280 3010	Repair single zone rooftop unit, 60 ton	10	Q6	Ea.	298.68	\$ 43,236.00	\$ 51,258.00	1.095	\$ 56,127.51	0.97	
1.000	D3 05 3280 4010	Repair single zone rooftop unit, 100 ton	10	Q7	Ea.	330.39	\$ 49,332.00	\$ 58,291.00	1.095	\$ 63,828.65	0.97	
1.000	D3 05 3282 1010	Repair multi-zone variable volume, 50 ton	10	Q6	Ea.	251.40	\$ 36,162.50	\$ 42,863.00	1.095	\$ 46,934.99	0.97	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹								
5% GF								
CostWorks 2010 - EAST HALL								
Based on National Averages								
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN								
Escalation								
	6%							
De-Escalation to July 2009								
	1.03							
De-Escalation Factor to be Applied								
	0.97							
Green Factor								
	1.05	Assumed Value						
GREEN								
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments	
1.000	D3 05 3110 5010	Repair unit heater, 400 MBH, 2 PSI steam	\$ 731.19	1.05	\$ 791.14	0.97	\$ 767.75	
1.000	D3 05 3170 1010	Repair terminal reheat, 12" x 24" coil	\$ 102.54	1.05	\$ 110.95	0.97	\$ 107.67	
1.000	D3 05 3170 2010	Repair terminal reheat, 18" x 24" coil	\$ 120.08	1.05	\$ 129.92	0.97	\$ 126.08	
1.000	D3 05 3170 3010	Repair terminal reheat, 36" x 36" coil	\$ 188.09	1.05	\$ 203.51	0.97	\$ 197.49	
1.000	D3 05 3170 4010	Repair terminal reheat, 48" x 126" coil	\$ 340.04	1.05	\$ 367.92	0.97	\$ 357.04	
1.000	D3 05 3245 1010	Repair heat pump, 1.5 ton, air to air split	\$ 2,134.29	1.05	\$ 2,309.27	0.97	\$ 2,241.00	
1.000	D3 05 3245 2010	Repair heat pump, 5 ton, air to air split	\$ 2,759.65	1.05	\$ 2,985.90	0.97	\$ 2,897.63	
1.000	D3 05 3245 3010	Repair heat pump, 10 ton, air to air split	\$ 4,438.60	1.05	\$ 4,802.51	0.97	\$ 4,660.53	
1.000	D3 05 3245 4010	Repair heat pump, 25 ton, air to air split	\$ 8,687.52	1.05	\$ 9,399.78	0.97	\$ 9,121.90	
1.000	D3 05 3245 5010	Repair heat pump, 50 ton, air to air split	\$ 47,494.18	1.05	\$ 51,388.08	0.97	\$ 49,868.89	
1.000	D3 05 3245 6010	Repair heat pump, thru-wall unit, 1.5 ton	\$ 2,134.29	1.05	\$ 2,309.27	0.97	\$ 2,241.00	
1.000	D3 05 3245 7010	Repair heat pump, thru-wall unit, 5 ton	\$ 2,759.65	1.05	\$ 2,985.90	0.97	\$ 2,897.63	
1.000	D3 05 3265 1030	Replace air conditioner, window, 1 ton	\$ 1,049.88	1.05	\$ 1,135.95	0.97	\$ 1,102.37	
1.000	D3 05 3266 2030	Replace air conditioner, window, 2 ton	\$ 1,919.11	1.05	\$ 2,076.45	0.97	\$ 2,015.06	
1.000	D3 05 3272 1010	Repair air conditioner, DX, 5 ton	\$ 4,641.56	1.05	\$ 5,022.11	0.97	\$ 4,873.64	
1.000	D3 05 3272 2010	Repair air conditioner, DX, 20 ton	\$ 31,699.80	1.05	\$ 34,298.77	0.97	\$ 33,284.79	
1.000	D3 05 3272 3010	Repair air conditioner, DX, 50 ton	\$ 54,772.65	1.05	\$ 59,263.29	0.97	\$ 57,511.29	
1.000	D3 05 3274 1010	Repair computer room air conditioner, air cooled, 5 ton	\$ 4,781.83	1.05	\$ 5,173.88	0.97	\$ 5,020.92	
1.000	D3 05 3274 1020	Repair computer room air conditioner, air cooled, 10 ton	\$ 19,517.30	1.05	\$ 21,117.46	0.97	\$ 20,493.16	
1.000	D3 05 3274 1030	Repair computer room air conditioner, air cooled, 15 ton	\$ 27,625.15	1.05	\$ 29,890.05	0.97	\$ 29,006.41	
1.000	D3 05 3274 1040	Repair computer room air conditioner, air cooled, 20 ton	\$ 32,118.48	1.05	\$ 34,751.77	0.97	\$ 33,724.40	
1.000	D3 05 3276 1010	Repair computer room A/C, chilled water, 5 ton	\$ 8,427.71	1.05	\$ 9,118.67	0.97	\$ 8,849.09	
1.000	D3 05 3276 1020	Repair computer room A/C, chilled water, 10 ton	\$ 8,486.15	1.05	\$ 9,181.90	0.97	\$ 8,910.46	
1.000	D3 05 3276 1030	Repair computer room A/C, chilled water, 15 ton	\$ 8,510.59	1.05	\$ 9,208.35	0.97	\$ 8,936.12	
1.000	D3 05 3276 1040	Repair computer room A/C, chilled water, 20 ton	\$ 22,909.21	1.05	\$ 24,787.46	0.97	\$ 24,054.67	
1.000	D3 05 3278 1010	Repair multi-zone rooftop unit, 15 ton	\$ 24,446.30	1.05	\$ 26,450.57	0.97	\$ 25,668.61	
1.000	D3 05 3278 2010	Repair multi-zone rooftop unit, 25 ton	\$ 33,838.87	1.05	\$ 36,613.21	0.97	\$ 35,530.82	
1.000	D3 05 3278 3010	Repair multi-zone rooftop unit, 40 ton	\$ 34,007.83	1.05	\$ 36,796.02	0.97	\$ 35,708.22	
1.000	D3 05 3278 4010	Repair multi-zone rooftop unit, 70 ton	\$ 49,670.98	1.05	\$ 53,743.34	0.97	\$ 52,154.52	
1.000	D3 05 3278 5010	Repair multi-zone rooftop unit, 105 ton	\$ 51,570.96	1.05	\$ 55,799.09	0.97	\$ 54,149.50	
1.000	D3 05 3280 1001	Repair single zone rt. unit, 3 ton	\$ 2,513.12	1.05	\$ 2,719.16	0.97	\$ 2,638.77	
1.000	D3 05 3280 1003	Repair single zone rt. unit, 5 ton	\$ 2,725.64	1.05	\$ 2,949.11	0.97	\$ 2,861.92	
1.000	D3 05 3280 1005	Repair single zone rt. unit, 7.5 ton	\$ 3,726.64	1.05	\$ 4,032.17	0.97	\$ 3,912.97	
1.000	D3 05 3280 1007	Repair single zone rt. unit, 10 ton	\$ 17,067.94	1.05	\$ 18,467.28	0.97	\$ 17,921.34	
1.000	D3 05 3280 1010	Repair single zone rooftop unit, 15 ton	\$ 24,775.18	1.05	\$ 26,806.42	0.97	\$ 26,013.94	
1.000	D3 05 3280 2010	Repair single zone rooftop unit, 25 ton	\$ 33,795.84	1.05	\$ 36,566.65	0.97	\$ 35,485.63	
1.000	D3 05 3280 3010	Repair single zone rooftop unit, 60 ton	\$ 54,468.21	1.05	\$ 58,933.89	0.97	\$ 57,191.62	
1.000	D3 05 3280 4010	Repair single zone rooftop unit, 100 ton	\$ 61,941.68	1.05	\$ 67,020.08	0.97	\$ 65,038.76	
1.000	D3 05 3282 1010	Repair multi-zone variable volume, 50 ton	\$ 45,547.45	1.05	\$ 49,281.73	0.97	\$ 47,824.82	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹													
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ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN													
Escalation	6%												
De-Escalation to July 2009	1.03											NON-GREEN	
De-Escalation Factor to be Applied	0.97												
Green Factor	1.05		Assumed Value										
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor		
1.000	D3 05 3282 2010	Repair multi-zone variable volume, 70 ton	10	Q7	Ea.	251.53	\$ 39,548.50	\$ 46,768.00	1.095	\$ 51,210.96	0.97		
1.000	D3 05 3282 3010	Repair multi-zone variable volume, 90 ton	10	Q7	Ea.	301.32	\$ 47,118.50	\$ 55,770.00	1.095	\$ 61,068.15	0.97		
1.000	D3 05 3282 4010	Repair multi-zone variable volume, 105 ton	10	Q7	Ea.	273.99	\$ 41,158.50	\$ 48,681.00	1.095	\$ 53,305.70	0.97		
1.000	D3 05 3282 5010	Repair multi-zone variable volume, 140 ton	10	Q7	Ea.	367.75	\$ 54,993.50	\$ 65,023.00	1.095	\$ 71,200.19	0.97		
1.000	D3 05 3284 1010	Repair single zone variable volume, 20 ton	10	Q6	Ea.	79.76	\$ 22,028.00	\$ 25,577.50	1.095	\$ 28,007.36	0.97		
1.000	D3 05 3284 1040	Replace single zone variable volume, 20 ton	10	Q7	Ea.	136.49	\$ 38,175.00	\$ 44,275.00	1.095	\$ 48,481.13	0.97		
1.000	D3 05 3284 2010	Repair single zone variable volume, 30 ton	10	Q6	Ea.	114.54	\$ 32,813.00	\$ 38,054.50	1.095	\$ 41,669.68	0.97		
1.000	D3 05 3284 2040	Replace single zone variable volume, 30 ton	10	Q7	Ea.	196.29	\$ 47,975.00	\$ 55,875.00	1.095	\$ 61,183.13	0.97		
1.000	D3 05 3284 3010	Repair single zone variable volume, 40 ton	10	Q6	Ea.	123.35	\$ 27,403.00	\$ 32,024.50	1.095	\$ 35,066.83	0.97		
1.000	D3 05 3284 3040	Replace single zone variable volume, 40 ton	10	Q7	Ea.	265.10	\$ 64,250.00	\$ 75,400.00	1.095	\$ 82,563.00	0.97		
1.000	D3 05 3284 4010	Repair single zone variable volume, 60 ton	10	Q6	Ea.	298.02	\$ 43,121.00	\$ 51,128.00	1.095	\$ 55,985.16	0.97		
1.000	D3 05 3284 4040	Replace single zone variable volume, 60 ton	10	Q7	Ea.	374.00	\$ 86,100.00	\$ 100,000.00	1.095	\$ 109,500.00	0.97		
1.000	D3 05 3286 1010	Repair central station A.H.U., 1300 CFM	10	1 Stpi	Ea.	3.45	\$ 516.30	\$ 610.50	1.095	\$ 668.50	0.97		
1.000	D3 05 3286 2010	Repair central station A.H.U., 1900 CFM	10	1 Stpi	Ea.	3.81	\$ 546.30	\$ 650.50	1.095	\$ 712.30	0.97		
1.000	D3 05 3286 3010	Repair central station A.H.U., 5400 CFM	10	1 Stpi	Ea.	4.01	\$ 624.30	\$ 737.00	1.095	\$ 807.02	0.97		
1.000	D3 05 3286 4010	Repair central station A.H.U., 8000 CFM	10	1 Stpi	Ea.	4.21	\$ 732.30	\$ 863.00	1.095	\$ 944.99	0.97		
1.000	D3 05 3286 5010	Repair central station A.H.U., 16,000 CFM	10	1 Stpi	Ea.	4.70	\$ 1,015.30	\$ 1,194.00	1.095	\$ 1,307.43	0.97		
1.000	D3 05 3286 6010	Repair central station A.H.U., 33,500 CFM	10	1 Stpi	Ea.	8.10	\$ 2,725.30	\$ 3,145.00	1.095	\$ 3,443.78	0.97		
1.000	D3 05 3286 7010	Repair central station A.H.U., 63,000 CFM	10	1 Stpi	Ea.	13.33	\$ 4,179.30	\$ 4,849.00	1.095	\$ 5,309.66	0.97		
1.000	D3 05 3310 1010	Repair furnace, gas, 25 MBH residential	10	Q1	Ea.	7.25	\$ 888.35	\$ 1,058.00	1.095	\$ 1,158.51	0.97		
1.000	D3 05 3310 2010	Repair furnace, gas, 100 MBH residential	10	Q1	Ea.	7.89	\$ 1,317.80	\$ 1,555.50	1.095	\$ 1,703.27	0.97		
1.000	D3 05 3310 3010	Repair furnace, gas, 200 MBH residential	10	Q1	Ea.	17.88	\$ 2,630.50	\$ 3,122.50	1.095	\$ 3,419.14	0.97		
1.000	D3 05 3320 1010	Repair furnace, oil, 55 MBH residential	10	Q1	Ea.	17.85	\$ 1,706.50	\$ 2,059.00	1.095	\$ 2,254.61	0.97		
1.000	D3 05 3320 2010	Repair furnace, oil, 100 MBH residential	10	Q1	Ea.	17.91	\$ 1,729.00	\$ 2,085.50	1.095	\$ 2,283.62	0.97		
1.000	D3 05 3320 3010	Repair furnace, oil, 200 MBH residential	10	Q1	Ea.	17.99	\$ 1,763.50	\$ 2,124.50	1.095	\$ 2,326.33	0.97		
1.000	D3 05 3330 1010	Repair furnace, electric, 25 MBH residential	10	Q20	Ea.	6.03	\$ 1,853.50	\$ 2,144.50	1.095	\$ 2,348.23	0.97		
1.000	D3 05 3330 2010	Repair furnace, electric, 50 MBH residential	10	Q20	Ea.	6.21	\$ 1,882.00	\$ 2,174.00	1.095	\$ 2,380.53	0.97		
1.000	D3 05 3330 3010	Repair furnace, electric, 85 MBH residential	10	Q20	Ea.	6.68	\$ 3,090.50	\$ 3,549.50	1.095	\$ 3,886.70	0.97		
1.000	D4 01 3110 3010	Rebuild 4" diameter reduced pressure backflow preventer	10	1 Plum	Ea.	2.92	\$ 509.40	\$ 598.95	1.095	\$ 655.85	0.97		
1.000	D4 01 3110 3020	Rebuild 6" diameter reduced pressure backflow preventer	10	1 Plum	Ea.	3.94	\$ 590.40	\$ 700.15	1.095	\$ 766.66	0.97		
1.000	D4 01 3110 3030	Rebuild 8" diameter reduced pressure backflow preventer	10	1 Plum	Ea.	4.95	\$ 736.55	\$ 876.65	1.095	\$ 959.93	0.97		
1.000	D4 01 3110 3040	Rebuild 10" diameter reduced pressure backflow preventer	10	1 Plum	Ea.	5.97	\$ 873.00	\$ 1,038.40	1.095	\$ 1,137.05	0.97		
							\$ 2,635,025.95	\$ 3,095,086.35					
1.000	D3 01 3210 0110	Replace 10' of buried 2" diam steel pipe/M.L.F. natural gas	12	Q4	Ea.	10.68	\$ 659.67	\$ 804.59	1.095	\$ 881.03	0.97		
1.000	D3 01 3210 0120	Replace 10' of buried 3" diam steel pipe/M.L.F. natural gas	12	Q4	Ea.	10.83	\$ 758.17	\$ 911.09	1.095	\$ 997.64	0.97		

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹								
5% GF								
CostWorks 2010 - EAST HALL								
Based on National Averages								
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN								
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.05	Assumed Value						
				GREEN				
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments	
1.000	D3 05 3282 2010	Repair multi-zone variable volume, 70 ton	\$ 49,697.01	1.05	\$ 53,771.51	0.97	\$ 52,181.86	
1.000	D3 05 3282 3010	Repair multi-zone variable volume, 90 ton	\$ 59,262.79	1.05	\$ 64,121.56	0.97	\$ 62,225.93	
1.000	D3 05 3282 4010	Repair multi-zone variable volume, 105 ton	\$ 51,729.82	1.05	\$ 55,970.98	0.97	\$ 54,316.31	
1.000	D3 05 3282 5010	Repair multi-zone variable volume, 140 ton	\$ 69,095.29	1.05	\$ 74,760.19	0.97	\$ 72,550.06	
1.000	D3 05 3284 1010	Repair single zone variable volume, 20 ton	\$ 27,179.38	1.05	\$ 29,407.73	0.97	\$ 28,538.35	
1.000	D3 05 3284 1040	Replace single zone variable volume, 20 ton	\$ 47,047.88	1.05	\$ 50,905.18	0.97	\$ 49,400.27	
1.000	D3 05 3284 2010	Repair single zone variable volume, 30 ton	\$ 40,437.80	1.05	\$ 43,753.16	0.97	\$ 42,459.69	
1.000	D3 05 3284 2040	Replace single zone variable volume, 30 ton	\$ 59,374.37	1.05	\$ 64,242.28	0.97	\$ 62,343.09	
1.000	D3 05 3284 3010	Repair single zone variable volume, 40 ton	\$ 34,030.15	1.05	\$ 36,820.17	0.97	\$ 35,731.65	
1.000	D3 05 3284 3040	Replace single zone variable volume, 40 ton	\$ 80,122.19	1.05	\$ 86,691.15	0.97	\$ 84,128.30	
1.000	D3 05 3284 4010	Repair single zone variable volume, 60 ton	\$ 54,330.07	1.05	\$ 58,784.42	0.97	\$ 57,046.57	
1.000	D3 05 3284 4040	Replace single zone variable volume, 60 ton	\$ 106,262.85	1.05	\$ 114,975.00	0.97	\$ 111,575.99	
1.000	D3 05 3286 1010	Repair central station A.H.U., 1300 CFM	\$ 648.73	1.05	\$ 701.92	0.97	\$ 681.17	
1.000	D3 05 3286 2010	Repair central station A.H.U., 1900 CFM	\$ 691.24	1.05	\$ 747.91	0.97	\$ 725.80	
1.000	D3 05 3286 3010	Repair central station A.H.U., 5400 CFM	\$ 783.16	1.05	\$ 847.37	0.97	\$ 822.32	
1.000	D3 05 3286 4010	Repair central station A.H.U., 8000 CFM	\$ 917.05	1.05	\$ 992.23	0.97	\$ 962.90	
1.000	D3 05 3286 5010	Repair central station A.H.U., 16,000 CFM	\$ 1,268.78	1.05	\$ 1,372.80	0.97	\$ 1,332.22	
1.000	D3 05 3286 6010	Repair central station A.H.U., 33,500 CFM	\$ 3,341.97	1.05	\$ 3,615.96	0.97	\$ 3,509.06	
1.000	D3 05 3286 7010	Repair central station A.H.U., 63,000 CFM	\$ 5,152.69	1.05	\$ 5,575.14	0.97	\$ 5,410.32	
1.000	D3 05 3310 1010	Repair furnace, gas, 25 MBH residential	\$ 1,124.26	1.05	\$ 1,216.44	0.97	\$ 1,180.47	
1.000	D3 05 3310 2010	Repair furnace, gas, 100 MBH residential	\$ 1,652.92	1.05	\$ 1,788.44	0.97	\$ 1,735.56	
1.000	D3 05 3310 3010	Repair furnace, gas, 200 MBH residential	\$ 3,318.06	1.05	\$ 3,590.09	0.97	\$ 3,483.96	
1.000	D3 05 3320 1010	Repair furnace, oil, 55 MBH residential	\$ 2,187.95	1.05	\$ 2,367.34	0.97	\$ 2,297.35	
1.000	D3 05 3320 2010	Repair furnace, oil, 100 MBH residential	\$ 2,216.11	1.05	\$ 2,397.80	0.97	\$ 2,326.92	
1.000	D3 05 3320 3010	Repair furnace, oil, 200 MBH residential	\$ 2,257.55	1.05	\$ 2,442.64	0.97	\$ 2,370.43	
1.000	D3 05 3330 1010	Repair furnace, electric, 25 MBH residential	\$ 2,278.81	1.05	\$ 2,465.64	0.97	\$ 2,392.75	
1.000	D3 05 3330 2010	Repair furnace, electric, 50 MBH residential	\$ 2,310.15	1.05	\$ 2,499.56	0.97	\$ 2,425.66	
1.000	D3 05 3330 3010	Repair furnace, electric, 85 MBH residential	\$ 3,771.80	1.05	\$ 4,081.04	0.97	\$ 3,960.39	
1.000	D4 01 3110 3010	Rebuild 4" diameter reduced pressure backflow preventer	\$ 636.46	1.05	\$ 688.64	0.97	\$ 668.28	
1.000	D4 01 3110 3020	Rebuild 6" diameter reduced pressure backflow preventer	\$ 744.00	1.05	\$ 805.00	0.97	\$ 781.20	
1.000	D4 01 3110 3030	Rebuild 8" diameter reduced pressure backflow preventer	\$ 931.55	1.05	\$ 1,007.93	0.97	\$ 978.13	
1.000	D4 01 3110 3040	Rebuild 10" diameter reduced pressure backflow preventer	\$ 1,103.43	1.05	\$ 1,193.90	0.97	\$ 1,158.61	
			\$ 3,288,926.96				\$ 3,453,373.31	
			\$ 657,785.39	Assume 20% required		Assume 20% required	\$ 690,674.66	
				PER 10 YEARS		PER 10 YEARS		
1.000	D3 01 3210 0110	Replace 10' of buried 2" diam steel pipe/M.L.F. natural gas	\$ 854.98	1.05	\$ 925.08	0.97	\$ 897.73	
1.000	D3 01 3210 0120	Replace 10' of buried 3" diam steel pipe/M.L.F. natural gas	\$ 968.15	1.05	\$ 1,047.53	0.97	\$ 1,016.56	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
5% GF												
CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation	6%											
De-Escalation to July 2009	1.03											NON-GREEN
De-Escalation Factor to be Applied	0.97											
Green Factor	1.05	Assumed Value										
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 01 3210 0130	Replace 10' of buried 4" diam steel pipe/M.L.F. natural gas	12	B35	Ea.	11.91	\$ 910.67	\$ 1,089.09	1.095	\$ 1,192.55	0.97	
1.000	D3 01 3210 0140	Replace 10' of buried 6" diam steel pipe/M.L.F. natural gas	12	B35	Ea.	13.20	\$ 1,215.67	\$ 1,445.09	1.095	\$ 1,582.37	0.97	
1.000	D3 01 3210 0410	Replace 10' of hung 2" diam steel pipe/M.L.F. natural gas	12	Q1	Ea.	6.79	\$ 542.53	\$ 666.29	1.095	\$ 729.59	0.97	
1.000	D3 01 3210 0420	Replace 10' of hung 3" diam steel pipe/M.L.F. natural gas	12	Q15	Ea.	8.18	\$ 629.67	\$ 769.09	1.095	\$ 842.15	0.97	
1.000	D3 01 3210 0430	Replace 10' of hung 4" diam steel pipe/M.L.F. natural gas	12	Q15	Ea.	9.36	\$ 758.67	\$ 920.09	1.095	\$ 1,007.50	0.97	
1.000	D3 01 3210 0440	Replace 10' of hung 6" diam steel pipe/M.L.F. natural gas	12	Q16	Ea.	13.93	\$ 1,179.67	\$ 1,434.09	1.095	\$ 1,570.33	0.97	
1.000	D3 01 3260 0120	Replace 10' steel pipe 1/2" diam. per M.L.F. LPG distribution	12	1 Plum	Ea.	3.40	\$ 259.17	\$ 318.59	1.095	\$ 348.86	0.97	
1.000	D3 01 3260 0220	Replace 10' steel pipe 3/4" diam. per M.L.F. LPG distribution	12	1 Plum	Ea.	3.09	\$ 246.67	\$ 303.09	1.095	\$ 331.88	0.97	
1.000	D3 01 3260 0320	Replace 10' steel pipe 1" diam. per M.L.F. LPG distribution	12	1 Plum	Ea.	3.87	\$ 319.17	\$ 390.09	1.095	\$ 427.15	0.97	
1.000	D3 01 3260 0420	Replace 10' steel pipe 1-1/4" diam. M.L.F. LPG distribution	12	Q1	Ea.	4.43	\$ 352.67	\$ 428.09	1.095	\$ 468.76	0.97	
1.000	D3 01 3260 0520	Replace 10' steel pipe 1-1/2" diam. M.L.F. LPG distribution	12	Q1	Ea.	4.83	\$ 390.17	\$ 473.59	1.095	\$ 518.58	0.97	
1.000	D3 01 3260 0620	Replace 10' section steel pipe 2" diam. M.L.F. LPG distribution	12	Q1	Ea.	5.80	\$ 479.17	\$ 587.09	1.095	\$ 642.86	0.97	
1.000	D3 02 3388 1060	Replace coal spreader pneumatic	12	4 Stpi	Ea.	195.04	\$ 19,875.00	\$ 24,125.00	1.095	\$ 26,416.88	0.97	
							\$ 28,576.74	\$ 34,664.96				
1.000	D3 01 3240 0110	Replace pressure regulator 1/2" diam. pipe natural gas	14	1 Stpi	Ea.	0.66	\$ 89.09	\$ 106.25	1.095	\$ 116.34	0.97	
1.000	D3 01 3240 0120	Replace pressure regulator 1" diam. pipe natural gas	14	1 Stpi	Ea.	0.83	\$ 148.24	\$ 174.80	1.095	\$ 191.41	0.97	
1.000	D3 01 3240 0130	Replace pressure regulator 1-1/2" diam. pipe natural gas	14	1 Stpi	Ea.	1.21	\$ 686.14	\$ 792.80	1.095	\$ 868.12	0.97	
1.000	D3 01 3240 0140	Replace pressure regulator 2" diam. pipe natural gas	14	1 Stpi	Ea.	1.43	\$ 701.14	\$ 808.80	1.095	\$ 885.64	0.97	
							\$ 1,624.61	\$ 1,882.65				
1.000	D3 01 3601 0010	Replace solar panel 3' x 8'	15	Q1	Ea.	5.67	\$ 1,285.00	\$ 1,487.00	1.095	\$ 1,628.27	0.97	
1.000	D3 02 3198 1020	Replace boiler blowoff system	15	Q5	Ea.	8.33	\$ 3,935.00	\$ 4,551.00	1.095	\$ 4,983.35	0.97	
1.000	D3 02 3292 1010	Repair chemical feed system	15	1 Stpi	Ea.	6.02	\$ 793.57	\$ 947.22	1.095	\$ 1,037.21	0.97	
1.000	D3 02 3292 1030	Replace chemical feed system	15	2 Stpi	Ea.	2.50	\$ 740.00	\$ 860.00	1.095	\$ 941.70	0.97	
1.000	D3 02 3294 1010	Repair feed water supply pump	15	1 Stpi	Ea.	9.45	\$ 2,565.00	\$ 2,974.50	1.095	\$ 3,257.08	0.97	
1.000	D3 02 3294 1030	Replace feed water pump	15	Q2	Ea.	33.33	\$ 15,170.00	\$ 17,535.00	1.095	\$ 19,200.83	0.97	
1.000	D3 02 3310 0010	Replace metal flue, all fuel SS, 6" diameter metal flue / chimney	15	Q9	L.F.	0.39	\$ 96.50	\$ 112.00	1.095	\$ 122.64	0.97	
1.000	D3 02 3310 0020	Replace metal flue, all fuel SS, 10" diameter metal flue / chimney	15	Q9	L.F.	0.48	\$ 130.00	\$ 150.00	1.095	\$ 164.25	0.97	
1.000	D3 02 3310 0030	Replace metal flue, all fuel SS, 20" diameter metal flue / chimney	15	Q10	L.F.	0.97	\$ 239.00	\$ 278.00	1.095	\$ 304.41	0.97	
1.000	D3 02 3310 0040	Replace metal flue, all fuel SS, 32" diameter metal flue / chimney	15	Q10	L.F.	1.29	\$ 380.00	\$ 440.00	1.095	\$ 481.80	0.97	
1.000	D3 02 3310 0050	Replace metal flue, all fuel SS, 48" diameter metal flue / chimney	15	Q10	L.F.	1.83	\$ 585.00	\$ 675.00	1.095	\$ 739.13	0.97	
1.000	D3 02 3390 1030	Replace fuel oil 25 GPH pump / motor set	15	Q5	Ea.	5.20	\$ 1,175.00	\$ 1,375.00	1.095	\$ 1,505.63	0.97	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
5% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	GREEN Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 01 3210 0130	Replace 10' of buried 4" diam steel pipe/M.L.F. natural gas	\$ 1,157.30	1.05	\$ 1,252.18	0.97	\$ 1,215.16
1.000	D3 01 3210 0140	Replace 10' of buried 6" diam steel pipe/M.L.F. natural gas	\$ 1,535.59	1.05	\$ 1,661.49	0.97	\$ 1,612.37
1.000	D3 01 3210 0410	Replace 10' of hung 2" diam steel pipe/M.L.F. natural gas	\$ 708.02	1.05	\$ 766.07	0.97	\$ 743.42
1.000	D3 01 3210 0420	Replace 10' of hung 3" diam steel pipe/M.L.F. natural gas	\$ 817.26	1.05	\$ 884.26	0.97	\$ 858.12
1.000	D3 01 3210 0430	Replace 10' of hung 4" diam steel pipe/M.L.F. natural gas	\$ 977.71	1.05	\$ 1,057.87	0.97	\$ 1,026.60
1.000	D3 01 3210 0440	Replace 10' of hung 6" diam steel pipe/M.L.F. natural gas	\$ 1,523.90	1.05	\$ 1,648.84	0.97	\$ 1,600.10
1.000	D3 01 3260 0120	Replace 10' steel pipe 1/2" diam. per M.L.F. LPG distribution	\$ 338.54	1.05	\$ 366.30	0.97	\$ 355.47
1.000	D3 01 3260 0220	Replace 10' steel pipe 3/4" diam. per M.L.F. LPG distribution	\$ 322.07	1.05	\$ 348.48	0.97	\$ 338.18
1.000	D3 01 3260 0320	Replace 10' steel pipe 1" diam. per M.L.F. LPG distribution	\$ 414.52	1.05	\$ 448.51	0.97	\$ 435.25
1.000	D3 01 3260 0420	Replace 10' steel pipe 1-1/4" diam. M.L.F. LPG distribution	\$ 454.90	1.05	\$ 492.20	0.97	\$ 477.65
1.000	D3 01 3260 0520	Replace 10' steel pipe 1-1/2" diam. M.L.F. LPG distribution	\$ 503.25	1.05	\$ 544.51	0.97	\$ 528.41
1.000	D3 01 3260 0620	Replace 10' section steel pipe 2" diam. M.L.F. LPG distribution	\$ 623.86	1.05	\$ 675.01	0.97	\$ 655.05
1.000	D3 02 3388 1060	Replace coal spreader pneumatic	\$ 25,635.91	1.05	\$ 27,737.72	0.97	\$ 26,917.71
			\$ 36,835.97				\$ 38,677.77
			\$ 18,417.99	Assume 50% required		Assume 50% required	\$ 19,338.89
				PER 12 YEARS		PER 12 YEARS	
1.000	D3 01 3240 0110	Replace pressure regulator 1/2" diam. pipe natural gas	\$ 112.90	1.05	\$ 122.16	0.97	\$ 118.55
1.000	D3 01 3240 0120	Replace pressure regulator 1" diam. pipe natural gas	\$ 185.75	1.05	\$ 200.98	0.97	\$ 195.03
1.000	D3 01 3240 0130	Replace pressure regulator 1-1/2" diam. pipe natural gas	\$ 842.45	1.05	\$ 911.52	0.97	\$ 884.57
1.000	D3 01 3240 0140	Replace pressure regulator 2" diam. pipe natural gas	\$ 859.45	1.05	\$ 929.92	0.97	\$ 902.43
			\$ 2,000.56				\$ 2,100.59
			\$ 1,000.28	Assume 50% required		Assume 50% required	\$ 1,050.29
				PER 14 YEARS		PER 14 YEARS	
1.000	D3 01 3601 0010	Replace solar panel 3' x 8'	\$ 1,580.13	1.05	\$ 1,709.68	0.97	\$ 1,659.14
1.000	D3 02 3198 1020	Replace boiler blowoff system	\$ 4,836.02	1.05	\$ 5,232.51	0.97	\$ 5,077.82
1.000	D3 02 3292 1010	Repair chemical feed system	\$ 1,006.54	1.05	\$ 1,089.07	0.97	\$ 1,056.87
1.000	D3 02 3292 1030	Replace chemical feed system	\$ 913.86	1.05	\$ 988.79	0.97	\$ 959.55
1.000	D3 02 3294 1010	Repair feed water supply pump	\$ 3,160.79	1.05	\$ 3,419.93	0.97	\$ 3,318.83
1.000	D3 02 3294 1030	Replace feed water pump	\$ 18,633.19	1.05	\$ 20,160.87	0.97	\$ 19,564.85
1.000	D3 02 3310 0010	Replace metal flue, all fuel SS, 6" diameter metal flue / chimney	\$ 119.01	1.05	\$ 128.77	0.97	\$ 124.97
1.000	D3 02 3310 0020	Replace metal flue, all fuel SS, 10" diameter metal flue / chimney	\$ 159.39	1.05	\$ 172.46	0.97	\$ 167.36
1.000	D3 02 3310 0030	Replace metal flue, all fuel SS, 20" diameter metal flue / chimney	\$ 295.41	1.05	\$ 319.63	0.97	\$ 310.18
1.000	D3 02 3310 0040	Replace metal flue, all fuel SS, 32" diameter metal flue / chimney	\$ 467.56	1.05	\$ 505.89	0.97	\$ 490.93
1.000	D3 02 3310 0050	Replace metal flue, all fuel SS, 48" diameter metal flue / chimney	\$ 717.27	1.05	\$ 776.08	0.97	\$ 753.14
1.000	D3 02 3390 1030	Replace fuel oil 25 GPH pump / motor set	\$ 1,461.11	1.05	\$ 1,580.91	0.97	\$ 1,534.17

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹													
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Escalation													
	6%												
De-Escalation to July 2009													
	1.03												NON-GREEN
De-Escalation Factor to be Applied													
	0.97												
Green Factor													
	1.05	Assumed Value											
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor		
1.000	D3 02 3390 1040	Replace fuel oil 45 GPH pump / motor set	15	Q5	Ea.	5.20	\$ 1,175.00	\$ 1,375.00	1.095	\$ 1,505.63	0.97		
1.000	D3 02 3390 1050	Replace fuel oil 90 GPH pump / motor set	15	Q5	Ea.	6.24	\$ 1,220.00	\$ 1,451.00	1.095	\$ 1,588.85	0.97		
1.000	D3 02 3390 1060	Replace fuel oil 160 GPH pump / motor set	15	Q5	Ea.	7.79	\$ 1,375.00	\$ 1,613.00	1.095	\$ 1,766.24	0.97		
1.000	D3 03 3115 1030	Replace cooling tower, 50 ton	15	Q6	Ea.	31.18	\$ 12,625.00	\$ 14,580.00	1.095	\$ 15,965.10	0.97		
1.000	D3 03 3115 2030	Replace cooling tower, 100 ton	15	Q6	Ea.	42.86	\$ 18,555.00	\$ 21,375.00	1.095	\$ 23,405.63	0.97		
1.000	D3 03 3115 3030	Replace cooling tower, 300 ton	15	Q6	Ea.	108.86	\$ 34,875.00	\$ 40,425.00	1.095	\$ 44,265.38	0.97		
1.000	D3 03 3115 4030	Replace cooling tower, 1000 ton	15	Q6	Ea.	313.05	\$ 87,750.00	\$ 101,850.00	1.095	\$ 111,525.75	0.97		
1.000	D3 03 3210 1030	Replace condenser, air cooled, 5 ton	15	Q5	Ea.	15.58	\$ 2,900.00	\$ 3,400.00	1.095	\$ 3,723.00	0.97		
1.000	D3 03 3210 2030	Replace condenser, air cooled, 20 ton	15	Q5	Ea.	31.17	\$ 7,125.00	\$ 8,325.00	1.095	\$ 9,115.88	0.97		
1.000	D3 03 3210 3030	Replace condenser, air cooled, 50 ton	15	Q6	Ea.	116.88	\$ 22,250.00	\$ 26,025.00	1.095	\$ 28,497.38	0.97		
1.000	D3 03 3210 4030	Replace condenser, air cooled, 100 ton	15	Q7	Ea.	207.26	\$ 43,650.00	\$ 51,000.00	1.095	\$ 55,845.00	0.97		
1.000	D3 03 3260 1030	Replace evaporative condenser, 20 ton	15	Q5	Ea.	66.33	\$ 10,425.00	\$ 12,300.00	1.095	\$ 13,468.50	0.97		
1.000	D3 03 3260 2030	Replace evaporative condenser, 100 ton	15	Q7	Ea.	172.76	\$ 28,625.00	\$ 33,825.00	1.095	\$ 37,038.38	0.97		
1.000	D3 03 3260 3030	Replace evaporative condenser, 300 ton	15	Q7	Ea.	457.03	\$ 75,850.00	\$ 89,700.00	1.095	\$ 98,221.50	0.97		
1.000	D3 04 3120 1030	Replace fan coil unit, 1 ton	15	Q5	Ea.	5.20	\$ 1,200.00	\$ 1,400.00	1.095	\$ 1,533.00	0.97		
1.000	D3 04 3120 2030	Replace fan coil unit, 3 ton	15	Q5	Ea.	7.79	\$ 2,350.00	\$ 2,713.00	1.095	\$ 2,970.74	0.97		
1.000	D3 04 3120 3030	Replace fan coil unit, 5 ton	15	Q5	Ea.	8.05	\$ 3,155.00	\$ 3,644.00	1.095	\$ 3,990.18	0.97		
1.000	D3 04 3120 4030	Replace fan coil unit, 10 ton	15	Q6	Ea.	34.62	\$ 5,515.00	\$ 6,490.00	1.095	\$ 7,106.55	0.97		
1.000	D3 04 3120 5030	Replace fan coil unit, 20 ton	15	Q6	Ea.	58.54	\$ 9,050.00	\$ 10,675.00	1.095	\$ 11,689.13	0.97		
1.000	D3 04 3120 6030	Replace fan coil unit, 30 ton	15	Q6	Ea.	77.92	\$ 13,650.00	\$ 16,050.00	1.095	\$ 17,574.75	0.97		
1.000	D3 04 3122 1040	Replace fan coil, DX 1-1/2 ton, no heat	15	Q5	Ea.	6.24	\$ 1,120.00	\$ 1,325.00	1.095	\$ 1,450.88	0.97		
1.000	D3 04 3122 2040	Replace fan coil, DX 2 ton, no heat	15	Q5	Ea.	6.50	\$ 1,200.00	\$ 1,407.00	1.095	\$ 1,540.67	0.97		
1.000	D3 04 3122 3040	Replace fan coil, DX 2-1/2 ton, no heat	15	Q5	Ea.	7.09	\$ 1,287.00	\$ 1,496.00	1.095	\$ 1,638.12	0.97		
1.000	D3 04 3122 4040	Replace fan coil, DX 3 ton, no heat	15	Q5	Ea.	8.21	\$ 1,558.00	\$ 1,823.00	1.095	\$ 1,996.19	0.97		
1.000	D3 04 3122 6060	Replace fan coil, DX 5 ton, no heat	15	Q5	Ea.	10.40	\$ 2,051.00	\$ 2,401.00	1.095	\$ 2,629.10	0.97		
1.000	D3 04 3122 8080	Replace fan coil, DX 10 ton, no heat	15	Q6	Ea.	18.00	\$ 4,135.00	\$ 4,825.00	1.095	\$ 5,283.38	0.97		
1.000	D3 04 3122 9590	Replace fan coil, DX 20 ton, no heat	15	Q6	Ea.	66.89	\$ 9,925.00	\$ 11,775.00	1.095	\$ 12,893.63	0.97		
1.000	D3 04 3124 1010	Replace fan coil, DX 1-1/2 ton, with heat	15	Q5	Ea.	8.79	\$ 1,559.00	\$ 1,842.00	1.095	\$ 2,016.99	0.97		
1.000	D3 04 3124 2010	Replace fan coil, DX 2 ton, with heat	15	Q5	Ea.	9.15	\$ 1,689.00	\$ 1,974.00	1.095	\$ 2,161.53	0.97		
1.000	D3 04 3124 3010	Replace fan coil, DX 2-1/2 ton, with heat	15	Q5	Ea.	9.98	\$ 1,802.00	\$ 2,115.00	1.095	\$ 2,315.93	0.97		
1.000	D3 04 3124 4010	Replace fan coil, DX 3 ton, with heat	15	Q5	Ea.	11.56	\$ 2,176.00	\$ 2,570.00	1.095	\$ 2,814.15	0.97		
1.000	D3 04 3128 1030	Replace unit ventilator, 750 CFM, heat/cool coils	15	Q6	Ea.	23.40	\$ 5,395.00	\$ 6,285.00	1.095	\$ 6,882.08	0.97		
1.000	D3 04 3128 2030	Replace unit ventilator, 1250 CFM, heat/cool coils	15	Q6	Ea.	33.43	\$ 6,870.00	\$ 8,035.00	1.095	\$ 8,798.33	0.97		
1.000	D3 04 3128 2050	Replace unit ventilator, 2000 CFM, heat/cool coils	15	Q6	Ea.	93.55	\$ 11,725.00	\$ 13,950.00	1.095	\$ 15,275.25	0.97		
1.000	D3 04 3140 0030	Replace duct heater	15	1 Elec	Ea.	2.67	\$ 1,965.00	\$ 2,275.00	1.095	\$ 2,491.13	0.97		
1.000	D3 04 3220 1010	Replace fan & motor, propeller exh., 375 CFM exhaust fan	15	Q20	Ea.	3.90	\$ 693.50	\$ 811.50	1.095	\$ 888.59	0.97		
1.000	D3 04 3220 1030	Replace fan & motor, propeller exh., 1000 CFM exhaust fan	15	Q20	Ea.	4.88	\$ 1,006.50	\$ 1,164.00	1.095	\$ 1,274.58	0.97		
1.000	D3 04 3220 1040	Replace fan & motor, propeller exh., 4700 CFM exhaust fan	15	Q20	Ea.	7.80	\$ 1,622.00	\$ 1,883.00	1.095	\$ 2,061.89	0.97		
1.000	D3 04 3320 0030	Replace flash tank 24 gallon	15	Q5	Ea.	2.23	\$ 738.00	\$ 854.00	1.095	\$ 935.13	0.97		

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
5% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value					
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	GREEN Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 02 3390 1040	Replace fuel oil 45 GPH pump / motor set	\$ 1,461.11	1.05	\$ 1,580.91	0.97	\$ 1,534.17
1.000	D3 02 3390 1050	Replace fuel oil 90 GPH pump / motor set	\$ 1,541.87	1.05	\$ 1,668.29	0.97	\$ 1,618.97
1.000	D3 02 3390 1060	Replace fuel oil 160 GPH pump / motor set	\$ 1,714.02	1.05	\$ 1,854.55	0.97	\$ 1,799.72
1.000	D3 03 3115 1030	Replace cooling tower, 50 ton	\$ 15,493.12	1.05	\$ 16,763.36	0.97	\$ 16,267.78
1.000	D3 03 3115 2030	Replace cooling tower, 100 ton	\$ 22,713.68	1.05	\$ 24,575.91	0.97	\$ 23,849.37
1.000	D3 03 3115 3030	Replace cooling tower, 300 ton	\$ 42,956.76	1.05	\$ 46,478.64	0.97	\$ 45,104.59
1.000	D3 03 3115 4030	Replace cooling tower, 1000 ton	\$ 108,228.71	1.05	\$ 117,102.04	0.97	\$ 113,640.15
1.000	D3 03 3210 1030	Replace condenser, air cooled, 5 ton	\$ 3,612.94	1.05	\$ 3,909.15	0.97	\$ 3,793.58
1.000	D3 03 3210 2030	Replace condenser, air cooled, 20 ton	\$ 8,846.38	1.05	\$ 9,571.67	0.97	\$ 9,288.70
1.000	D3 03 3210 3030	Replace condenser, air cooled, 50 ton	\$ 27,654.91	1.05	\$ 29,922.24	0.97	\$ 29,037.65
1.000	D3 03 3210 4030	Replace condenser, air cooled, 100 ton	\$ 54,194.05	1.05	\$ 58,637.25	0.97	\$ 56,903.76
1.000	D3 03 3260 1030	Replace evaporative condenser, 20 ton	\$ 13,070.33	1.05	\$ 14,141.93	0.97	\$ 13,723.85
1.000	D3 03 3260 2030	Replace evaporative condenser, 100 ton	\$ 35,943.41	1.05	\$ 38,890.29	0.97	\$ 37,740.58
1.000	D3 03 3260 3030	Replace evaporative condenser, 300 ton	\$ 95,317.78	1.05	\$ 103,132.58	0.97	\$ 100,083.67
1.000	D3 04 3120 1030	Replace fan coil unit, 1 ton	\$ 1,487.68	1.05	\$ 1,609.65	0.97	\$ 1,562.06
1.000	D3 04 3120 2030	Replace fan coil unit, 3 ton	\$ 2,882.91	1.05	\$ 3,119.27	0.97	\$ 3,027.06
1.000	D3 04 3120 3030	Replace fan coil unit, 5 ton	\$ 3,872.22	1.05	\$ 4,189.69	0.97	\$ 4,065.83
1.000	D3 04 3120 4030	Replace fan coil unit, 10 ton	\$ 6,896.46	1.05	\$ 7,461.88	0.97	\$ 7,241.28
1.000	D3 04 3120 5030	Replace fan coil unit, 20 ton	\$ 11,343.56	1.05	\$ 12,273.58	0.97	\$ 11,910.74
1.000	D3 04 3120 6030	Replace fan coil unit, 30 ton	\$ 17,055.19	1.05	\$ 18,453.49	0.97	\$ 17,907.95
1.000	D3 04 3122 1040	Replace fan coil, DX 1-1/2 ton, no heat	\$ 1,407.98	1.05	\$ 1,523.42	0.97	\$ 1,478.38
1.000	D3 04 3122 2040	Replace fan coil, DX 2 ton, no heat	\$ 1,495.12	1.05	\$ 1,617.70	0.97	\$ 1,569.87
1.000	D3 04 3122 3040	Replace fan coil, DX 2-1/2 ton, no heat	\$ 1,589.69	1.05	\$ 1,720.03	0.97	\$ 1,669.18
1.000	D3 04 3122 4040	Replace fan coil, DX 3 ton, no heat	\$ 1,937.17	1.05	\$ 2,095.99	0.97	\$ 2,034.03
1.000	D3 04 3122 6060	Replace fan coil, DX 5 ton, no heat	\$ 2,551.37	1.05	\$ 2,760.55	0.97	\$ 2,678.94
1.000	D3 04 3122 8080	Replace fan coil, DX 10 ton, no heat	\$ 5,127.18	1.05	\$ 5,547.54	0.97	\$ 5,383.54
1.000	D3 04 3122 9590	Replace fan coil, DX 20 ton, no heat	\$ 12,512.45	1.05	\$ 13,538.31	0.97	\$ 13,138.07
1.000	D3 04 3124 1010	Replace fan coil, DX 1-1/2 ton, with heat	\$ 1,957.36	1.05	\$ 2,117.84	0.97	\$ 2,055.23
1.000	D3 04 3124 2010	Replace fan coil, DX 2 ton, with heat	\$ 2,097.63	1.05	\$ 2,269.61	0.97	\$ 2,202.51
1.000	D3 04 3124 3010	Replace fan coil, DX 2-1/2 ton, with heat	\$ 2,247.46	1.05	\$ 2,431.72	0.97	\$ 2,359.83
1.000	D3 04 3124 4010	Replace fan coil, DX 3 ton, with heat	\$ 2,730.96	1.05	\$ 2,954.86	0.97	\$ 2,867.50
1.000	D3 04 3128 1030	Replace unit ventilator, 750 CFM, heat/cool coils	\$ 6,678.62	1.05	\$ 7,226.18	0.97	\$ 7,012.55
1.000	D3 04 3128 2030	Replace unit ventilator, 1250 CFM, heat/cool coils	\$ 8,538.22	1.05	\$ 9,238.24	0.97	\$ 8,965.13
1.000	D3 04 3128 2050	Replace unit ventilator, 2000 CFM, heat/cool coils	\$ 14,823.67	1.05	\$ 16,039.01	0.97	\$ 15,564.85
1.000	D3 04 3140 0030	Replace duct heater	\$ 2,417.48	1.05	\$ 2,615.68	0.97	\$ 2,538.35
1.000	D3 04 3220 1010	Replace fan & motor, propeller exh., 375 CFM exhaust fan	\$ 862.32	1.05	\$ 933.02	0.97	\$ 905.44
1.000	D3 04 3220 1030	Replace fan & motor, propeller exh., 1000 CFM exhaust fan	\$ 1,236.90	1.05	\$ 1,338.31	0.97	\$ 1,298.74
1.000	D3 04 3220 1040	Replace fan & motor, propeller exh., 4700 CFM exhaust fan	\$ 2,000.93	1.05	\$ 2,164.98	0.97	\$ 2,100.98
1.000	D3 04 3320 0030	Replace flash tank 24 gallon	\$ 907.48	1.05	\$ 981.89	0.97	\$ 952.86

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹													
5% GF													
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ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN													
Escalation													
	6%												
De-Escalation to July 2009													
	1.03												NON-GREEN
De-Escalation Factor to be Applied													
	0.97												
Green Factor													
	1.05	Assumed Value											
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor		
1.000	D3 04 3340 0010	Repair condensate meter	15	1 Stpi	Ea.	4.14	\$ 1,164.00	\$ 1,355.00	1.095	\$ 1,483.73	0.97		
1.000	D3 04 3530 1030	Replace circulator pump, 1/12 - 3/4 H.P.	15	Q1	Ea.	7.79	\$ 2,876.00	\$ 3,314.00	1.095	\$ 3,628.83	0.97		
1.000	D3 04 3530 2030	Replace circulator. pump, 1 H.P.	15	Q1	Ea.	7.80	\$ 4,351.00	\$ 5,014.00	1.095	\$ 5,490.33	0.97		
1.000	D3 05 3110 1030	Replace unit heater, 12 MBH, 2 PSI steam	15	Q5	Ea.	2.60	\$ 520.00	\$ 607.50	1.095	\$ 665.21	0.97		
1.000	D3 05 3110 2030	Replace unit heater, 36 MBH, 2 PSI steam	15	Q5	Ea.	3.90	\$ 780.00	\$ 914.00	1.095	\$ 1,000.83	0.97		
1.000	D3 05 3110 3030	Replace unit heater, 85 MBH, 2 PSI steam	15	Q5	Ea.	4.80	\$ 937.50	\$ 1,096.00	1.095	\$ 1,200.12	0.97		
1.000	D3 05 3110 4030	Replace unit heater, 250 MBH, 2 PSI steam	15	Q5	Ea.	12.48	\$ 2,416.00	\$ 2,850.00	1.095	\$ 3,120.75	0.97		
1.000	D3 05 3110 5020	Replace unit heater, 400 MBH, 2 PSI steam	15	Q5	Ea.	19.51	\$ 3,875.00	\$ 4,545.00	1.095	\$ 4,976.78	0.97		
1.000	D3 05 3112 0030	Replace infrared heater suspended, commercial	15	1 Elec	Ea.	2.77	\$ 410.00	\$ 485.00	1.095	\$ 531.08	0.97		
1.000	D3 05 3114 0030	Replace heater standard suspended heater	15	1 Elec	Ea.	3.87	\$ 795.00	\$ 930.00	1.095	\$ 1,018.35	0.97		
1.000	D3 05 3116 0030	Replace heater explosionproof industrial heater	15	1 Elec	Ea.	4.61	\$ 5,923.00	\$ 6,760.00	1.095	\$ 7,402.20	0.97		
1.000	D3 05 3160 0030	Replace heater convector suspended, commercial	15	1 Elec	Ea.	2.67	\$ 2,165.00	\$ 2,475.00	1.095	\$ 2,710.13	0.97		
1.000	D3 05 3170 1040	Replace terminal reheat, 12" x 24" coil	15	Q5	Ea.	2.57	\$ 924.50	\$ 1,062.00	1.095	\$ 1,162.89	0.97		
1.000	D3 05 3170 2040	Replace terminal reheat, 18" x 24" coil	15	Q5	Ea.	3.85	\$ 1,124.50	\$ 1,318.00	1.095	\$ 1,443.21	0.97		
1.000	D3 05 3170 3040	Replace terminal reheat, 36" x 36" coil	15	Q5	Ea.	11.56	\$ 2,198.00	\$ 2,579.00	1.095	\$ 2,824.01	0.97		
1.000	D3 05 3170 4040	Replace terminal reheat, 48" x 126" coil	15	Q5	Ea.	53.81	\$ 7,850.00	\$ 9,275.00	1.095	\$ 10,156.13	0.97		
1.000	D3 05 3278 1040	Replace multi-zone rooftop unit, 15 ton	15	Q7	Ea.	164.70	\$ 72,800.00	\$ 83,750.00	1.095	\$ 91,706.25	0.97		
1.000	D3 05 3278 2040	Replace multi-zone rooftop unit, 25 ton	15	Q7	Ea.	210.81	\$ 93,550.00	\$ 107,850.00	1.095	\$ 118,095.75	0.97		
1.000	D3 05 3278 3040	Replace multi-zone rooftop unit, 40 ton	15	Q7	Ea.	323.00	\$ 137,500.00	\$ 158,700.00	1.095	\$ 173,776.50	0.97		
1.000	D3 05 3278 4040	Replace multi-zone rooftop unit, 70 ton	15	Q7	Ea.	495.00	\$ 189,100.00	\$ 218,800.00	1.095	\$ 239,586.00	0.97		
1.000	D3 05 3278 5040	Replace multi-zone rooftop unit, 105 ton	15	Q7	Ea.	737.00	\$ 254,700.00	\$ 294,600.00	1.095	\$ 322,587.00	0.97		
1.000	D3 05 3280 1002	Replace single zone rt. unit, 3 ton	15	Q5	Ea.	38.48	\$ 6,040.00	\$ 7,130.00	1.095	\$ 7,807.35	0.97		
1.000	D3 05 3280 1004	Replace single zone rt. unit, 5 ton	15	Q5	Ea.	56.57	\$ 8,600.00	\$ 10,175.00	1.095	\$ 11,141.63	0.97		
1.000	D3 05 3280 1006	Replace single zone rt. unit, 7.5 ton	15	Q5	Ea.	69.03	\$ 12,300.00	\$ 14,475.00	1.095	\$ 15,850.13	0.97		
1.000	D3 05 3280 1008	Replace single zone rt. unit, 10 ton	15	Q6	Ea.	81.90	\$ 16,525.00	\$ 19,450.00	1.095	\$ 21,297.75	0.97		
1.000	D3 05 3280 1040	Replace single zone rooftop unit, 15 ton	15	Q6	Ea.	106.39	\$ 22,925.00	\$ 26,775.00	1.095	\$ 29,318.63	0.97		
1.000	D3 05 3280 2040	Replace single zone rooftop unit, 25 ton	15	Q7	Ea.	153.66	\$ 36,900.00	\$ 43,000.00	1.095	\$ 47,085.00	0.97		
1.000	D3 05 3280 3040	Replace single zone rooftop unit, 60 ton	15	Q7	Ea.	369.00	\$ 75,000.00	\$ 87,900.00	1.095	\$ 96,250.50	0.97		
1.000	D3 05 3280 4040	Replace single zone rooftop unit, 100 ton	15	Q7	Ea.	600.00	\$ 146,600.00	\$ 171,200.00	1.095	\$ 187,464.00	0.97		
1.000	D3 05 3282 1040	Replace multi-zone variable volume, 50 ton	15	Q7	Ea.	379.00	\$ 132,300.00	\$ 152,700.00	1.095	\$ 167,206.50	0.97		
1.000	D3 05 3282 2040	Replace multi-zone variable volume, 70 ton	15	Q7	Ea.	535.00	\$ 185,100.00	\$ 214,300.00	1.095	\$ 234,658.50	0.97		
1.000	D3 05 3282 3040	Replace multi-zone variable volume, 90 ton	15	Q7	Ea.	691.00	\$ 217,100.00	\$ 251,700.00	1.095	\$ 275,611.50	0.97		
1.000	D3 05 3282 4040	Replace multi-zone variable volume, 105 ton	15	Q7	Ea.	791.00	\$ 244,200.00	\$ 283,100.00	1.095	\$ 309,994.50	0.97		
1.000	D3 05 3282 5040	Replace multi-zone variable volume, 140 ton	15	Q7	Ea.	1,108.00	\$ 307,600.00	\$ 357,500.00	1.095	\$ 391,462.50	0.97		
1.000	D3 05 3286 1040	Replace central station A.H.U., 1300 CFM	15	Q5	Ea.	26.00	\$ 7,275.00	\$ 8,450.00	1.095	\$ 9,252.75	0.97		
1.000	D3 05 3286 2040	Replace central station A.H.U., 1900 CFM	15	Q5	Ea.	28.37	\$ 10,520.00	\$ 12,185.00	1.095	\$ 13,342.58	0.97		
1.000	D3 05 3286 3040	Replace central station A.H.U., 5400 CFM	15	Q6	Ea.	58.52	\$ 25,075.00	\$ 28,875.00	1.095	\$ 31,618.13	0.97		
1.000	D3 05 3286 4040	Replace central station A.H.U., 8000 CFM	15	Q6	Ea.	77.92	\$ 39,250.00	\$ 45,150.00	1.095	\$ 49,439.25	0.97		
1.000	D3 05 3286 5040	Replace central station A.H.U., 16,000 CFM	15	Q6	Ea.	123.22	\$ 74,450.00	\$ 85,575.00	1.095	\$ 93,704.63	0.97		

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹													
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Escalation													
	6%												
De-Escalation to July 2009													
	1.03												NON-GREEN
De-Escalation Factor to be Applied													
	0.97												
Green Factor													
	1.05	Assumed Value											
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor		
1.000	D3 05 3286 6040	Replace central station A.H.U., 33,500 CFM	15	Q6	Ea.	246.19	\$ 170,925.00	\$ 196,175.00	1.095	\$ 214,811.63	0.97		
1.000	D3 05 3286 7040	Replace central station A.H.U., 63,000 CFM	15	Q7	Ea.	480.00	\$ 323,300.00	\$ 370,700.00	1.095	\$ 405,916.50	0.97		
1.000	D3 05 3310 1030	Replace furnace, gas, 25 MBH residential	15	Q9	Ea.	6.00	\$ 966.00	\$ 1,133.00	1.095	\$ 1,240.64	0.97		
1.000	D3 05 3310 2030	Replace furnace, gas, 100 MBH residential	15	Q9	Ea.	9.75	\$ 1,305.00	\$ 1,550.00	1.095	\$ 1,697.25	0.97		
1.000	D3 05 3310 3030	Replace furnace, gas, 200 MBH residential	15	Q9	Ea.	12.00	\$ 3,322.00	\$ 3,852.00	1.095	\$ 4,217.94	0.97		
1.000	D3 05 3320 1030	Replace furnace, oil, 55 MBH residential	15	Q9	Ea.	8.67	\$ 2,510.00	\$ 2,925.00	1.095	\$ 3,202.88	0.97		
1.000	D3 05 3320 2030	Replace furnace, oil, 100 MBH residential	15	Q1	Ea.	9.18	\$ 2,570.00	\$ 2,986.00	1.095	\$ 3,269.67	0.97		
1.000	D3 05 3320 3030	Replace furnace, oil, 200 MBH residential	15	Q1	Ea.	12.00	\$ 3,222.00	\$ 3,727.00	1.095	\$ 4,081.07	0.97		
1.000	D3 05 3330 1030	Replace furnace, electric, 25 MBH residential	15	Q20	Ea.	8.48	\$ 1,139.00	\$ 1,349.00	1.095	\$ 1,477.16	0.97		
1.000	D3 05 3330 2030	Replace furnace, electric, 50 MBH residential	15	Q20	Ea.	9.29	\$ 1,249.00	\$ 1,468.00	1.095	\$ 1,607.46	0.97		
1.000	D3 05 3330 3030	Replace furnace, electric, 85 MBH residential	15	Q20	Ea.	10.84	\$ 1,472.00	\$ 1,727.00	1.095	\$ 1,891.07	0.97		
							\$ 3,334,630.57	\$ 3,863,922.72					
1.000	D3 01 3150 0020	Replace remote tank fuel gauge	20	1 Stpi	Ea.	6.25	\$ 4,134.00	\$ 4,742.00	1.095	\$ 5,192.49	0.97		
1.000	D3 01 3170 0020	Install 10' sect. 3/8" type L copper per M.L.F. fuel oil storage	20	1 Plum	Ea.	1.86	\$ 145.00	\$ 178.00	1.095	\$ 194.91	0.97		
1.000	D3 01 3170 0030	Install 10' sect. 1/2" type L copper per M.L.F. fuel oil storage	20	1 Plum	Ea.	1.93	\$ 151.50	\$ 187.00	1.095	\$ 204.77	0.97		
1.000	D3 01 3170 0040	Install 10' sect. 5/8" type L copper per M.L.F. fuel oil storage	20	1 Plum	Ea.	1.98	\$ 170.50	\$ 207.00	1.095	\$ 226.67	0.97		
1.000	D3 01 3170 0050	Install 10' sect. 3/4" type L copper per M.L.F. fuel oil storage	20	1 Plum	Ea.	2.05	\$ 175.00	\$ 213.00	1.095	\$ 233.24	0.97		
1.000	D3 01 3170 0060	Install 10' section 1" type L copper per M.L.F. fuel oil storage	20	1 Plum	Ea.	2.29	\$ 213.50	\$ 259.50	1.095	\$ 284.15	0.97		
1.000	D3 02 3182 1010	Repair boiler, coal, 4600 MBH	20	4 Stpi	Ea.	109.54	\$ 28,117.50	\$ 32,790.00	1.095	\$ 35,905.05	0.97		
1.000	D3 02 3296 1030	Replace deaerator	20	4 Stpi	Ea.	186.50	\$ 41,250.00	\$ 48,365.00	1.095	\$ 52,959.68	0.97		
1.000	D3 03 3130 1030	Replace chiller, water cooled, 20 ton, reciprocating	20	Q7	Ea.	151.63	\$ 29,000.00	\$ 33,975.00	1.095	\$ 37,202.63	0.97		
1.000	D3 03 3130 2030	Replace chiller, water cooled 50 ton, reciprocating	20	Q7	Ea.	222.07	\$ 47,125.00	\$ 55,075.00	1.095	\$ 60,307.13	0.97		
1.000	D3 03 3130 3030	Replace chiller, water cooled, 100 ton, reciprocating	20	Q7	Ea.	349.00	\$ 85,600.00	\$ 99,950.00	1.095	\$ 109,445.25	0.97		
1.000	D3 03 3130 5030	Replace chiller, water cooled, 200 ton, reciprocating	20	Q7	Ea.	489.00	\$ 125,975.00	\$ 147,000.00	1.095	\$ 160,965.00	0.97		
1.000	D3 03 3135 1030	Replace chiller, air cooled, 20 ton	20	Q7	Ea.	160.86	\$ 35,775.00	\$ 41,825.00	1.095	\$ 45,798.38	0.97		
1.000	D3 03 3135 2030	Replace chiller, air cooled, 50 ton	20	Q7	Ea.	219.40	\$ 53,800.00	\$ 62,625.00	1.095	\$ 68,574.38	0.97		
1.000	D3 03 3135 3030	Replace chiller, air cooled, 100 ton	20	Q7	Ea.	252.21	\$ 94,150.00	\$ 108,950.00	1.095	\$ 119,300.25	0.97		
1.000	D3 03 3137 4030	Replace chiller, water cooled, 5 ton, reciprocating	20	Q5	Ea.	54.55	\$ 6,700.00	\$ 7,975.00	1.095	\$ 8,732.63	0.97		
1.000	D3 03 3137 5030	Replace chiller, water cooled, 10 ton, reciprocating	20	Q6	Ea.	130.44	\$ 14,600.00	\$ 17,450.00	1.095	\$ 19,107.75	0.97		
1.000	D3 03 3137 6030	Replace chiller, water cooled, 15 ton, reciprocating	20	Q6	Ea.	128.57	\$ 25,275.00	\$ 29,625.00	1.095	\$ 32,439.38	0.97		
1.000	D3 03 3140 1030	Replace hermetic centrifugal chiller, 100 ton	20	Q7	Ea.	489.00	\$ 119,975.00	\$ 140,000.00	1.095	\$ 153,300.00	0.97		
1.000	D3 03 3140 2030	Replace hermetic centrifugal chiller, 300 ton	20	Q7	Ea.	520.00	\$ 174,100.00	\$ 201,800.00	1.095	\$ 220,971.00	0.97		
1.000	D3 03 3140 3030	Replace hermetic centrifugal chiller, 1000 ton	20	Q7	Ea.	726.00	\$ 502,800.00	\$ 576,100.00	1.095	\$ 630,829.50	0.97		
1.000	D3 03 3142 1030	Replace open centrifugal chiller, 300 ton	20	Q7	Ea.	998.87	\$ 236,600.00	\$ 276,000.00	1.095	\$ 302,220.00	0.97		
1.000	D3 03 3142 2030	Replace open centrifugal chiller, 1000 ton	20	Q7	Ea.	3,417.40	\$ 810,200.00	\$ 944,000.00	1.095	\$ 1,033,680.00	0.97		

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹													
5% GF													
CostWorks 2010 - EAST HALL													
Based on National Averages													
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN													
Escalation													
	6%												
De-Escalation to July 2009													
	1.03												NON-GREEN
De-Escalation Factor to be Applied													
	0.97												
Green Factor													
	1.05	Assumed Value											
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor		
1.000	D3 03 3145 1030	Replace chiller, absorption, 100 ton	20	Q7	Ea.	465.00	\$ 166,000.00	\$ 191,900.00	1.095	\$ 210,130.50	0.97		
1.000	D3 03 3145 2030	Replace chiller, absorption, 350 ton	20	Q7	Ea.	600.00	\$ 364,700.00	\$ 418,300.00	1.095	\$ 458,038.50	0.97		
1.000	D3 03 3145 3030	Replace chiller, absorption, 950 ton	20	Q7	Ea.	799.00	\$ 719,300.00	\$ 822,900.00	1.095	\$ 901,075.50	0.97		
1.000	D3 04 3210 1030	Replace fan, induced draft, 2000 CFM	20	Q9	Ea.	9.46	\$ 5,050.00	\$ 5,818.00	1.095	\$ 6,370.71	0.97		
1.000	D3 04 3210 2030	Replace fan, induced draft, 6700 CFM	20	Q9	Ea.	13.57	\$ 6,776.00	\$ 7,790.00	1.095	\$ 8,530.05	0.97		
1.000	D3 04 3210 3030	Replace fan, induced draft, 17,700 CFM	20	Q9	Ea.	39.01	\$ 13,620.00	\$ 15,700.00	1.095	\$ 17,191.50	0.97		
1.000	D3 04 3220 2030	Replace roof mounted exhaust fan, 800 CFM exhaust fan	20	Q20	Ea.	7.80	\$ 1,272.00	\$ 1,483.00	1.095	\$ 1,623.89	0.97		
1.000	D3 04 3220 2040	Replace roof mounted exhaust fan, 2000 CFM exhaust fan	20	Q20	Ea.	9.75	\$ 2,133.00	\$ 2,504.00	1.095	\$ 2,741.88	0.97		
1.000	D3 04 3220 2050	Replace roof mounted exhaust fan, 8500 CFM exhaust fan	20	Q20	Ea.	13.00	\$ 3,369.00	\$ 3,905.00	1.095	\$ 4,275.98	0.97		
1.000	D3 04 3220 2060	Replace roof mounted exhaust fan, 20,300 CFM exhaust fan	20	Q20	Ea.	39.01	\$ 9,485.00	\$ 11,015.00	1.095	\$ 12,061.43	0.97		
1.000	D3 04 3430 0010	Replace radiator, baseboard 10' section	20	Q5	Ea.	6.78	\$ 751.00	\$ 894.00	1.095	\$ 978.93	0.97		
1.000	D3 04 3440 0010	Replace finned radiator wall, 10' section	20	Q5	Ea.	10.40	\$ 1,135.00	\$ 1,350.00	1.095	\$ 1,478.25	0.97		
1.000	D3 04 3520 1020	Replace gate valve, partial, 3/8" - 1 - 1/2" valves	20	1 Stpi	Ea.	1.35	\$ 243.09	\$ 285.87	1.095	\$ 313.03	0.97		
1.000	D3 04 3520 2020	Replace gate valve, partial, 2" - 3" valves	20	Q1	Ea.	2.06	\$ 739.59	\$ 851.87	1.095	\$ 928.80	0.97		
1.000	D3 04 3520 3030	Replace drain valve, 3/4" valves	20	1 Stpi	Ea.	0.63	\$ 50.89	\$ 62.37	1.095	\$ 68.30	0.97		
1.000	D3 05 3150 0030	Replace heater wall mounted/recessed heater, with fan	20	1 Elec	Ea.	3.33	\$ 395.00	\$ 470.00	1.095	\$ 514.65	0.97		
1.000	D3 05 3245 1030	Replace heat pump, 1.5 ton, air to air split	20	Q5	Ea.	12.99	\$ 3,026.00	\$ 3,540.00	1.095	\$ 3,876.30	0.97		
1.000	D3 05 3245 2030	Replace heat pump, 5 ton, air to air split	20	Q5	Ea.	62.37	\$ 7,375.00	\$ 8,775.00	1.095	\$ 9,608.63	0.97		
1.000	D3 05 3245 3030	Replace heat pump, 10 ton, air to air split	20	Q6	Ea.	73.47	\$ 13,075.00	\$ 15,425.00	1.095	\$ 16,890.38	0.97		
1.000	D3 05 3245 4030	Replace heat pump, 25 ton, air to air split	20	Q7	Ea.	184.54	\$ 31,975.00	\$ 37,600.00	1.095	\$ 41,172.00	0.97		
1.000	D3 05 3245 5030	Replace heat pump, 50 ton, air to air split	20	Q7	Ea.	303.97	\$ 69,925.00	\$ 81,925.00	1.095	\$ 89,707.88	0.97		
1.000	D3 05 3245 6030	Replace heat pump, thru-wall unit, 1.5 ton	20	Q5	Ea.	20.13	\$ 3,965.00	\$ 4,635.00	1.095	\$ 5,075.33	0.97		
1.000	D3 05 3245 7030	Replace heat pump, thru-wall unit, 5 ton	20	Q5	Ea.	48.00	\$ 7,350.00	\$ 8,675.00	1.095	\$ 9,499.13	0.97		
1.000	D3 05 3272 1030	Replace air conditioner, DX, 5 ton	20	Q6	Ea.	39.00	\$ 6,655.00	\$ 7,825.00	1.095	\$ 8,568.38	0.97		
1.000	D3 05 3272 2030	Replace air conditioner, DX, 20 ton	20	Q7	Ea.	69.35	\$ 19,125.00	\$ 22,175.00	1.095	\$ 24,281.63	0.97		
1.000	D3 05 3272 3030	Replace air conditioner, DX, 50 ton	20	Q7	Ea.	124.68	\$ 53,550.00	\$ 61,675.00	1.095	\$ 67,534.13	0.97		
1.000	D3 05 3274 1015	Replace computer room A/C, incl. remote air cooled cond, 5 ton	20	Q6	Ea.	48.56	\$ 21,780.00	\$ 25,075.00	1.095	\$ 27,457.13	0.97		
1.000	D3 05 3274 1025	Replace computer room A/C, incl. remote air cooled cond, 10 ton	20	Q6	Ea.	97.90	\$ 42,925.00	\$ 49,450.00	1.095	\$ 54,147.75	0.97		
1.000	D3 05 3274 1035	Replace computer room A/C, incl. remote air cooled cond, 15 ton	20	Q6	Ea.	123.04	\$ 48,125.00	\$ 55,775.00	1.095	\$ 61,073.63	0.97		
1.000	D3 05 3274 1045	Replace computer room A/C, incl. remote air cooled cond, 20 ton	20	Q6	Ea.	123.11	\$ 56,925.00	\$ 65,775.00	1.095	\$ 72,023.63	0.97		
1.000	D3 05 3276 1015	Replace computer room A/C, chilled water, 5 ton	20	Q6	Ea.	41.07	\$ 15,980.00	\$ 18,375.00	1.095	\$ 20,120.63	0.97		
1.000	D3 05 3276 1025	Replace computer room A/C, chilled water, 10 ton	20	Q6	Ea.	76.00	\$ 18,325.00	\$ 21,350.00	1.095	\$ 23,378.25	0.97		
1.000	D3 05 3276 1035	Replace computer room A/C, chilled water, 15 ton	20	Q6	Ea.	94.76	\$ 20,225.00	\$ 23,675.00	1.095	\$ 25,924.13	0.97		
1.000	D3 05 3276 1045	Replace computer room A/C, chilled water, 20 ton	20	Q6	Ea.	70.16	\$ 19,525.00	\$ 22,675.00	1.095	\$ 24,829.13	0.97		
1.000	D3 05 3410 0030	Replace baseboard heater units	20	1 Elec	Ea.	2.53	\$ 227.00	\$ 275.00	1.095	\$ 301.13	0.97		
1.000	D4 01 3310 1030	Replace sprinkler head	20	1 Plum	Ea.	0.98	\$ 71.00	\$ 87.00	1.095	\$ 95.27	0.97		
							\$ 4,191,180.57	\$ 4,849,282.61					

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
5% GF												
CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation 6%												
De-Escalation to July 2009 1.03												
De-Escalation Factor to be Applied 0.97												
Green Factor 1.05 Assumed Value												
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 01 3170 0130	Replace 1000' type L 3/8" copper, fuel oil storage	25	1 Plum	M.L.F.	185.72	\$ 14,500.00	\$ 17,800.00	1.095	\$ 19,491.00	0.97	
1.000	D3 01 3170 0140	Replace 1000' type L 1/2" copper, fuel oil storage	25	1 Plum	M.L.F.	192.61	\$ 15,150.00	\$ 18,700.00	1.095	\$ 20,476.50	0.97	
1.000	D3 01 3170 0150	Replace 1000' type L 5/8" copper, fuel oil storage	25	1 Plum	M.L.F.	197.48	\$ 17,050.00	\$ 20,700.00	1.095	\$ 22,666.50	0.97	
1.000	D3 01 3170 0160	Replace 1000' type L 3/4" copper, fuel oil storage	25	1 Plum	M.L.F.	205.29	\$ 17,500.00	\$ 21,300.00	1.095	\$ 23,323.50	0.97	
1.000	D3 01 3170 0170	Replace 1000' type L 1" copper, fuel oil storage	25	1 Plum	M.L.F.	229.41	\$ 21,325.00	\$ 25,950.00	1.095	\$ 28,415.25	0.97	
1.000	D3 04 3450 1020	Replace coil, hot water boost, 12" x 24" duct coil, 1-row	25	Q5	Ea.	1.97	\$ 474.50	\$ 557.00	1.095	\$ 609.92	0.97	
1.000	D3 04 3450 1030	Replace coil, hot water boost, 24" x 24" duct coil, 1-row	25	Q5	Ea.	5.15	\$ 744.50	\$ 879.00	1.095	\$ 962.51	0.97	
1.000	D3 04 3450 1040	Replace coil, hot water boost, 24" x 36" duct coil, 1-row	25	Q5	Ea.	7.74	\$ 1,084.00	\$ 1,287.00	1.095	\$ 1,409.27	0.97	
1.000	D3 04 3450 1050	Replace coil, hot water boost, 36" x 36" duct coil, 1-row	25	Q5	Ea.	11.60	\$ 1,474.00	\$ 1,730.00	1.095	\$ 1,894.35	0.97	
1.000	D3 04 3510 0010	install new gasket, 4" pipe size, steel/iron	25	1 Plum	Ea.	2.60	\$ 178.00	\$ 221.00	1.095	\$ 242.00	0.97	
							\$ 89,480.00	\$ 109,124.00				
1.000	D3 01 3110 0010	Replace 275 gallon fuel oil storage tank	30	Q5	Ea.	6.24	\$ 775.00	\$ 921.00	1.095	\$ 1,008.50	0.97	
1.000	D3 01 3160 0020	Replace oil filter housing	30	1 Stpi	Ea.	0.52	\$ 54.50	\$ 66.00	1.095	\$ 72.27	0.97	
1.000	D3 01 3210 0010	install new 2" gasket, 1 per M.L.F. natural gas, steel/iron	30	1 Stpi	Ea.	1.60	\$ 108.50	\$ 135.00	1.095	\$ 147.83	0.97	
1.000	D3 01 3210 0020	install new 3" gasket, 1 per M.L.F. natural gas, steel/iron	30	1 Stpi	Ea.	1.89	\$ 127.50	\$ 158.50	1.095	\$ 173.56	0.97	
1.000	D3 01 3210 0030	install new 4" gasket, 1 per M.L.F. natural gas, steel/iron	30	1 Stpi	Ea.	2.60	\$ 177.50	\$ 221.00	1.095	\$ 242.00	0.97	
1.000	D3 01 3210 0040	install new 6" gasket, 1 per M.L.F. natural gas, steel/iron	30	1 Stpi	Ea.	3.47	\$ 239.00	\$ 297.00	1.095	\$ 325.22	0.97	
1.000	D3 02 3180 1060	Replace boiler, gas, 250 MBH	30	Q7	Ea.	65.66	\$ 7,450.00	\$ 8,900.00	1.095	\$ 9,745.50	0.97	
1.000	D3 02 3180 2070	Replace boiler, gas, 2000 MBH	30	Q7	Ea.	166.76	\$ 29,925.00	\$ 35,225.00	1.095	\$ 38,571.38	0.97	
1.000	D3 02 3180 3070	Replace boiler, gas, 10,000 MBH	30	Q7	Ea.	1,086.40	\$ 211,300.00	\$ 247,900.00	1.095	\$ 271,450.50	0.97	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹								
5% GF								
CostWorks 2010 - EAST HALL								
Based on National Averages								
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN								
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.05	Assumed Value						
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor PER 20 YEARS	GREEN Total Adjusted Green OH&P Location	De-Escalation Factor PER 20 YEARS	Total Green with All Adjustments	
1.000	D3 01 3170 0130	Replace 1000' type L 3/8" copper, fuel oil storage	\$ 18,914.79	1.05	\$ 20,465.55	0.97	\$ 19,860.53	
1.000	D3 01 3170 0140	Replace 1000' type L 1/2" copper, fuel oil storage	\$ 19,871.15	1.05	\$ 21,500.33	0.97	\$ 20,864.71	
1.000	D3 01 3170 0150	Replace 1000' type L 5/8" copper, fuel oil storage	\$ 21,996.41	1.05	\$ 23,799.83	0.97	\$ 23,096.23	
1.000	D3 01 3170 0160	Replace 1000' type L 3/4" copper, fuel oil storage	\$ 22,633.99	1.05	\$ 24,489.68	0.97	\$ 23,765.69	
1.000	D3 01 3170 0170	Replace 1000' type L 1" copper, fuel oil storage	\$ 27,575.21	1.05	\$ 29,836.01	0.97	\$ 28,953.97	
1.000	D3 04 3450 1020	Replace coil, hot water boost, 12" x 24" duct coil, 1-row	\$ 591.88	1.05	\$ 640.41	0.97	\$ 621.48	
1.000	D3 04 3450 1030	Replace coil, hot water boost, 24" x 24" duct coil, 1-row	\$ 934.05	1.05	\$ 1,010.63	0.97	\$ 980.75	
1.000	D3 04 3450 1040	Replace coil, hot water boost, 24" x 36" duct coil, 1-row	\$ 1,367.60	1.05	\$ 1,479.73	0.97	\$ 1,435.98	
1.000	D3 04 3450 1050	Replace coil, hot water boost, 36" x 36" duct coil, 1-row	\$ 1,838.35	1.05	\$ 1,989.07	0.97	\$ 1,930.26	
1.000	D3 04 3510 0010	install new gasket, 4" pipe size, steel/iron	\$ 234.84	1.05	\$ 254.09	0.97	\$ 246.58	
			\$ 115,958.27				\$ 121,756.19	
			\$ 34,787.48	Assume 30% required		Assume 30% required	\$ 36,526.86	
				PER 25 YEARS		PER 25 YEARS		
1.000	D3 01 3110 0010	Replace 275 gallon fuel oil storage tank	\$ 978.68	1.05	\$ 1,058.92	0.97	\$ 1,027.61	
1.000	D3 01 3160 0020	Replace oil filter housing	\$ 70.13	1.05	\$ 75.88	0.97	\$ 73.64	
1.000	D3 01 3210 0010	install new 2" gasket, 1 per M.L.F. natural gas, steel/iron	\$ 143.45	1.05	\$ 155.22	0.97	\$ 150.63	
1.000	D3 01 3210 0020	install new 3" gasket, 1 per M.L.F. natural gas, steel/iron	\$ 168.43	1.05	\$ 182.24	0.97	\$ 176.85	
1.000	D3 01 3210 0030	install new 4" gasket, 1 per M.L.F. natural gas, steel/iron	\$ 234.84	1.05	\$ 254.09	0.97	\$ 246.58	
1.000	D3 01 3210 0040	install new 6" gasket, 1 per M.L.F. natural gas, steel/iron	\$ 315.60	1.05	\$ 341.48	0.97	\$ 331.38	
1.000	D3 02 3180 1060	Replace boiler, gas, 250 MBH	\$ 9,457.39	1.05	\$ 10,232.78	0.97	\$ 9,930.26	
1.000	D3 02 3180 2070	Replace boiler, gas, 2000 MBH	\$ 37,431.09	1.05	\$ 40,499.94	0.97	\$ 39,302.64	
1.000	D3 02 3180 3070	Replace boiler, gas, 10,000 MBH	\$ 263,425.61	1.05	\$ 285,023.03	0.97	\$ 276,596.89	

HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹												
5% GF												
CostWorks 2010 - EAST HALL												
Based on National Averages												
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN												
Escalation 6%												
De-Escalation to July 2009 1.03												
De-Escalation Factor to be Applied 0.97												
Green Factor 1.05 Assumed Value												
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Total In-House	Total Ind. O&P	Location Adjustment Factor	Adjusted Cost Total OH&P	De-Escalation Factor	
1.000	D3 02 3182 1050	Replace boiler, coal, 4600 MBH	30	5 Stpi	Ea.	366.91	\$ 119,850.00	\$ 138,825.00	1.095	\$ 152,013.38	0.97	
1.000	D3 02 3184 1060	Replace boiler, oil, 250 MBH	30	Q7	Ea.	73.39	\$ 8,050.00	\$ 9,650.00	1.095	\$ 10,566.75	0.97	
1.000	D3 02 3184 2060	Replace boiler, oil, 2000 MBH	30	Q7	Ea.	205.76	\$ 31,625.00	\$ 37,425.00	1.095	\$ 40,980.38	0.97	
1.000	D3 02 3184 3060	Replace boiler, oil, 10,000 MBH	30	Q7	Ea.	894.01	\$ 193,800.00	\$ 226,100.00	1.095	\$ 247,579.50	0.97	
1.000	D3 02 3186 1050	Replace boiler, gas/oil, 2000 MBH	30	Q7	Ea.	172.76	\$ 41,725.00	\$ 48,625.00	1.095	\$ 53,244.38	0.97	
1.000	D3 02 3186 2050	Replace boiler, gas/oil, 20,000 MBH	30	Q7	Ea.	4,684.20	\$ 515,000.00	\$ 619,000.00	1.095	\$ 677,805.00	0.97	
1.000	D3 04 3310 0030	Replace steam converter	30	Q5	Ea.	6.24	\$ 3,220.00	\$ 3,701.00	1.095	\$ 4,052.60	0.97	
1.000	D3 04 3340 0030	Replace condensate meter 500 lb./hr.	30	1 Stpi	Ea.	1.11	\$ 2,649.00	\$ 3,030.00	1.095	\$ 3,317.85	0.97	
1.000	D3 04 3340 0130	Replace condensate meter 1500 lb./hr.	30	1 Stpi	Ea.	2.23	\$ 2,948.00	\$ 3,359.50	1.095	\$ 3,678.65	0.97	
							\$ 1,169,024.00	\$ 1,383,539.00				
1.000	D3 04 3252 0020	Replace metal pipe flue, architectural fireplace	50	2 Sswk	L.F.	0.31	\$ 25.10	\$ 30.22	1.095	\$ 33.09	0.97	
1.000	D3 04 3410 0010	Replace radiator valve 1/2" angle union	50	1 Stpi	Ea.	0.65	\$ 80.45	\$ 96.45	1.095	\$ 105.61	0.97	
1.000	D3 04 3410 0020	Replace radiator valve 3/4" angle union	50	1 Stpi	Ea.	0.78	\$ 91.70	\$ 110.50	1.095	\$ 121.00	0.97	
1.000	D3 04 3410 0030	Replace radiator valve 1" angle union	50	1 Stpi	Ea.	0.82	\$ 101.10	\$ 121.00	1.095	\$ 132.50	0.97	
1.000	D3 04 3410 0040	Replace radiator valve 1-1/4" angle union	50	1 Stpi	Ea.	1.04	\$ 129.50	\$ 154.00	1.095	\$ 168.63	0.97	
1.000	D3 04 3420 0010	Replace C.I. radiator 4 tube 25"H 10' section	50	Q5	Section	3.25	\$ 482.50	\$ 573.50	1.095	\$ 627.98	0.97	
1.000	D3 04 3540 0020	Replace expansion tank, 24 gal capacity	50	Q5	Ea.	2.23	\$ 1,268.00	\$ 1,453.50	1.095	\$ 1,591.58	0.97	
1.000	D3 04 3540 0120	Replace expansion tank, 60 gal capacity	50	Q5	Ea.	3.90	\$ 1,850.00	\$ 2,119.00	1.095	\$ 2,320.31	0.97	
1.000	D3 04 3540 0220	Replace expansion tank, 175 gal capacity	50	Q5	Ea.	7.79	\$ 4,900.00	\$ 5,638.00	1.095	\$ 6,173.61	0.97	
1.000	D3 04 3540 0320	Replace expansion tank, 400 gal capacity	50	Q5	Ea.	11.16	\$ 10,165.00	\$ 11,669.00	1.095	\$ 12,777.56	0.97	
							\$ 19,093.35	\$ 21,965.17				
NOTES:												
REPORT RECOMMENDATIONS												
SHALL INDICATE THAT THE ITEMS MENTIONED ABOVE												
HAVE NOT BEEN QUANTIFIED												
THEREFORE IT IS FOR ANALYSIS ONLY AND DOES NOT												
DEPICT CURRENT OR APPLICABLE CONDITIONS												
FOOTNOTES:												
1												
RS Means CostWorks 2010 Operations and Maintenance												

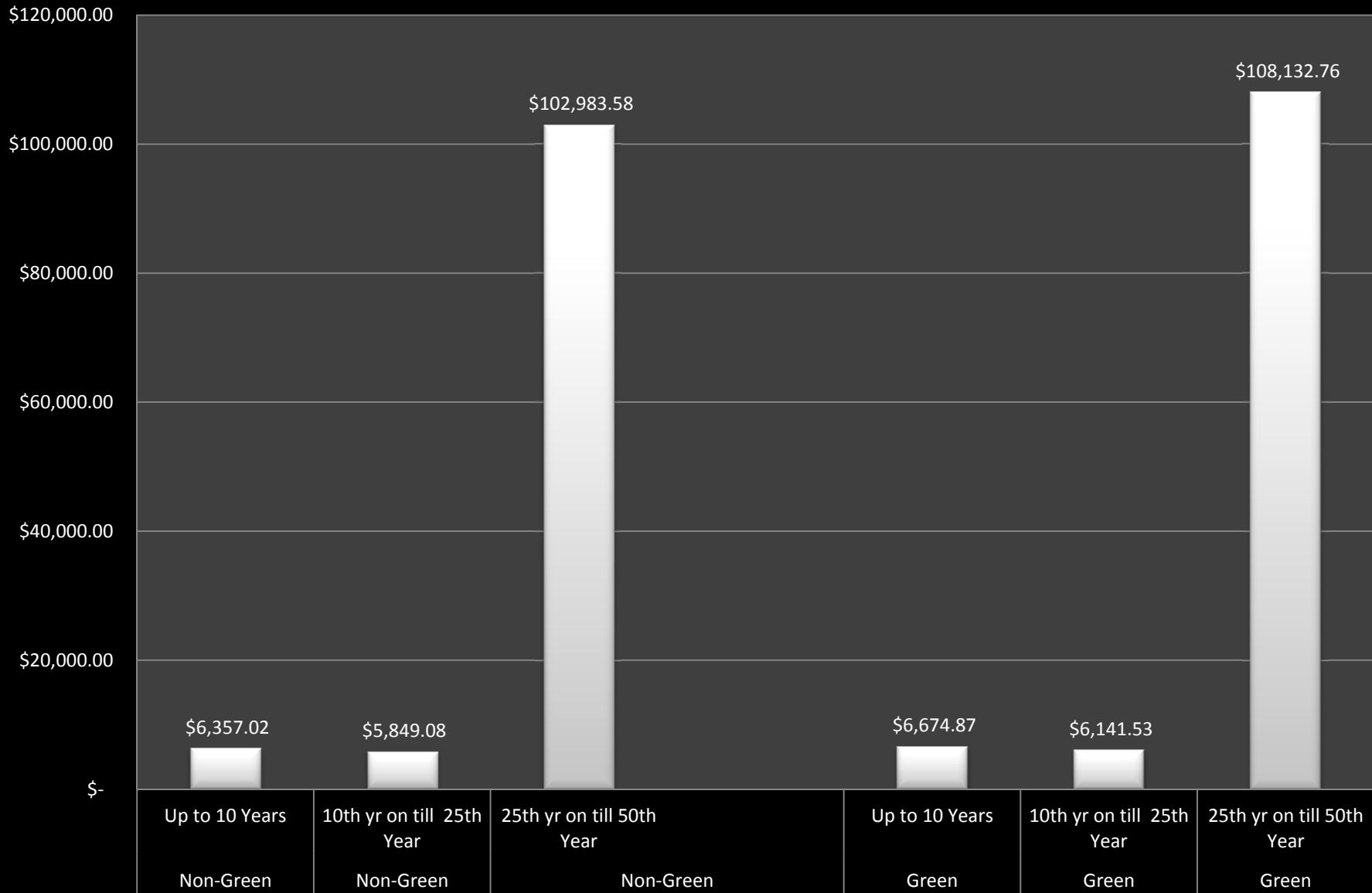
HVAC AND FIRE PROTECTION REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
5% GF							
CostWorks 2010 - EAST HALL							
Based on National Averages							
ADJUSTED TO REFLECT WORCESTER & ADJUSTED GREEN VS. NON-GREEN							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value					
					GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	Total Adjusted Green OH&P Location	De-Escalation Factor	Total Green with All Adjustments
1.000	D3 02 3182 1050	Replace boiler, coal, 4600 MBH	\$ 147,519.40	1.05	\$ 159,614.04	0.97	\$ 154,895.37
1.000	D3 02 3184 1060	Replace boiler, oil, 250 MBH	\$ 10,254.37	1.05	\$ 11,095.09	0.97	\$ 10,767.08
1.000	D3 02 3184 2060	Replace boiler, oil, 2000 MBH	\$ 39,768.87	1.05	\$ 43,029.39	0.97	\$ 41,757.32
1.000	D3 02 3184 3060	Replace boiler, oil, 10,000 MBH	\$ 240,260.30	1.05	\$ 259,958.48	0.97	\$ 252,273.32
1.000	D3 02 3186 1050	Replace boiler, gas/oil, 2000 MBH	\$ 51,670.31	1.05	\$ 55,906.59	0.97	\$ 54,253.83
1.000	D3 02 3186 2050	Replace boiler, gas/oil, 20,000 MBH	\$ 657,767.04	1.05	\$ 711,695.25	0.97	\$ 690,655.39
1.000	D3 04 3310 0030	Replace steam converter	\$ 3,932.79	1.05	\$ 4,255.22	0.97	\$ 4,129.43
1.000	D3 04 3340 0030	Replace condensate meter 500 lb./hr.	\$ 3,219.76	1.05	\$ 3,483.74	0.97	\$ 3,380.75
1.000	D3 04 3340 0130	Replace condensate meter 1500 lb./hr.	\$ 3,569.90	1.05	\$ 3,862.59	0.97	\$ 3,748.40
			\$ 1,470,187.97				\$ 1,543,697.37
			\$ 735,093.99	Assume 50% required		Assume 50% required	\$ 771,848.69
				PER 30 YEARS		PER 30 YEARS	
1.000	D3 04 3252 0020	Replace metal pipe flue, architectural fireplace	\$ 32.11	1.05	\$ 34.75	0.97	\$ 33.72
1.000	D3 04 3410 0010	Replace radiator valve 1/2" angle union	\$ 102.49	1.05	\$ 110.89	0.97	\$ 107.62
1.000	D3 04 3410 0020	Replace radiator valve 3/4" angle union	\$ 117.42	1.05	\$ 127.05	0.97	\$ 123.29
1.000	D3 04 3410 0030	Replace radiator valve 1" angle union	\$ 128.58	1.05	\$ 139.12	0.97	\$ 135.01
1.000	D3 04 3410 0040	Replace radiator valve 1-1/4" angle union	\$ 163.64	1.05	\$ 177.06	0.97	\$ 171.83
1.000	D3 04 3420 0010	Replace C.I. radiator 4 tube 25"H 10' section	\$ 609.42	1.05	\$ 659.38	0.97	\$ 639.89
1.000	D3 04 3540 0020	Replace expansion tank, 24 gal capacity	\$ 1,544.53	1.05	\$ 1,671.16	0.97	\$ 1,621.76
1.000	D3 04 3540 0120	Replace expansion tank, 60 gal capacity	\$ 2,251.71	1.05	\$ 2,436.32	0.97	\$ 2,364.30
1.000	D3 04 3540 0220	Replace expansion tank, 175 gal capacity	\$ 5,991.10	1.05	\$ 6,482.29	0.97	\$ 6,290.65
1.000	D3 04 3540 0320	Replace expansion tank, 400 gal capacity	\$ 12,399.81	1.05	\$ 13,416.43	0.97	\$ 13,019.80
			\$ 23,340.82				\$ 24,507.86
			\$ 11,670.41	Assume 50% required		Assume 50% required	\$ 12,253.93
				PER 50 YEARS		PER 50 YEARS	
NOTES:							
REPORT RECOMMENDATIONS							
SHALL INDICATE THAT THE ITEMS MENTIONED ABOVE							
HAVE NOT BEEN QUANTIFIED							
THEREFORE IT IS FOR ANALYSIS ONLY AND DOES NOT							
DEPICT CURRENT OR APPLICABLE CONDITIONS							
FOOTNOTES:							
1							
RS Means CostWorks 2010 Operations and Maintenance							

Appendix C-SM12 5% GF Summary of FMRRC

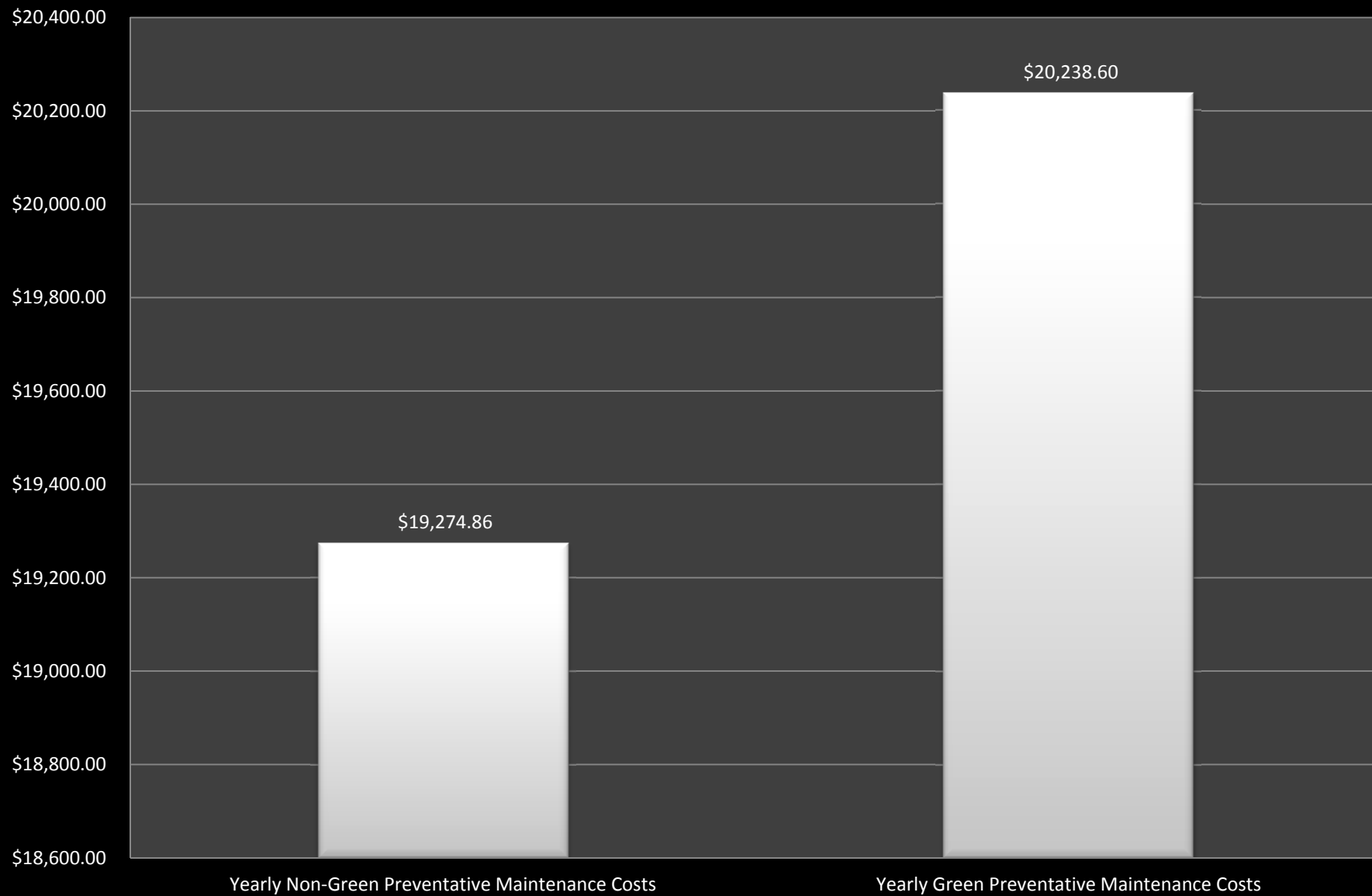
Summary of Green versus Non-Green Major Repair and Replacement Costs based on Frequency (HVAC & FP) 5% GF			
Type of Construction	Description	TOTAL COST	COMMENTS
Non-Green	Up to 10 Years	\$ 748,879.83	
Non-Green	10 th yr on till 25 th Year	\$ 2,831,875.84	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
Non-Green	25 th yr on till 50 th Year	\$ 746,764.39	
Green	Up to 10 Years	\$ 786,323.82	
Green	10 th yr on till 25 th Year	\$ 2,973,469.63	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
Green	25 th yr on till 50 th Year	\$ 784,102.61	
SUMMARY OF FINDINGS			
Green v. Non-Green	4.76%	Green Major Repair and Replacement is 4.76% higher in cost than that of a traditional building	

Appendix C-SE1 Graph: 5% Frequency Maintenance Repair and Replacement Costs and
Yearly Preventative Maintenance Costs (Electrical)

Frequency and Magnitude of Major Repair and Replacement Costs (5% Green Factor)

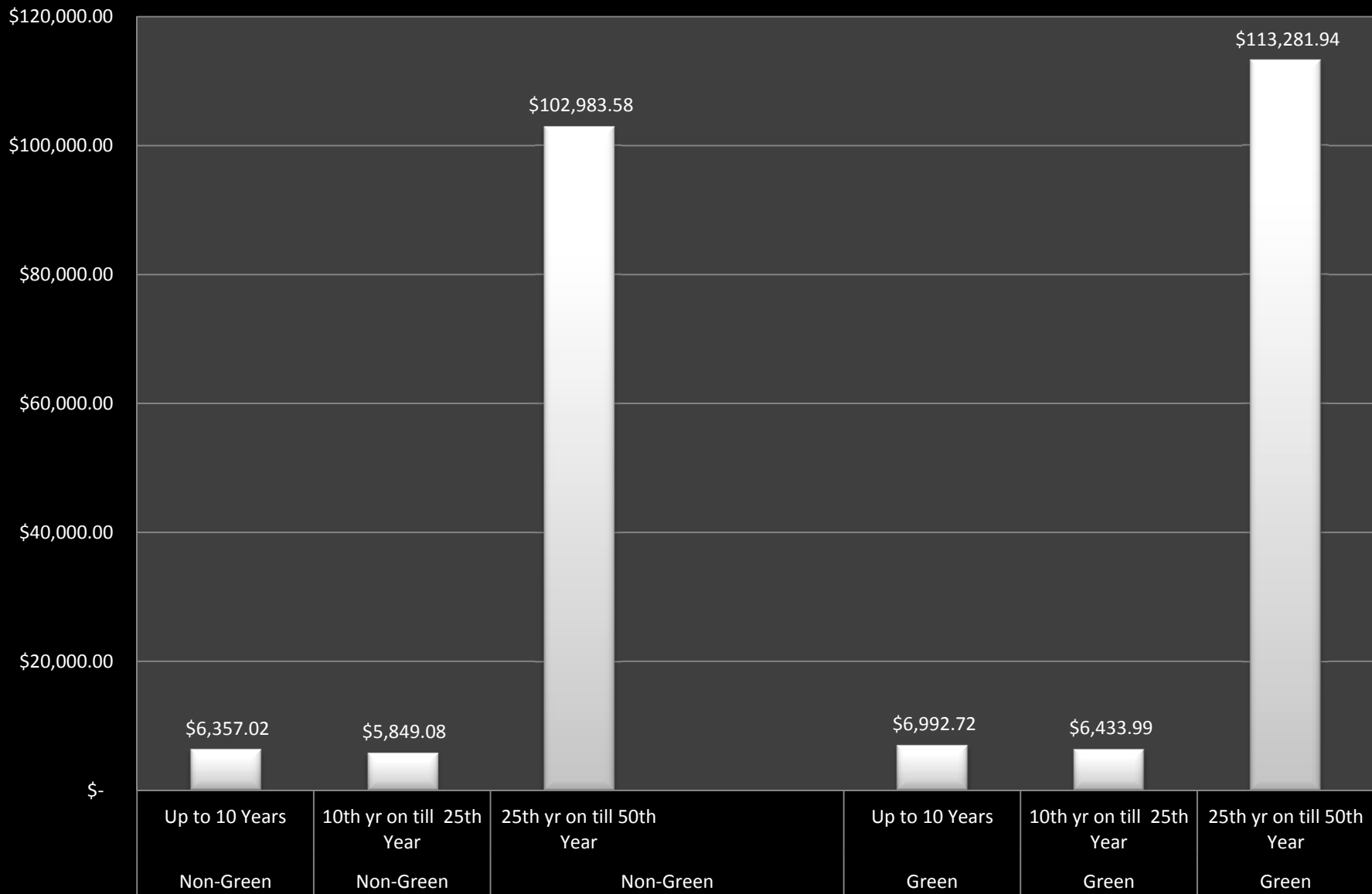


Electrical: Green v. Non-Green Yearly Preventative Maintenance Costs (5% Green Factor)

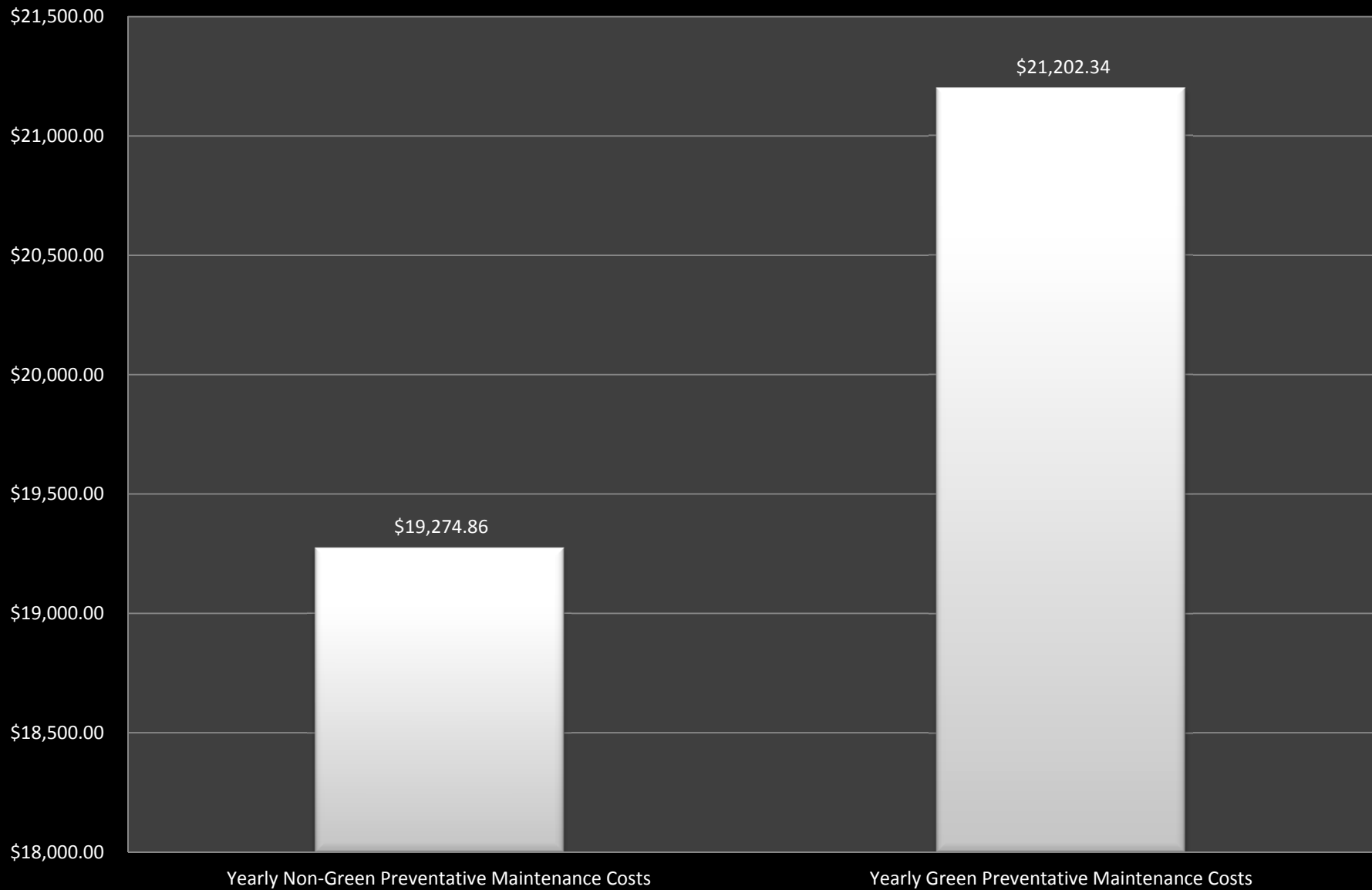


Appendix C-SE2 Graph: 10% Frequency Maintenance Repair and Replacement Costs and
Yearly Preventative Maintenance Costs (Electrical)

Frequency and Magnitude of Major Repair and Replacement Costs (10% Green Factor)

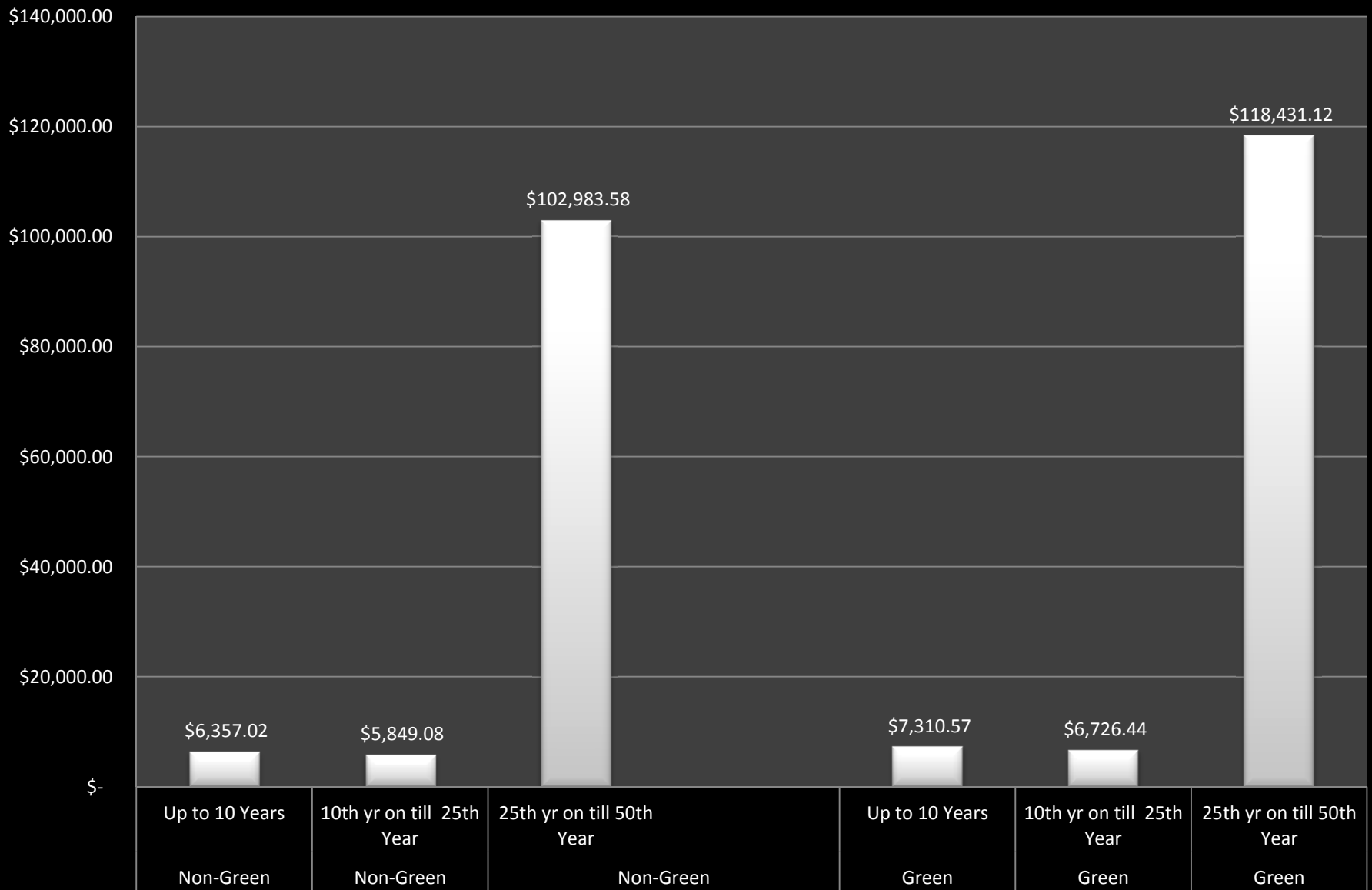


Electrical: Green v. Non-Green Yearly Preventative Maintenance Costs (10% Green Factor)

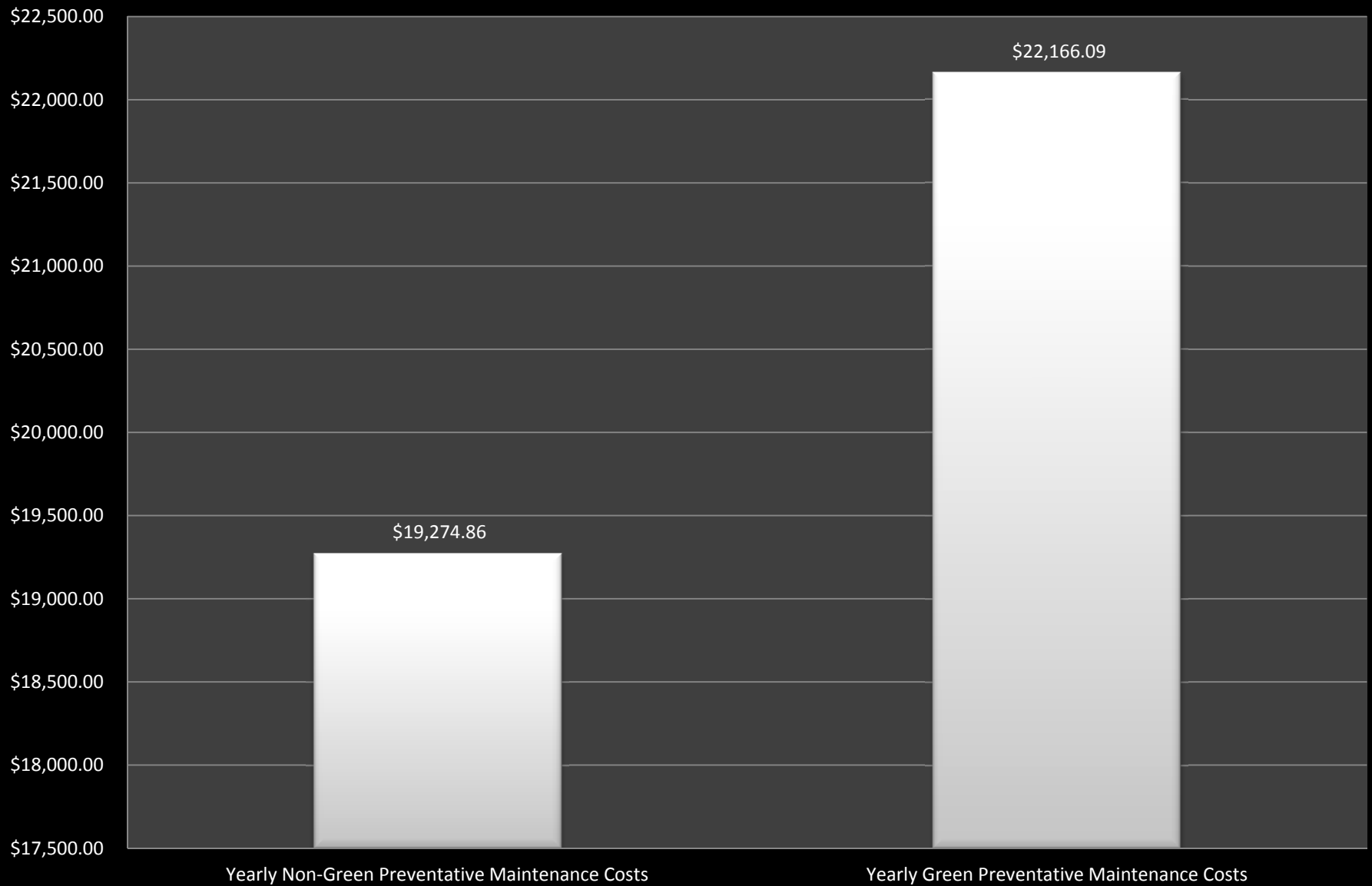


Appendix C-SE3 Graph: 15% Frequency Maintenance Repair and Replacement Costs and
Yearly Preventative Maintenance Costs (Electrical)

Frequency and Magnitude of Major Repair and Replacement Costs (15% Green Factor)



Electrical: Green v. Non-Green Yearly Preventative Maintenance Costs (15% Green Factor)



Appendix C-SE4 15% GF Analysis of YPM

ELECTRICAL PREVENTATIVE MAINTENANCE ³										
15% GF										
CostWorks 2010 - EAST HALL										
National Average										
Location Adjustment	1.095	Weighted Average (CostWorks 2010)								
Total Building Area	162,404	sf								
Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.15	Assumed Value								
Qty	Assembly Number	Description	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	
1.000	D5 01 5210 1950	Switchboard, annualized	0.71	\$ 7.00	\$ 34.50	\$ -	\$ 41.50	\$ 50.00	\$ 62.00	
1.000	D5 01 5214 1950	Switchboard, with air circuit breaker, annualized	13.30	\$ 28.00	\$ 650.00	\$ -	\$ 678.00	\$ 830.00	\$ 1,025.00	
1.000	D5 01 5217 1950	Switchboard, with air circuit breaker and tie switch, annualized	13.36	\$ 41.50	\$ 655.00	\$ -	\$ 696.50	\$ 850.00	\$ 1,050.00	
1.000	D5 01 5220 1950	Circuit breaker, high voltage air, annualized	0.47	\$ -	\$ 23.00	\$ -	\$ 23.00	\$ 28.50	\$ 35.50	
1.000	D5 01 5222 1950	Circuit breaker, high voltage oil, annualized	0.86	\$ 14.05	\$ 42.00	\$ -	\$ 56.05	\$ 67.00	\$ 82.00	
1.000	D5 01 5230 1950	Switch, selector, high voltage, air, annualized	0.41	\$ 14.05	\$ 20.00	\$ -	\$ 34.05	\$ 40.00	\$ 48.00	
1.000	D5 01 5232 1950	Switch, selector, high voltage, oil, annualized	0.45	\$ 21.00	\$ 22.00	\$ -	\$ 43.00	\$ 50.00	\$ 60.50	
1.000	D5 01 5234 1950	Switch, automatic transfer, annualized	5.32	\$ 14.05	\$ 260.00	\$ -	\$ 274.05	\$ 335.00	\$ 420.00	
1.000	D5 01 5236 1950	Switch, interrupt, high voltage, fused air, annualized	0.36	\$ 14.05	\$ 17.85	\$ -	\$ 31.90	\$ 37.50	\$ 45.00	
1.000	D5 01 5238 1950	Switch, interrupt, high voltage, w/ aux fuses, air, annualized	0.36	\$ 14.05	\$ 17.85	\$ -	\$ 31.90	\$ 37.50	\$ 45.00	
1.000	D5 01 5240 1950	Transformer, dry type 500 KVA and over, annualized	0.77	\$ 14.05	\$ 37.50	\$ -	\$ 51.55	\$ 61.50	\$ 75.50	
1.000	D5 01 5240 2950	Transformer, oil pad mounted, annualized	1.08	\$ 28.00	\$ 53.00	\$ -	\$ 81.00	\$ 96.00	\$ 117.00	
1.000	D5 01 5240 3950	Transformer, oil pad mounted, PCB, annualized	2.66	\$ 41.50	\$ 130.00	\$ -	\$ 171.50	\$ 205.00	\$ 252.00	
1.000	D5 01 5260 1950	Panelboard, 225 A and above, annualized	0.44	\$ 28.00	\$ 21.50	\$ -	\$ 49.50	\$ 57.50	\$ 68.00	
1.000	D5 01 5280 1950	Motor control center, over 400 A, annualized	0.39	\$ 28.00	\$ 19.05	\$ -	\$ 47.05	\$ 54.00	\$ 64.50	
1.000	D5 03 5610 1950	Central clock systems, annualized	1.32	\$ 1.46	\$ 64.50	\$ -	\$ 65.96	\$ 81.00	\$ 101.00	
1.000	D5 03 5710 1950	Fire alarm annunciator system, annualized	11.05	\$ 137.00	\$ 555.00	\$ -	\$ 692.00	\$ 840.00	\$ 1,025.00	
1.000	D5 03 5810 1950	Security, intrusion alarm system, annualized	3.83	\$ 41.50	\$ 188.00	\$ -	\$ 229.50	\$ 276.00	\$ 340.00	
1.000	D5 09 5210 1950	Emergency diesel or gas generator, up to 15 KVA, annualized	13.17	\$ 124.00	\$ 645.00	\$ -	\$ 769.00	\$ 930.00	\$ 1,150.00	
1.000	D5 09 5210 2950	Emergency diesel or gas generator, over 15 KVA, annualized	16.16	\$ 137.00	\$ 790.00	\$ -	\$ 927.00	\$ 1,125.00	\$ 1,400.00	
1.000	D5 09 5210 3950	Emergency diesel generator, turbine, annualized	16.10	\$ 233.00	\$ 790.00	\$ -	\$ 1,023.00	\$ 1,225.00	\$ 1,525.00	
1.000	D5 09 5220 1950	Power stabilizer, annualized	0.63	\$ -	\$ 30.50	\$ -	\$ 30.50	\$ 37.50	\$ 47.00	
1.000	D5 09 5230 1950	Uninterrupted power system, up to 200 KVA, annualized	22.92	\$ 209.00	\$ 1,125.00	\$ -	\$ 1,334.00	\$ 1,600.00	\$ 1,975.00	
1.000	D5 09 5230 2950	Uninterrupted power system, 200 KVA to 800 KVA, annualized	78.09	\$ 281.00	\$ 3,825.00	\$ -	\$ 4,106.00	\$ 5,000.00	\$ 6,225.00	
1.000	D5 09 5240 1950	Battery system and charger, annualized	8.73	\$ 28.00	\$ 430.00	\$ -	\$ 458.00	\$ 555.00	\$ 695.00	
1.000	D5 09 5250 1950	Light, emergency, hardwired system, annualized	0.25	\$ -	\$ 12.25	\$ -	\$ 12.25	\$ 15.05	\$ 18.85	
1.000	D5 09 5250 2950	Light, emergency, dry cell, annualized	0.37	\$ 41.50	\$ 18.15	\$ -	\$ 59.65	\$ 68.00	\$ 80.00	
1.000	D5 09 5250 3950	Light, emergency, wet cell, annualized	0.39	\$ 62.00	\$ 19.10	\$ -	\$ 81.10	\$ 91.50	\$ 107.00	

ELECTRICAL PREVENTATIVE MAINTENANCE ³										
15% GF										
CostWorks 2010 - EAST HALL										
National Average										
Location Adjustment	1.095	Weighted Average (CostWorks 2010)								
Total Building Area	162,404	sf								
Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.15	Assumed Value								
Qty	Assembly Number	Description	Location Factor	Adjusted Total Includ. O&P	De-Escalation Factor to July 2009 Costs	Total Non-Green with all Adjustments	GREEN Factor	Adjusted Total with Green Factor OH&P		
1.000	D5 01 5210 1950	Switchboard, annualized	1.095	\$ 67.89	0.97	\$ 65.88	1.15	\$ 75.77		
1.000	D5 01 5214 1950	Switchboard, with air circuit breaker, annualized	1.095	\$ 1,122.38	0.97	\$ 1,089.19	1.15	\$ 1,252.57		
1.000	D5 01 5217 1950	Switchboard, with air circuit breaker and tie switch, annualized	1.095	\$ 1,149.75	0.97	\$ 1,115.76	1.15	\$ 1,283.12		
1.000	D5 01 5220 1950	Circuit breaker, high voltage air, annualized	1.095	\$ 38.87	0.97	\$ 37.72	1.15	\$ 43.38		
1.000	D5 01 5222 1950	Circuit breaker, high voltage oil, annualized	1.095	\$ 89.79	0.97	\$ 87.14	1.15	\$ 100.21		
1.000	D5 01 5230 1950	Switch, selector, high voltage, air, annualized	1.095	\$ 52.56	0.97	\$ 51.01	1.15	\$ 58.66		
1.000	D5 01 5232 1950	Switch, selector, high voltage, oil, annualized	1.095	\$ 66.25	0.97	\$ 64.29	1.15	\$ 73.93		
1.000	D5 01 5234 1950	Switch, automatic transfer, annualized	1.095	\$ 459.90	0.97	\$ 446.30	1.15	\$ 513.25		
1.000	D5 01 5236 1950	Switch, interrupt, high voltage, fused air, annualized	1.095	\$ 49.28	0.97	\$ 47.82	1.15	\$ 54.99		
1.000	D5 01 5238 1950	Switch, interrupt, high voltage, w/ aux fuses, air, annualized	1.095	\$ 49.28	0.97	\$ 47.82	1.15	\$ 54.99		
1.000	D5 01 5240 1950	Transformer, dry type 500 KVA and over, annualized	1.095	\$ 82.67	0.97	\$ 80.23	1.15	\$ 92.26		
1.000	D5 01 5240 2950	Transformer, oil pad mounted, annualized	1.095	\$ 128.12	0.97	\$ 124.33	1.15	\$ 142.98		
1.000	D5 01 5240 3950	Transformer, oil pad mounted, PCB, annualized	1.095	\$ 275.94	0.97	\$ 267.78	1.15	\$ 307.95		
1.000	D5 01 5260 1950	Panelboard, 225 A and above, annualized	1.095	\$ 74.46	0.97	\$ 72.26	1.15	\$ 83.10		
1.000	D5 01 5280 1950	Motor control center, over 400 A, annualized	1.095	\$ 70.63	0.97	\$ 68.54	1.15	\$ 78.82		
1.000	D5 03 5610 1950	Central clock systems, annualized	1.095	\$ 110.60	0.97	\$ 107.33	1.15	\$ 123.42		
1.000	D5 03 5710 1950	Fire alarm annunciator system, annualized	1.095	\$ 1,122.38	0.97	\$ 1,089.19	1.15	\$ 1,252.57		
1.000	D5 03 5810 1950	Security, intrusion alarm system, annualized	1.095	\$ 372.30	0.97	\$ 361.29	1.15	\$ 415.49		
1.000	D5 09 5210 1950	Emergency diesel or gas generator, up to 15 KVA, annualized	1.095	\$ 1,259.25	0.97	\$ 1,222.02	1.15	\$ 1,405.33		
1.000	D5 09 5210 2950	Emergency diesel or gas generator, over 15 KVA, annualized	1.095	\$ 1,533.00	0.97	\$ 1,487.68	1.15	\$ 1,710.83		
1.000	D5 09 5210 3950	Emergency diesel generator, turbine, annualized	1.095	\$ 1,669.88	0.97	\$ 1,620.51	1.15	\$ 1,863.58		
1.000	D5 09 5220 1950	Power stabilizer, annualized	1.095	\$ 51.47	0.97	\$ 49.94	1.15	\$ 57.44		
1.000	D5 09 5230 1950	Uninterrupted power system, up to 200 KVA, annualized	1.095	\$ 2,162.63	0.97	\$ 2,098.69	1.15	\$ 2,413.49		
1.000	D5 09 5230 2950	Uninterrupted power system, 200 KVA to 800 KVA, annualized	1.095	\$ 6,816.38	0.97	\$ 6,614.86	1.15	\$ 7,607.09		
1.000	D5 09 5240 1950	Battery system and charger, annualized	1.095	\$ 761.03	0.97	\$ 738.53	1.15	\$ 849.31		
1.000	D5 09 5250 1950	Light, emergency, hardwired system, annualized	1.095	\$ 20.64	0.97	\$ 20.03	1.15	\$ 23.04		
1.000	D5 09 5250 2950	Light, emergency, dry cell, annualized	1.095	\$ 87.60	0.97	\$ 85.01	1.15	\$ 97.76		
1.000	D5 09 5250 3950	Light, emergency, wet cell, annualized	1.095	\$ 117.17	0.97	\$ 113.70	1.15	\$ 130.76		
						\$ 19,274.86		\$ 22,166.09		
						Total Yearly Preventative Maintenance Cost		Total Yearly Preventative Maintenance Cost		
						Non-Green		Green		

Qty	Assembly Number	Description	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P
SUMMARY OF FINDINGS									
		Description	Cost	% Difference	Comments				
		Yearly Non-Green Preventative Maintenance Costs	\$19,274.86						
		Yearly Green Preventative Maintenance Costs	\$22,166.09	13.04%	Green Costs are 13.04% higher than Non-Green based on this analysis				
NOTES:									
It is assumed that all above mentioned items shall be required to be maintained									
FOOTNOTES:									
1									
RS Means CostWorks 2010 Operations and Maintenance									

Appendix C-SE5 15% GF Analysis of FMRRC

ELECTRICAL REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

15% GF

CostWorks 2010 -East Hall

National Averages

Escalation	6%	
De-Escalation to July 2009	1.03	
De-Escalation Factor to be Applied	0.97	
Green Factor	1.15	Assumed Value

Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Location Adjustment
1.000	D5013 110 0020	Maintenance and inspection primary transformer, liquid filled	0.5	1 Elec	Ea.	0.50	\$ -	\$ 24.50	\$ -	\$ 24.50	\$ 30.00	\$ 37.50	1.095
1.000	D5013 120 0020	Maintenance and inspection primary transformer, dry	0.5	1 Elec	Ea.	0.50	\$ -	\$ 24.50	\$ -	\$ 24.50	\$ 30.00	\$ 37.50	1.095
1.000	D5013 210 0020	Maintenance and inspection switchgear, mainframe	1	1 Elec	Ea.	0.80	\$ -	\$ 39.00	\$ -	\$ 39.00	\$ 48.00	\$ 60.00	1.095
1.000	D5013 220 0020	Maintenance and inspection switchgear, indoor, less than 600 V	3	1 Elec	Ea.	0.50	\$ -	\$ 24.50	\$ -	\$ 24.50	\$ 30.00	\$ 37.50	1.095
1.000	D5013 210 0010	Repair switchgear 1200 A mainframe	5	1 Elec	Ea.	6.70	\$ 1,150.00	\$ 328.50	\$ -	\$ 1,478.50	\$ 1,677.00	\$ 1,953.00	1.095
1.000	D5013 224 0010	Maintenance and repair - (5% of total fuses) switchgear, indoor, 600 V	10	1 Elec	Ea.	0.55	\$ 320.00	\$ 27.00	\$ -	\$ 347.00	\$ 384.05	\$ 441.35	1.095
1.000	D5013 220 0010	Repair switchgear, - (5% of total C.B.), indoor, less than 600 V	10	1 Elec	Ea.	1.54	\$ 179.00	\$ 75.60	\$ -	\$ 254.60	\$ 290.00	\$ 340.00	1.095
1.000	D5013 110 0010	Repair 500 kva transformer, primary, liquid filled	10	1 Elec	Ea.	3.96	\$ 2,225.00	\$ 194.00	\$ -	\$ 2,419.00	\$ 2,685.00	\$ 3,075.50	1.095

ELECTRICAL REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
15% GF							
CostWorks 2010 -East Hall							
National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value					
Qty	Assembly Number	Description	Non-Green Total with L. Adjusted OH&P	De-Escalation Factor	Total Non-Green w/All Adjustments	Green Factor	Total w/Green Factor
1.000	D5013 110 0020	Maintenance and inspection primary transformer, liquid filled	\$ 41.06	0.97	\$ 39.85	1.15	\$ 45.83
1.000	D5013 120 0020	Maintenance and inspection primary transformer, dry	\$ 41.06	0.97	\$ 39.85	1.15	\$ 45.83
					\$ 79.70		\$ 91.65
					\$ 79.70		\$ 91.65
							Assumed 100%
							PER 0.5 YR
1.000	D5013 210 0020	Maintenance and inspection switchgear, mainframe	\$ 65.70	0.97	\$ 63.76	1.15	\$ 73.32
					\$ 63.76		\$ 73.32
					\$ 63.76		\$ 73.32
							Assumed 100%
							PER 1 YR
1.000	D5013 220 0020	Maintenance and inspection switchgear, indoor, less than 600 V	\$ 41.06	0.97	\$ 39.85	1.15	\$ 45.83
					\$ 39.85		\$ 45.83
					\$ 39.85		\$ 45.83
							Assumed 100%
							PER 3 YR
1.000	D5013 210 0010	Repair switchgear 1200 A mainframe	\$ 2,138.54	0.97	\$ 2,075.31	1.15	\$ 2,386.61
					\$ 2,075.31		\$ 2,386.61
					\$ 2,075.31		\$ 2,386.61
							Assumed 100%
							PER 5 YR
1.000	D5013 224 0010	Maintenance and repair - (5% of total fuses) switchgear, indoor, 600 V	\$ 483.28	0.97	\$ 468.99	1.15	\$ 539.34
1.000	D5013 220 0010	Repair switchgear, - (5% of total C.B.), indoor, less than 600 V	\$ 372.30	0.97	\$ 361.29	1.15	\$ 415.49
1.000	D5013 110 0010	Repair 500 kva transformer, primary, liquid filled	\$ 3,367.67	0.97	\$ 3,268.11	1.15	\$ 3,758.33
					\$ 4,098.40		\$ 4,713.16
					\$ 4,098.40		\$ 4,713.16
							Assumed 100%

ELECTRICAL REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

15% GF

CostWorks 2010 -East Hall

National Averages

Escalation	6%													
De-Escalation to July 2009	1.03													
De-Escalation Factor to be Applied	0.97													
Green Factor	1.15	Assumed Value												

Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Location Adjustment
1.000	D5013 120 0010	Repair 15 KV primary transformer, dry	15	1 Elec	Ea.	2.00	\$ 48.50	\$ 98.00	\$ -	\$ 146.50	\$ 174.00	\$ 212.00	1.095
1.000	D5013 210 0030	Replace switchgear 1200 A mainframe	20	3 Elec	Ea.	29.82	\$ 2,075.00	\$ 1,467.00	\$ -	\$ 3,542.00	\$ 4,080.00	\$ 4,851.00	1.095
1.000	D5013 216 0010	Replace fuse	25	1 Elec	Ea.	0.55	\$ 320.00	\$ 27.00	\$ -	\$ 347.00	\$ 384.05	\$ 441.35	1.095
1.000	D5013 110 0030	Replace transformer primary, liquid filled	30	R3	Ea.	63.79	\$ 20,000.00	\$ 3,090.00	\$ 440.50	\$ 23,530.50	\$ 26,215.00	\$ 30,225.00	1.095
1.000	D5013 120 0030	Replace transformer primary, dry	30	R3	Ea.	70.94	\$ 45,600.00	\$ 3,415.00	\$ 490.50	\$ 49,505.50	\$ 54,915.00	\$ 62,625.00	1.095
1.000	D5013 220 0030	Replace switchgear, indoor, less than 600 V	30	1 Elec	Ea.	17.45	\$ 2,200.00	\$ 855.00	\$ -	\$ 3,055.00	\$ 3,480.50	\$ 4,064.00	1.095

ELECTRICAL REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹								
15% GF								
CostWorks 2010 -East Hall								
National Averages								
Escalation	6%							
De-Escalation to July 2009	1.03							
De-Escalation Factor to be Applied	0.97							
Green Factor	1.15	Assumed Value						
Qty	Assembly Number	Description	Non-Green Total with L. Adjusted OH&P	De-Escalation Factor	Total Non-Green w/All Adjustments	Green Factor	Total w/Green Factor	
								PER 10 YR
1.000	D5013 120 0010	Repair 15 KV primary transformer, dry	\$ 232.14	0.97	\$ 225.28	1.15	\$ 259.07	
					\$ 225.28		\$ 259.07	
					\$ 225.28		\$ 259.07	Assumed 100%
								PER 15 YR
1.000	D5013 210 0030	Replace switchgear 1200 A mainframe	\$ 5,311.85	0.97	\$ 5,154.81	1.15	\$ 5,928.03	
					\$ 5,154.81		\$ 5,928.03	
					\$ 5,154.81		\$ 5,928.03	Assumed 100%
								PER 20 YR
1.000	D5013 216 0010	Replace fuse	\$ 483.28	0.97	\$ 468.99	1.15	\$ 539.34	
					\$ 468.99		\$ 539.34	
					\$ 468.99		\$ 539.34	Assumed 100%
								PER 25 YR
1.000	D5013 110 0030	Replace transformer primary, liquid filled	\$ 33,096.38	0.97	\$ 32,117.95	1.15	\$ 36,935.64	
1.000	D5013 120 0030	Replace transformer primary, dry	\$ 68,574.38	0.97	\$ 66,547.11	1.15	\$ 76,529.18	
1.000	D5013 220 0030	Replace switchgear, indoor, less than 600 V	\$ 4,450.08	0.97	\$ 4,318.52	1.15	\$ 4,966.30	
					\$ 102,983.58		\$ 118,431.12	
					\$ 102,983.58		\$ 118,431.12	Assumed 100%
								PER 30 YR

ELECTRICAL REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹														
15% GF														
CostWorks 2010 -East Hall														
National Averages														
Escalation	6%													
De-Escalation to July 2009	1.03													
De-Escalation Factor to be Applied	0.97													
Green Factor	1.15	Assumed Value												
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Location Adjustment	
FOOTNOTES:														
1														
RS Means CostWorks 2010 Operations and Maintenance														

Appendix C-SE6 15% GF Summary of FMRRC

Summary of Green versus Non-Green Major Repair and Replacement Costs based on Frequency (Electrical) 15% GF			
Type of Construction	Description	Total Cost	Comments
Non-Green	Up to 10 Years	\$ 6,357.02	
Non-Green	10 th yr on till 25 th Year	\$ 5,849.08	
Non-Green	25 th yr on till 50 th Year	\$ 102,983.58	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
Green	Up to 10 Years	\$ 7,310.57	
Green	10 th yr on till 25 th Year	\$ 6,726.44	
Green	25 th yr on till 50 th Year	\$ 118,431.12	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
SUMMARY OF FINDINGS			
Green v. Non-Green	13.04%	Green	Major Repair and Replacement is 13.04% higher in cost than that of a traditional building

Appendix C-SE7 10% GF Analysis of YPM

ELECTRICAL PREVENTATIVE MAINTENANCE ³										
10% GF										
CostWorks 2010 - EAST HALL										
National Average										
Location Adjustment	1.095	Weighted Average (CostWorks 2010)								
Total Building Area	162,404	sf								
Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.10	Assumed Value								
Qty	Assembly Number	Description	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	
1.000	D5 01 5210 1950	Switchboard, annualized	0.71	\$ 7.00	\$ 34.50	\$ -	\$ 41.50	\$ 50.00	\$ 62.00	
1.000	D5 01 5214 1950	Switchboard, with air circuit breaker, annualized	13.30	\$ 28.00	\$ 650.00	\$ -	\$ 678.00	\$ 830.00	\$ 1,025.00	
1.000	D5 01 5217 1950	Switchboard, with air circuit breaker and tie switch, annualized	13.36	\$ 41.50	\$ 655.00	\$ -	\$ 696.50	\$ 850.00	\$ 1,050.00	
1.000	D5 01 5220 1950	Circuit breaker, high voltage air, annualized	0.47	\$ -	\$ 23.00	\$ -	\$ 23.00	\$ 28.50	\$ 35.50	
1.000	D5 01 5222 1950	Circuit breaker, high voltage oil, annualized	0.86	\$ 14.05	\$ 42.00	\$ -	\$ 56.05	\$ 67.00	\$ 82.00	
1.000	D5 01 5230 1950	Switch, selector, high voltage, air, annualized	0.41	\$ 14.05	\$ 20.00	\$ -	\$ 34.05	\$ 40.00	\$ 48.00	
1.000	D5 01 5232 1950	Switch, selector, high voltage, oil, annualized	0.45	\$ 21.00	\$ 22.00	\$ -	\$ 43.00	\$ 50.00	\$ 60.50	
1.000	D5 01 5234 1950	Switch, automatic transfer, annualized	5.32	\$ 14.05	\$ 260.00	\$ -	\$ 274.05	\$ 335.00	\$ 420.00	
1.000	D5 01 5236 1950	Switch, interrupt, high voltage, fused air, annualized	0.36	\$ 14.05	\$ 17.85	\$ -	\$ 31.90	\$ 37.50	\$ 45.00	
1.000	D5 01 5238 1950	Switch, interrupt, high voltage, w/ aux fuses, air, annualized	0.36	\$ 14.05	\$ 17.85	\$ -	\$ 31.90	\$ 37.50	\$ 45.00	
1.000	D5 01 5240 1950	Transformer, dry type 500 KVA and over, annualized	0.77	\$ 14.05	\$ 37.50	\$ -	\$ 51.55	\$ 61.50	\$ 75.50	
1.000	D5 01 5240 2950	Transformer, oil pad mounted, annualized	1.08	\$ 28.00	\$ 53.00	\$ -	\$ 81.00	\$ 96.00	\$ 117.00	
1.000	D5 01 5240 3950	Transformer, oil pad mounted, PCB, annualized	2.66	\$ 41.50	\$ 130.00	\$ -	\$ 171.50	\$ 205.00	\$ 252.00	
1.000	D5 01 5260 1950	Panelboard, 225 A and above, annualized	0.44	\$ 28.00	\$ 21.50	\$ -	\$ 49.50	\$ 57.50	\$ 68.00	
1.000	D5 01 5280 1950	Motor control center, over 400 A, annualized	0.39	\$ 28.00	\$ 19.05	\$ -	\$ 47.05	\$ 54.00	\$ 64.50	
1.000	D5 03 5610 1950	Central clock systems, annualized	1.32	\$ 1.46	\$ 64.50	\$ -	\$ 65.96	\$ 81.00	\$ 101.00	
1.000	D5 03 5710 1950	Fire alarm annunciator system, annualized	11.05	\$ 137.00	\$ 555.00	\$ -	\$ 692.00	\$ 840.00	\$ 1,025.00	
1.000	D5 03 5810 1950	Security, intrusion alarm system, annualized	3.83	\$ 41.50	\$ 188.00	\$ -	\$ 229.50	\$ 276.00	\$ 340.00	
1.000	D5 09 5210 1950	Emergency diesel or gas generator, up to 15 KVA, annualized	13.17	\$ 124.00	\$ 645.00	\$ -	\$ 769.00	\$ 930.00	\$ 1,150.00	
1.000	D5 09 5210 2950	Emergency diesel or gas generator, over 15 KVA, annualized	16.16	\$ 137.00	\$ 790.00	\$ -	\$ 927.00	\$ 1,125.00	\$ 1,400.00	
1.000	D5 09 5210 3950	Emergency diesel generator, turbine, annualized	16.10	\$ 233.00	\$ 790.00	\$ -	\$ 1,023.00	\$ 1,225.00	\$ 1,525.00	
1.000	D5 09 5220 1950	Power stabilizer, annualized	0.63	\$ -	\$ 30.50	\$ -	\$ 30.50	\$ 37.50	\$ 47.00	
1.000	D5 09 5230 1950	Uninterrupted power system, up to 200 KVA, annualized	22.92	\$ 209.00	\$ 1,125.00	\$ -	\$ 1,334.00	\$ 1,600.00	\$ 1,975.00	
1.000	D5 09 5230 2950	Uninterrupted power system, 200 KVA to 800 KVA, annualized	78.09	\$ 281.00	\$ 3,825.00	\$ -	\$ 4,106.00	\$ 5,000.00	\$ 6,225.00	
1.000	D5 09 5240 1950	Battery system and charger, annualized	8.73	\$ 28.00	\$ 430.00	\$ -	\$ 458.00	\$ 555.00	\$ 695.00	
1.000	D5 09 5250 1950	Light, emergency, hardwired system, annualized	0.25	\$ -	\$ 12.25	\$ -	\$ 12.25	\$ 15.05	\$ 18.85	
1.000	D5 09 5250 2950	Light, emergency, dry cell, annualized	0.37	\$ 41.50	\$ 18.15	\$ -	\$ 59.65	\$ 68.00	\$ 80.00	
1.000	D5 09 5250 3950	Light, emergency, wet cell, annualized	0.39	\$ 62.00	\$ 19.10	\$ -	\$ 81.10	\$ 91.50	\$ 107.00	

ELECTRICAL PREVENTATIVE MAINTENANCE ³										
10% GF										
CostWorks 2010 - EAST HALL										
National Average										
Location Adjustment	1.095	Weighted Average (CostWorks 2010)								
Total Building Area	162,404	sf								
Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.10	Assumed Value								
Qty	Assembly Number	Description	Location Factor	Adjusted Total Includ. O&P	De-Escalation Factor to July 2009 Costs	Total Non-Green with all Adjustments	GREEN Factor	Adjusted Total with Green Factor OH&P		
1.000	D5 01 5210 1950	Switchboard, annualized	1.095	\$ 67.89	0.97	\$ 65.88	1.10	\$ 72.47		
1.000	D5 01 5214 1950	Switchboard, with air circuit breaker, annualized	1.095	\$ 1,122.38	0.97	\$ 1,089.19	1.10	\$ 1,198.11		
1.000	D5 01 5217 1950	Switchboard, with air circuit breaker and tie switch, annualized	1.095	\$ 1,149.75	0.97	\$ 1,115.76	1.10	\$ 1,227.34		
1.000	D5 01 5220 1950	Circuit breaker, high voltage air, annualized	1.095	\$ 38.87	0.97	\$ 37.72	1.10	\$ 41.50		
1.000	D5 01 5222 1950	Circuit breaker, high voltage oil, annualized	1.095	\$ 89.79	0.97	\$ 87.14	1.10	\$ 95.85		
1.000	D5 01 5230 1950	Switch, selector, high voltage, air, annualized	1.095	\$ 52.56	0.97	\$ 51.01	1.10	\$ 56.11		
1.000	D5 01 5232 1950	Switch, selector, high voltage, oil, annualized	1.095	\$ 66.25	0.97	\$ 64.29	1.10	\$ 70.72		
1.000	D5 01 5234 1950	Switch, automatic transfer, annualized	1.095	\$ 459.90	0.97	\$ 446.30	1.10	\$ 490.93		
1.000	D5 01 5236 1950	Switch, interrupt, high voltage, fused air, annualized	1.095	\$ 49.28	0.97	\$ 47.82	1.10	\$ 52.60		
1.000	D5 01 5238 1950	Switch, interrupt, high voltage, w/ aux fuses, air, annualized	1.095	\$ 49.28	0.97	\$ 47.82	1.10	\$ 52.60		
1.000	D5 01 5240 1950	Transformer, dry type 500 KVA and over, annualized	1.095	\$ 82.67	0.97	\$ 80.23	1.10	\$ 88.25		
1.000	D5 01 5240 2950	Transformer, oil pad mounted, annualized	1.095	\$ 128.12	0.97	\$ 124.33	1.10	\$ 136.76		
1.000	D5 01 5240 3950	Transformer, oil pad mounted, PCB, annualized	1.095	\$ 275.94	0.97	\$ 267.78	1.10	\$ 294.56		
1.000	D5 01 5260 1950	Panelboard, 225 A and above, annualized	1.095	\$ 74.46	0.97	\$ 72.26	1.10	\$ 79.48		
1.000	D5 01 5280 1950	Motor control center, over 400 A, annualized	1.095	\$ 70.63	0.97	\$ 68.54	1.10	\$ 75.39		
1.000	D5 03 5610 1950	Central clock systems, annualized	1.095	\$ 110.60	0.97	\$ 107.33	1.10	\$ 118.06		
1.000	D5 03 5710 1950	Fire alarm annunciator system, annualized	1.095	\$ 1,122.38	0.97	\$ 1,089.19	1.10	\$ 1,198.11		
1.000	D5 03 5810 1950	Security, intrusion alarm system, annualized	1.095	\$ 372.30	0.97	\$ 361.29	1.10	\$ 397.42		
1.000	D5 09 5210 1950	Emergency diesel or gas generator, up to 15 KVA, annualized	1.095	\$ 1,259.25	0.97	\$ 1,222.02	1.10	\$ 1,344.23		
1.000	D5 09 5210 2950	Emergency diesel or gas generator, over 15 KVA, annualized	1.095	\$ 1,533.00	0.97	\$ 1,487.68	1.10	\$ 1,636.45		
1.000	D5 09 5210 3950	Emergency diesel generator, turbine, annualized	1.095	\$ 1,669.88	0.97	\$ 1,620.51	1.10	\$ 1,782.56		
1.000	D5 09 5220 1950	Power stabilizer, annualized	1.095	\$ 51.47	0.97	\$ 49.94	1.10	\$ 54.94		
1.000	D5 09 5230 1950	Uninterrupted power system, up to 200 KVA, annualized	1.095	\$ 2,162.63	0.97	\$ 2,098.69	1.10	\$ 2,308.56		
1.000	D5 09 5230 2950	Uninterrupted power system, 200 KVA to 800 KVA, annualized	1.095	\$ 6,816.38	0.97	\$ 6,614.86	1.10	\$ 7,276.35		
1.000	D5 09 5240 1950	Battery system and charger, annualized	1.095	\$ 761.03	0.97	\$ 738.53	1.10	\$ 812.38		
1.000	D5 09 5250 1950	Light, emergency, hardwired system, annualized	1.095	\$ 20.64	0.97	\$ 20.03	1.10	\$ 22.03		
1.000	D5 09 5250 2950	Light, emergency, dry cell, annualized	1.095	\$ 87.60	0.97	\$ 85.01	1.10	\$ 93.51		
1.000	D5 09 5250 3950	Light, emergency, wet cell, annualized	1.095	\$ 117.17	0.97	\$ 113.70	1.10	\$ 125.07		
						\$ 19,274.86		\$ 21,202.34		
						Total Yearly Preventative Maintenance Cost		Total Yearly Preventative Maintenance Cost		
						Non-Green		Green		

Qty	Assembly Number	Description	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P
SUMMARY OF FINDINGS									
		Description	Cost	% Difference	Comments				
		Yearly Non-Green Preventative Maintenance Costs	\$19,274.86						
		Yearly Green Preventative Maintenance Costs	\$21,202.34	9.09%	Green Costs are 9.09% higher than Non-Green based on this analysis				
NOTES:									
It is assumed that all above mentioned items shall be required to be maintained									
FOOTNOTES:									
1									
RS Means CostWorks 2010 Operations and Maintenance									

Appendix C-SE8 10% GF Analysis of FMRRC

ELECTRICAL REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

10% GF

CostWorks 2010 -East Hall

National Averages

Escalation	6%														
De-Escalation to July 2009	1.03														
De-Escalation Factor to be Applied	0.97														
Green Factor	1.10	Assumed Value													

Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Location Adjustment
1.000	D5013 110 0020	Maintenance and inspection primary transformer, liquid filled	0.5	1 Elec	Ea.	0.50	\$ -	\$ 24.50	\$ -	\$ 24.50	\$ 30.00	\$ 37.50	1.095
1.000	D5013 120 0020	Maintenance and inspection primary transformer, dry	0.5	1 Elec	Ea.	0.50	\$ -	\$ 24.50	\$ -	\$ 24.50	\$ 30.00	\$ 37.50	1.095
1.000	D5013 210 0020	Maintenance and inspection switchgear, mainframe	1	1 Elec	Ea.	0.80	\$ -	\$ 39.00	\$ -	\$ 39.00	\$ 48.00	\$ 60.00	1.095
1.000	D5013 220 0020	Maintenance and inspection switchgear, indoor, less than 600 V	3	1 Elec	Ea.	0.50	\$ -	\$ 24.50	\$ -	\$ 24.50	\$ 30.00	\$ 37.50	1.095
1.000	D5013 210 0010	Repair switchgear 1200 A mainframe	5	1 Elec	Ea.	6.70	\$ 1,150.00	\$ 328.50	\$ -	\$ 1,478.50	\$ 1,677.00	\$ 1,953.00	1.095
1.000	D5013 224 0010	Maintenance and repair - (5% of total fuses) switchgear, indoor, 600 V	10	1 Elec	Ea.	0.55	\$ 320.00	\$ 27.00	\$ -	\$ 347.00	\$ 384.05	\$ 441.35	1.095
1.000	D5013 220 0010	Repair switchgear, - (5% of total C.B.), indoor, less than 600 V	10	1 Elec	Ea.	1.54	\$ 179.00	\$ 75.60	\$ -	\$ 254.60	\$ 290.00	\$ 340.00	1.095
1.000	D5013 110 0010	Repair 500 kva transformer, primary, liquid filled	10	1 Elec	Ea.	3.96	\$ 2,225.00	\$ 194.00	\$ -	\$ 2,419.00	\$ 2,685.00	\$ 3,075.50	1.095

ELECTRICAL REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
10% GF							
CostWorks 2010 -East Hall							
National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value					
Qty	Assembly Number	Description	Non-Green Total with L. Adjusted OH&P	De-Escalation Factor	Total Non-Green w/All Adjustments	Green Factor	Total w/Green Factor
1.000	D5013 110 0020	Maintenance and inspection primary transformer, liquid filled	\$ 41.06	0.97	\$ 39.85	1.10	\$ 43.83
1.000	D5013 120 0020	Maintenance and inspection primary transformer, dry	\$ 41.06	0.97	\$ 39.85	1.10	\$ 43.83
					\$ 79.70		\$ 87.67
					\$ 79.70		\$ 87.67
							Assumed 100%
							PER 0.5 YR
1.000	D5013 210 0020	Maintenance and inspection switchgear, mainframe	\$ 65.70	0.97	\$ 63.76	1.10	\$ 70.13
					\$ 63.76		\$ 70.13
					\$ 63.76		\$ 70.13
							Assumed 100%
							PER 1 YR
1.000	D5013 220 0020	Maintenance and inspection switchgear, indoor, less than 600 V	\$ 41.06	0.97	\$ 39.85	1.10	\$ 43.83
					\$ 39.85		\$ 43.83
					\$ 39.85		\$ 43.83
							Assumed 100%
							PER 3 YR
1.000	D5013 210 0010	Repair switchgear 1200 A mainframe	\$ 2,138.54	0.97	\$ 2,075.31	1.10	\$ 2,282.84
					\$ 2,075.31		\$ 2,282.84
					\$ 2,075.31		\$ 2,282.84
							Assumed 100%
							PER 5 YR
1.000	D5013 224 0010	Maintenance and repair - (5% of total fuses) switchgear, indoor, 600 V	\$ 483.28	0.97	\$ 468.99	1.10	\$ 515.89
1.000	D5013 220 0010	Repair switchgear, - (5% of total C.B.), indoor, less than 600 V	\$ 372.30	0.97	\$ 361.29	1.10	\$ 397.42
1.000	D5013 110 0010	Repair 500 kva transformer, primary, liquid filled	\$ 3,367.67	0.97	\$ 3,268.11	1.10	\$ 3,594.93
					\$ 4,098.40		\$ 4,508.24
					\$ 4,098.40		\$ 4,508.24
							Assumed 100%

ELECTRICAL REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

10% GF

CostWorks 2010 -East Hall

National Averages

Escalation	6%													
De-Escalation to July 2009	1.03													
De-Escalation Factor to be Applied	0.97													
Green Factor	1.10	Assumed Value												

Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Location Adjustment
1.000	D5013 120 0010	Repair 15 KV primary transformer, dry	15	1 Elec	Ea.	2.00	\$ 48.50	\$ 98.00	\$ -	\$ 146.50	\$ 174.00	\$ 212.00	1.095
1.000	D5013 210 0030	Replace switchgear 1200 A mainframe	20	3 Elec	Ea.	29.82	\$ 2,075.00	\$ 1,467.00	\$ -	\$ 3,542.00	\$ 4,080.00	\$ 4,851.00	1.095
1.000	D5013 216 0010	Replace fuse	25	1 Elec	Ea.	0.55	\$ 320.00	\$ 27.00	\$ -	\$ 347.00	\$ 384.05	\$ 441.35	1.095
1.000	D5013 110 0030	Replace transformer primary, liquid filled	30	R3	Ea.	63.79	\$ 20,000.00	\$ 3,090.00	\$ 440.50	\$ 23,530.50	\$ 26,215.00	\$ 30,225.00	1.095
1.000	D5013 120 0030	Replace transformer primary, dry	30	R3	Ea.	70.94	\$ 45,600.00	\$ 3,415.00	\$ 490.50	\$ 49,505.50	\$ 54,915.00	\$ 62,625.00	1.095
1.000	D5013 220 0030	Replace switchgear, indoor, less than 600 V	30	1 Elec	Ea.	17.45	\$ 2,200.00	\$ 855.00	\$ -	\$ 3,055.00	\$ 3,480.50	\$ 4,064.00	1.095

ELECTRICAL REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
10% GF							
CostWorks 2010 -East Hall							
National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value					
Qty	Assembly Number	Description	Non-Green Total with L. Adjusted OH&P	De-Escalation Factor	Total Non-Green w/All Adjustments	Green Factor	Total w/Green Factor
							PER 10 YR
1.000	D5013 120 0010	Repair 15 KV primary transformer, dry	\$ 232.14	0.97	\$ 225.28	1.10	\$ 247.80
					\$ 225.28		\$ 247.80
					\$ 225.28		\$ 247.80
							Assumed 100%
							PER 15 YR
1.000	D5013 210 0030	Replace switchgear 1200 A mainframe	\$ 5,311.85	0.97	\$ 5,154.81	1.10	\$ 5,670.29
					\$ 5,154.81		\$ 5,670.29
					\$ 5,154.81		\$ 5,670.29
							Assumed 100%
							PER 20 YR
1.000	D5013 216 0010	Replace fuse	\$ 483.28	0.97	\$ 468.99	1.10	\$ 515.89
					\$ 468.99		\$ 515.89
					\$ 468.99		\$ 515.89
							Assumed 100%
							PER 25 YR
1.000	D5013 110 0030	Replace transformer primary, liquid filled	\$ 33,096.38	0.97	\$ 32,117.95	1.10	\$ 35,329.74
1.000	D5013 120 0030	Replace transformer primary, dry	\$ 68,574.38	0.97	\$ 66,547.11	1.10	\$ 73,201.82
1.000	D5013 220 0030	Replace switchgear, indoor, less than 600 V	\$ 4,450.08	0.97	\$ 4,318.52	1.10	\$ 4,750.37
					\$ 102,983.58		\$ 113,281.94
					\$ 102,983.58		\$ 113,281.94
							Assumed 100%
							PER 30 YR

ELECTRICAL REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹														
10% GF														
CostWorks 2010 -East Hall														
National Averages														
Escalation	6%													
De-Escalation to July 2009	1.03													
De-Escalation Factor to be Applied	0.97													
Green Factor	1.10	Assumed Value												
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Location Adjustment	
FOOTNOTES:														
1														
RS Means CostWorks 2010 Operations and Maintenance														

Appendix C-SE9 10% GF Summary of FMRRC

Summary of Green versus Non-Green Major Repair and Replacement Costs based on Frequency (Electrical) 10% GF			
Type of Construction	Description	Total Cost	Comments
Non-Green	Up to 10 Years	\$ 6,357.02	
Non-Green	10 th yr on till 25 th Year	\$ 5,849.08	
Non-Green	25 th yr on till 50 th Year	\$ 102,983.58	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
Green	Up to 10 Years	\$ 6,992.72	
Green	10 th yr on till 25 th Year	\$ 6,433.99	
Green	25 th yr on till 50 th Year	\$ 113,281.94	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
SUMMARY OF FINDINGS			
Green v. Non-Green	9.09%	Green Major Repair and Replacement is 9.09% higher in cost than that of a traditional building	

Appendix C-SE10 5% GF Analysis of YPM

ELECTRICAL PREVENTATIVE MAINTENANCE ³									
5% GF									
CostWorks 2010 - EAST HALL									
National Average									
Location Adjustment	1.095	Weighted Average (CostWorks 2010)							
Total Building Area	162,404	sf							
Escalation	6%								
De-Escalation to July 2009	1.03								
De-Escalation Factor to be Applied	0.97								
Green Factor	1.05	Assumed Value							
Qty	Assembly Number	Description	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P
1.000	D5 01 5210 1950	Switchboard, annualized	0.71	\$ 7.00	\$ 34.50	\$ -	\$ 41.50	\$ 50.00	\$ 62.00
1.000	D5 01 5214 1950	Switchboard, with air circuit breaker, annualized	13.30	\$ 28.00	\$ 650.00	\$ -	\$ 678.00	\$ 830.00	\$ 1,025.00
1.000	D5 01 5217 1950	Switchboard, with air circuit breaker and tie switch, annualized	13.36	\$ 41.50	\$ 655.00	\$ -	\$ 696.50	\$ 850.00	\$ 1,050.00
1.000	D5 01 5220 1950	Circuit breaker, high voltage air, annualized	0.47	\$ -	\$ 23.00	\$ -	\$ 23.00	\$ 28.50	\$ 35.50
1.000	D5 01 5222 1950	Circuit breaker, high voltage oil, annualized	0.86	\$ 14.05	\$ 42.00	\$ -	\$ 56.05	\$ 67.00	\$ 82.00
1.000	D5 01 5230 1950	Switch, selector, high voltage, air, annualized	0.41	\$ 14.05	\$ 20.00	\$ -	\$ 34.05	\$ 40.00	\$ 48.00
1.000	D5 01 5232 1950	Switch, selector, high voltage, oil, annualized	0.45	\$ 21.00	\$ 22.00	\$ -	\$ 43.00	\$ 50.00	\$ 60.50
1.000	D5 01 5234 1950	Switch, automatic transfer, annualized	5.32	\$ 14.05	\$ 260.00	\$ -	\$ 274.05	\$ 335.00	\$ 420.00
1.000	D5 01 5236 1950	Switch, interrupt, high voltage, fused air, annualized	0.36	\$ 14.05	\$ 17.85	\$ -	\$ 31.90	\$ 37.50	\$ 45.00
1.000	D5 01 5238 1950	Switch, interrupt, high voltage, w/ aux fuses, air, annualized	0.36	\$ 14.05	\$ 17.85	\$ -	\$ 31.90	\$ 37.50	\$ 45.00
1.000	D5 01 5240 1950	Transformer, dry type 500 KVA and over, annualized	0.77	\$ 14.05	\$ 37.50	\$ -	\$ 51.55	\$ 61.50	\$ 75.50
1.000	D5 01 5240 2950	Transformer, oil pad mounted, annualized	1.08	\$ 28.00	\$ 53.00	\$ -	\$ 81.00	\$ 96.00	\$ 117.00
1.000	D5 01 5240 3950	Transformer, oil pad mounted, PCB, annualized	2.66	\$ 41.50	\$ 130.00	\$ -	\$ 171.50	\$ 205.00	\$ 252.00
1.000	D5 01 5260 1950	Panelboard, 225 A and above, annualized	0.44	\$ 28.00	\$ 21.50	\$ -	\$ 49.50	\$ 57.50	\$ 68.00
1.000	D5 01 5280 1950	Motor control center, over 400 A, annualized	0.39	\$ 28.00	\$ 19.05	\$ -	\$ 47.05	\$ 54.00	\$ 64.50
1.000	D5 03 5610 1950	Central clock systems, annualized	1.32	\$ 1.46	\$ 64.50	\$ -	\$ 65.96	\$ 81.00	\$ 101.00
1.000	D5 03 5710 1950	Fire alarm annunciator system, annualized	11.05	\$ 137.00	\$ 555.00	\$ -	\$ 692.00	\$ 840.00	\$ 1,025.00
1.000	D5 03 5810 1950	Security, intrusion alarm system, annualized	3.83	\$ 41.50	\$ 188.00	\$ -	\$ 229.50	\$ 276.00	\$ 340.00
1.000	D5 09 5210 1950	Emergency diesel or gas generator, up to 15 KVA, annualized	13.17	\$ 124.00	\$ 645.00	\$ -	\$ 769.00	\$ 930.00	\$ 1,150.00
1.000	D5 09 5210 2950	Emergency diesel or gas generator, over 15 KVA, annualized	16.16	\$ 137.00	\$ 790.00	\$ -	\$ 927.00	\$ 1,125.00	\$ 1,400.00
1.000	D5 09 5210 3950	Emergency diesel generator, turbine, annualized	16.10	\$ 233.00	\$ 790.00	\$ -	\$ 1,023.00	\$ 1,225.00	\$ 1,525.00
1.000	D5 09 5220 1950	Power stabilizer, annualized	0.63	\$ -	\$ 30.50	\$ -	\$ 30.50	\$ 37.50	\$ 47.00
1.000	D5 09 5230 1950	Uninterrupted power system, up to 200 KVA, annualized	22.92	\$ 209.00	\$ 1,125.00	\$ -	\$ 1,334.00	\$ 1,600.00	\$ 1,975.00
1.000	D5 09 5230 2950	Uninterrupted power system, 200 KVA to 800 KVA, annualized	78.09	\$ 281.00	\$ 3,825.00	\$ -	\$ 4,106.00	\$ 5,000.00	\$ 6,225.00
1.000	D5 09 5240 1950	Battery system and charger, annualized	8.73	\$ 28.00	\$ 430.00	\$ -	\$ 458.00	\$ 555.00	\$ 695.00
1.000	D5 09 5250 1950	Light, emergency, hardwired system, annualized	0.25	\$ -	\$ 12.25	\$ -	\$ 12.25	\$ 15.05	\$ 18.85
1.000	D5 09 5250 2950	Light, emergency, dry cell, annualized	0.37	\$ 41.50	\$ 18.15	\$ -	\$ 59.65	\$ 68.00	\$ 80.00
1.000	D5 09 5250 3950	Light, emergency, wet cell, annualized	0.39	\$ 62.00	\$ 19.10	\$ -	\$ 81.10	\$ 91.50	\$ 107.00

ELECTRICAL PREVENTATIVE MAINTENANCE ³										
5% GF										
CostWorks 2010 - EAST HALL										
National Average										
Location Adjustment	1.095	Weighted Average (CostWorks 2010)								
Total Building Area	162,404	sf								
Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.05	Assumed Value								
Qty	Assembly Number	Description	Location Factor	Adjusted Total Includ. O&P	De-Escalation Factor to July 2009 Costs	Total Non-Green with all Adjustments	GREEN Factor	Adjusted Total with Green Factor OH&P		
1.000	D5 01 5210 1950	Switchboard, annualized	1.095	\$ 67.89	0.97	\$ 65.88	1.05	\$ 69.18		
1.000	D5 01 5214 1950	Switchboard, with air circuit breaker, annualized	1.095	\$ 1,122.38	0.97	\$ 1,089.19	1.05	\$ 1,143.65		
1.000	D5 01 5217 1950	Switchboard, with air circuit breaker and tie switch, annualized	1.095	\$ 1,149.75	0.97	\$ 1,115.76	1.05	\$ 1,171.55		
1.000	D5 01 5220 1950	Circuit breaker, high voltage air, annualized	1.095	\$ 38.87	0.97	\$ 37.72	1.05	\$ 39.61		
1.000	D5 01 5222 1950	Circuit breaker, high voltage oil, annualized	1.095	\$ 89.79	0.97	\$ 87.14	1.05	\$ 91.49		
1.000	D5 01 5230 1950	Switch, selector, high voltage, air, annualized	1.095	\$ 52.56	0.97	\$ 51.01	1.05	\$ 53.56		
1.000	D5 01 5232 1950	Switch, selector, high voltage, oil, annualized	1.095	\$ 66.25	0.97	\$ 64.29	1.05	\$ 67.50		
1.000	D5 01 5234 1950	Switch, automatic transfer, annualized	1.095	\$ 459.90	0.97	\$ 446.30	1.05	\$ 468.62		
1.000	D5 01 5236 1950	Switch, interrupt, high voltage, fused air, annualized	1.095	\$ 49.28	0.97	\$ 47.82	1.05	\$ 50.21		
1.000	D5 01 5238 1950	Switch, interrupt, high voltage, w/ aux fuses, air, annualized	1.095	\$ 49.28	0.97	\$ 47.82	1.05	\$ 50.21		
1.000	D5 01 5240 1950	Transformer, dry type 500 KVA and over, annualized	1.095	\$ 82.67	0.97	\$ 80.23	1.05	\$ 84.24		
1.000	D5 01 5240 2950	Transformer, oil pad mounted, annualized	1.095	\$ 128.12	0.97	\$ 124.33	1.05	\$ 130.54		
1.000	D5 01 5240 3950	Transformer, oil pad mounted, PCB, annualized	1.095	\$ 275.94	0.97	\$ 267.78	1.05	\$ 281.17		
1.000	D5 01 5260 1950	Panelboard, 225 A and above, annualized	1.095	\$ 74.46	0.97	\$ 72.26	1.05	\$ 75.87		
1.000	D5 01 5280 1950	Motor control center, over 400 A, annualized	1.095	\$ 70.63	0.97	\$ 68.54	1.05	\$ 71.97		
1.000	D5 03 5610 1950	Central clock systems, annualized	1.095	\$ 110.60	0.97	\$ 107.33	1.05	\$ 112.69		
1.000	D5 03 5710 1950	Fire alarm annunciator system, annualized	1.095	\$ 1,122.38	0.97	\$ 1,089.19	1.05	\$ 1,143.65		
1.000	D5 03 5810 1950	Security, intrusion alarm system, annualized	1.095	\$ 372.30	0.97	\$ 361.29	1.05	\$ 379.36		
1.000	D5 09 5210 1950	Emergency diesel or gas generator, up to 15 KVA, annualized	1.095	\$ 1,259.25	0.97	\$ 1,222.02	1.05	\$ 1,283.12		
1.000	D5 09 5210 2950	Emergency diesel or gas generator, over 15 KVA, annualized	1.095	\$ 1,533.00	0.97	\$ 1,487.68	1.05	\$ 1,562.06		
1.000	D5 09 5210 3950	Emergency diesel generator, turbine, annualized	1.095	\$ 1,669.88	0.97	\$ 1,620.51	1.05	\$ 1,701.53		
1.000	D5 09 5220 1950	Power stabilizer, annualized	1.095	\$ 51.47	0.97	\$ 49.94	1.05	\$ 52.44		
1.000	D5 09 5230 1950	Uninterrupted power system, up to 200 KVA, annualized	1.095	\$ 2,162.63	0.97	\$ 2,098.69	1.05	\$ 2,203.63		
1.000	D5 09 5230 2950	Uninterrupted power system, 200 KVA to 800 KVA, annualized	1.095	\$ 6,816.38	0.97	\$ 6,614.86	1.05	\$ 6,945.61		
1.000	D5 09 5240 1950	Battery system and charger, annualized	1.095	\$ 761.03	0.97	\$ 738.53	1.05	\$ 775.45		
1.000	D5 09 5250 1950	Light, emergency, hardwired system, annualized	1.095	\$ 20.64	0.97	\$ 20.03	1.05	\$ 21.03		
1.000	D5 09 5250 2950	Light, emergency, dry cell, annualized	1.095	\$ 87.60	0.97	\$ 85.01	1.05	\$ 89.26		
1.000	D5 09 5250 3950	Light, emergency, wet cell, annualized	1.095	\$ 117.17	0.97	\$ 113.70	1.05	\$ 119.39		
						\$ 19,274.86		\$ 20,238.60		
						Total Yearly Preventative Maintenance Cost		Total Yearly Preventative Maintenance Cost		
						Non-Green		Green		

Qty	Assembly Number	Description	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P
SUMMARY OF FINDINGS									
		Description	Cost	% Difference	Comments				
		Yearly Non-Green Preventative Maintenance Costs	\$19,274.86						
		Yearly Green Preventative Maintenance Costs	\$20,238.60	4.76%	Green Costs are 4.76% higher than Non-Green based on this analysis				
NOTES:									
It is assumed that all above mentioned items shall be required to be maintained									
FOOTNOTES:									
1									
RS Means CostWorks 2010 Operations and Maintenance									

Appendix C-SE11 5% GF Analysis of FMRRC

ELECTRICAL REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹													
5% GF													
CostWorks 2010 -East Hall													
National Averages													
Escalation	6%												
De-Escalation to July 2009	1.03												
De-Escalation Factor to be Applied	0.97												
Green Factor	1.05	Assumed Value											
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Location Adjustment
1.000	D5013 110 0020	Maintenance and inspection primary transformer, liquid filled	0.5	1 Elec	Ea.	0.50	\$ -	\$ 24.50	\$ -	\$ 24.50	\$ 30.00	\$ 37.50	1.095
1.000	D5013 120 0020	Maintenance and inspection primary transformer, dry	0.5	1 Elec	Ea.	0.50	\$ -	\$ 24.50	\$ -	\$ 24.50	\$ 30.00	\$ 37.50	1.095
1.000	D5013 210 0020	Maintenance and inspection switchgear, mainframe	1	1 Elec	Ea.	0.80	\$ -	\$ 39.00	\$ -	\$ 39.00	\$ 48.00	\$ 60.00	1.095
1.000	D5013 220 0020	Maintenance and inspection switchgear, indoor, less than 600 V	3	1 Elec	Ea.	0.50	\$ -	\$ 24.50	\$ -	\$ 24.50	\$ 30.00	\$ 37.50	1.095
1.000	D5013 210 0010	Repair switchgear 1200 A mainframe	5	1 Elec	Ea.	6.70	\$ 1,150.00	\$ 328.50	\$ -	\$ 1,478.50	\$ 1,677.00	\$ 1,953.00	1.095
1.000	D5013 224 0010	Maintenance and repair - (5% of total fuses) switchgear, indoor, 600 V	10	1 Elec	Ea.	0.55	\$ 320.00	\$ 27.00	\$ -	\$ 347.00	\$ 384.05	\$ 441.35	1.095
1.000	D5013 220 0010	Repair switchgear, - (5% of total C.B.), indoor, less than 600 V	10	1 Elec	Ea.	1.54	\$ 179.00	\$ 75.60	\$ -	\$ 254.60	\$ 290.00	\$ 340.00	1.095
1.000	D5013 110 0010	Repair 500 kva transformer, primary, liquid filled	10	1 Elec	Ea.	3.96	\$ 2,225.00	\$ 194.00	\$ -	\$ 2,419.00	\$ 2,685.00	\$ 3,075.50	1.095

ELECTRICAL REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
5% GF							
CostWorks 2010 -East Hall							
National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value					
Qty	Assembly Number	Description	Non-Green Total with L. Adjusted OH&P	De-Escalation Factor	Total Non-Green w/All Adjustments	Green Factor	Total w/Green Factor
1.000	D5013 110 0020	Maintenance and inspection primary transformer, liquid filled	\$ 41.06	0.97	\$ 39.85	1.05	\$ 41.84
1.000	D5013 120 0020	Maintenance and inspection primary transformer, dry	\$ 41.06	0.97	\$ 39.85	1.05	\$ 41.84
					\$ 79.70		\$ 83.68
					\$ 79.70		\$ 83.68
							Assumed 100%
							PER 0.5 YR
1.000	D5013 210 0020	Maintenance and inspection switchgear, mainframe	\$ 65.70	0.97	\$ 63.76	1.05	\$ 66.95
					\$ 63.76		\$ 66.95
					\$ 63.76		\$ 66.95
							Assumed 100%
							PER 1 YR
1.000	D5013 220 0020	Maintenance and inspection switchgear, indoor, less than 600 V	\$ 41.06	0.97	\$ 39.85	1.05	\$ 41.84
					\$ 39.85		\$ 41.84
					\$ 39.85		\$ 41.84
							Assumed 100%
							PER 3 YR
1.000	D5013 210 0010	Repair switchgear 1200 A mainframe	\$ 2,138.54	0.97	\$ 2,075.31	1.05	\$ 2,179.08
					\$ 2,075.31		\$ 2,179.08
					\$ 2,075.31		\$ 2,179.08
							Assumed 100%
							PER 5 YR
1.000	D5013 224 0010	Maintenance and repair - (5% of total fuses) switchgear, indoor, 600 V	\$ 483.28	0.97	\$ 468.99	1.05	\$ 492.44
1.000	D5013 220 0010	Repair switchgear, - (5% of total C.B.), indoor, less than 600 V	\$ 372.30	0.97	\$ 361.29	1.05	\$ 379.36
1.000	D5013 110 0010	Repair 500 kva transformer, primary, liquid filled	\$ 3,367.67	0.97	\$ 3,268.11	1.05	\$ 3,431.52
					\$ 4,098.40		\$ 4,303.32
					\$ 4,098.40		\$ 4,303.32
							Assumed 100%

ELECTRICAL REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

5% GF

CostWorks 2010 -East Hall

National Averages

Escalation	6%													
De-Escalation to July 2009	1.03													
De-Escalation Factor to be Applied	0.97													
Green Factor	1.05	Assumed Value												

Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Location Adjustment
1.000	D5013 120 0010	Repair 15 KV primary transformer, dry	15	1 Elec	Ea.	2.00	\$ 48.50	\$ 98.00	\$ -	\$ 146.50	\$ 174.00	\$ 212.00	1.095
1.000	D5013 210 0030	Replace switchgear 1200 A mainframe	20	3 Elec	Ea.	29.82	\$ 2,075.00	\$ 1,467.00	\$ -	\$ 3,542.00	\$ 4,080.00	\$ 4,851.00	1.095
1.000	D5013 216 0010	Replace fuse	25	1 Elec	Ea.	0.55	\$ 320.00	\$ 27.00	\$ -	\$ 347.00	\$ 384.05	\$ 441.35	1.095
1.000	D5013 110 0030	Replace transformer primary, liquid filled	30	R3	Ea.	63.79	\$ 20,000.00	\$ 3,090.00	\$ 440.50	\$ 23,530.50	\$ 26,215.00	\$ 30,225.00	1.095
1.000	D5013 120 0030	Replace transformer primary, dry	30	R3	Ea.	70.94	\$ 45,600.00	\$ 3,415.00	\$ 490.50	\$ 49,505.50	\$ 54,915.00	\$ 62,625.00	1.095
1.000	D5013 220 0030	Replace switchgear, indoor, less than 600 V	30	1 Elec	Ea.	17.45	\$ 2,200.00	\$ 855.00	\$ -	\$ 3,055.00	\$ 3,480.50	\$ 4,064.00	1.095

ELECTRICAL REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
5% GF							
CostWorks 2010 -East Hall							
National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value					
Qty	Assembly Number	Description	Non-Green Total with L. Adjusted OH&P	De-Escalation Factor	Total Non-Green w/All Adjustments	Green Factor	Total w/Green Factor
							PER 10 YR
1.000	D5013 120 0010	Repair 15 KV primary transformer, dry	\$ 232.14	0.97	\$ 225.28	1.05	\$ 236.54
					\$ 225.28		\$ 236.54
					\$ 225.28		\$ 236.54
							Assumed 100%
							PER 15 YR
1.000	D5013 210 0030	Replace switchgear 1200 A mainframe	\$ 5,311.85	0.97	\$ 5,154.81	1.05	\$ 5,412.55
					\$ 5,154.81		\$ 5,412.55
					\$ 5,154.81		\$ 5,412.55
							Assumed 100%
							PER 20 YR
1.000	D5013 216 0010	Replace fuse	\$ 483.28	0.97	\$ 468.99	1.05	\$ 492.44
					\$ 468.99		\$ 492.44
					\$ 468.99		\$ 492.44
							Assumed 100%
							PER 25 YR
1.000	D5013 110 0030	Replace transformer primary, liquid filled	\$ 33,096.38	0.97	\$ 32,117.95	1.05	\$ 33,723.84
1.000	D5013 120 0030	Replace transformer primary, dry	\$ 68,574.38	0.97	\$ 66,547.11	1.05	\$ 69,874.47
1.000	D5013 220 0030	Replace switchgear, indoor, less than 600 V	\$ 4,450.08	0.97	\$ 4,318.52	1.05	\$ 4,534.45
					\$ 102,983.58		\$ 108,132.76
					\$ 102,983.58		\$ 108,132.76
							Assumed 100%
							PER 30 YR

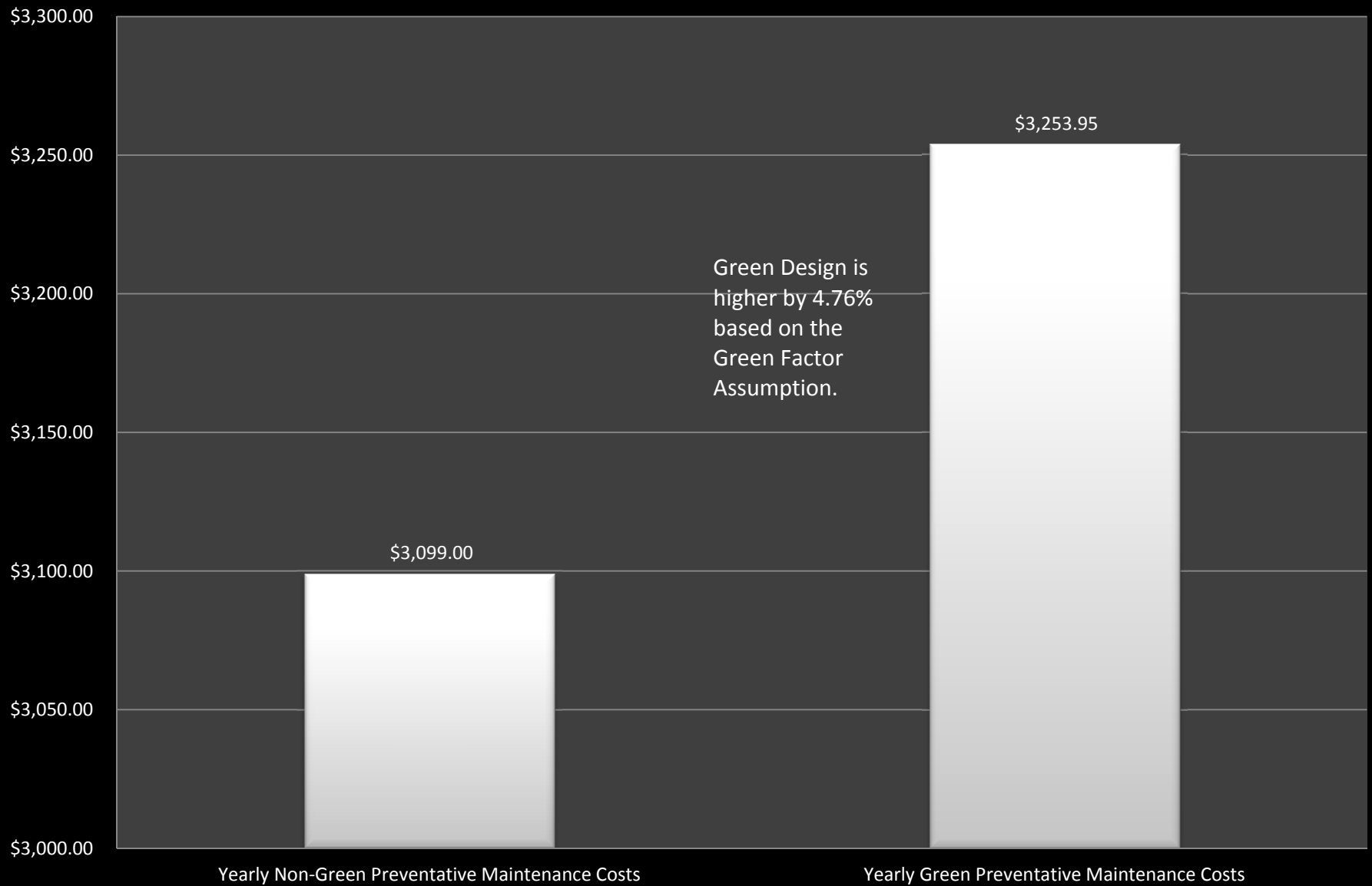
ELECTRICAL REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹														
5% GF														
CostWorks 2010 -East Hall														
National Averages														
Escalation	6%													
De-Escalation to July 2009	1.03													
De-Escalation Factor to be Applied	0.97													
Green Factor	1.05	Assumed Value												
Qty	Assembly Number	Description	Frequency	Crew	Unit	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Location Adjustment	
FOOTNOTES:														
1														
RS Means CostWorks 2010 Operations and Maintenance														

Appendix C-SE12 5% GF Summary of FMRRC

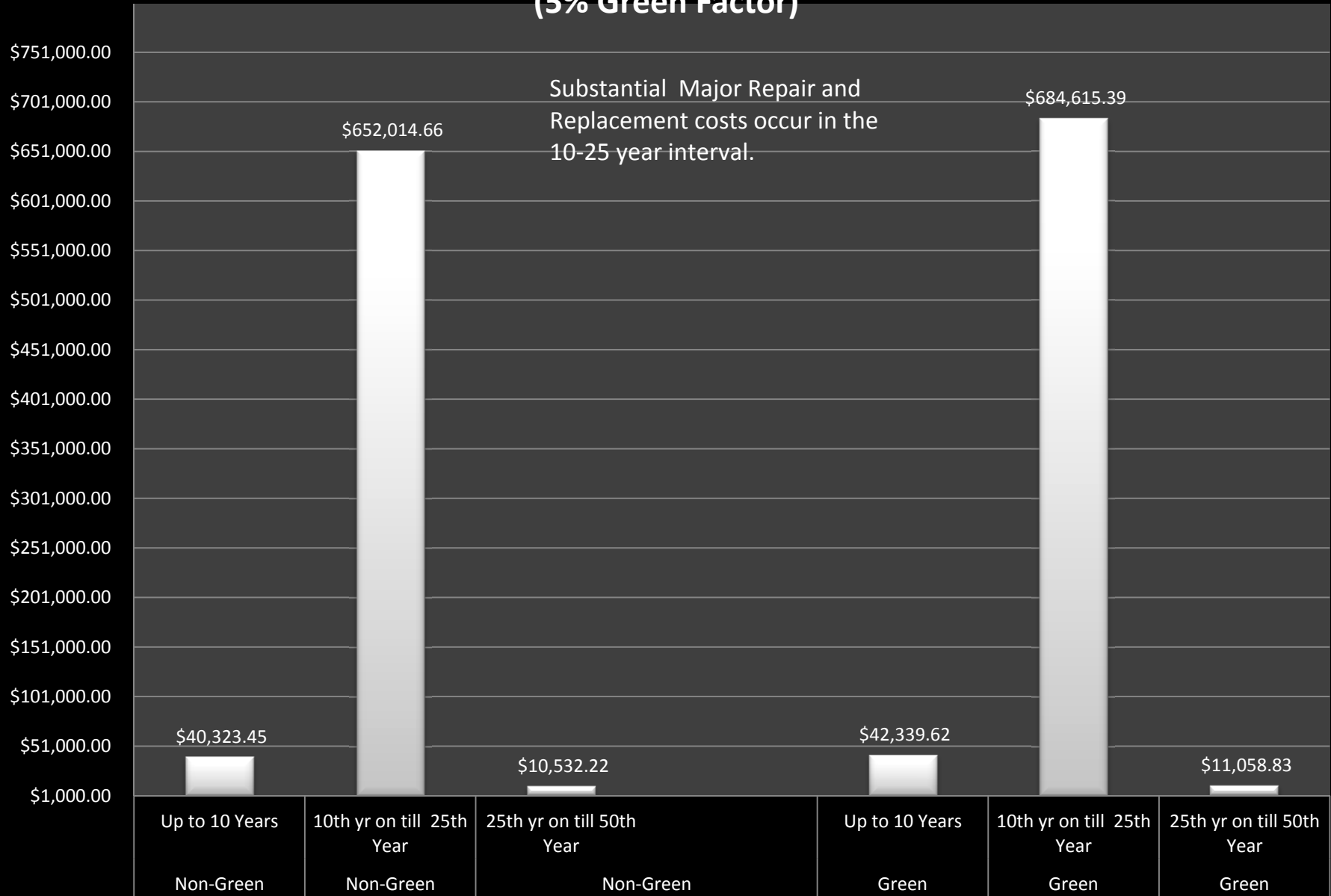
Summary of Green versus Non-Green Major Repair and Replacement Costs based on Frequency (Electrical) 5% GF			
Type of Construction	Description	Total Cost	Comments
Non-Green	Up to 10 Years	\$ 6,357.02	
Non-Green	10 th yr on till 25 th Year	\$ 5,849.08	
Non-Green	25 th yr on till 50 th Year	\$ 102,983.58	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
Green	Up to 10 Years	\$ 6,674.87	
Green	10 th yr on till 25 th Year	\$ 6,141.53	
Green	25 th yr on till 50 th Year	\$ 108,132.76	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
SUMMARY OF FINDINGS			
Green v. Non-Green	4.76%	Green Major Repair and Replacement is 4.76% higher in cost than that of a traditional building	

Appendix C-SW1 Graph: 5% Frequency Maintenance Repair and Replacement Costs and
Yearly Preventative Maintenance Costs (Plumbing)

Plumbing: Green v. Non-Green Yearly Preventative Maintenance Costs (5% Green Factor)

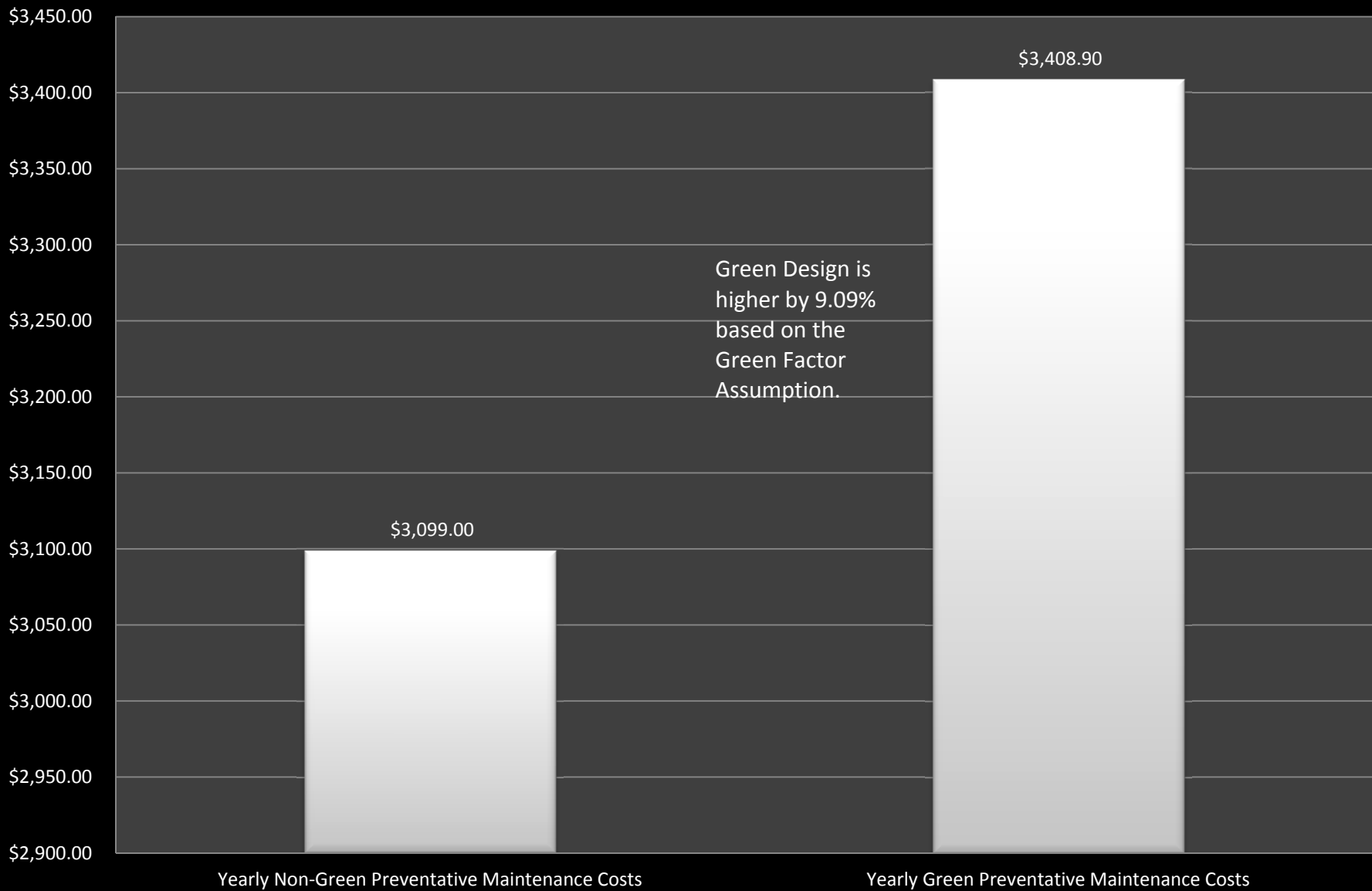


Frequency and Magnitude of Major Repair and Replacement Costs (5% Green Factor)

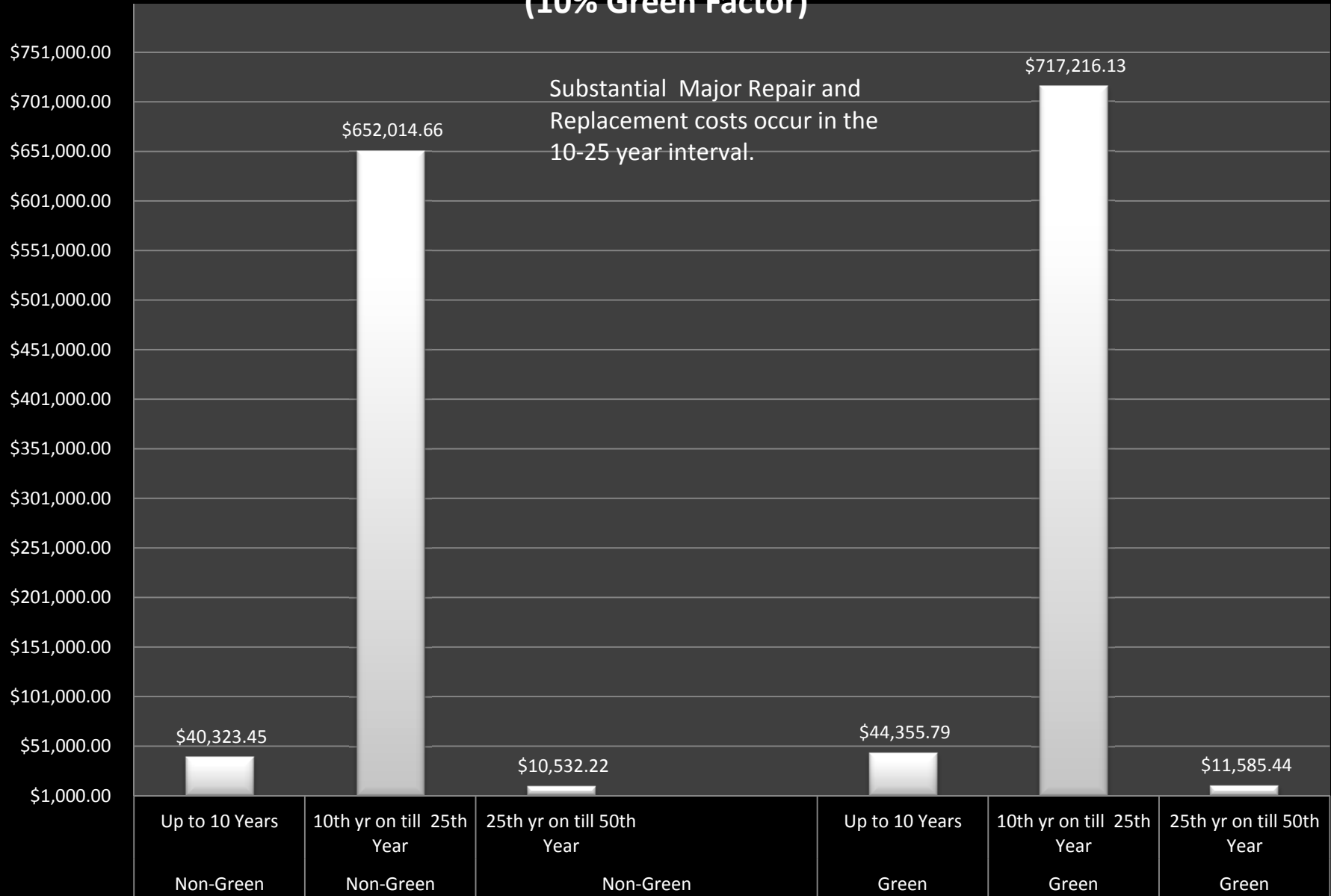


Appendix C-SW2 Graph: 10% Frequency Maintenance Repair and Replacement Costs
and Yearly Preventative Maintenance Costs (Plumbing)

Plumbing: Green v. Non-Green Yearly Preventative Maintenance Costs (10% Green Factor)

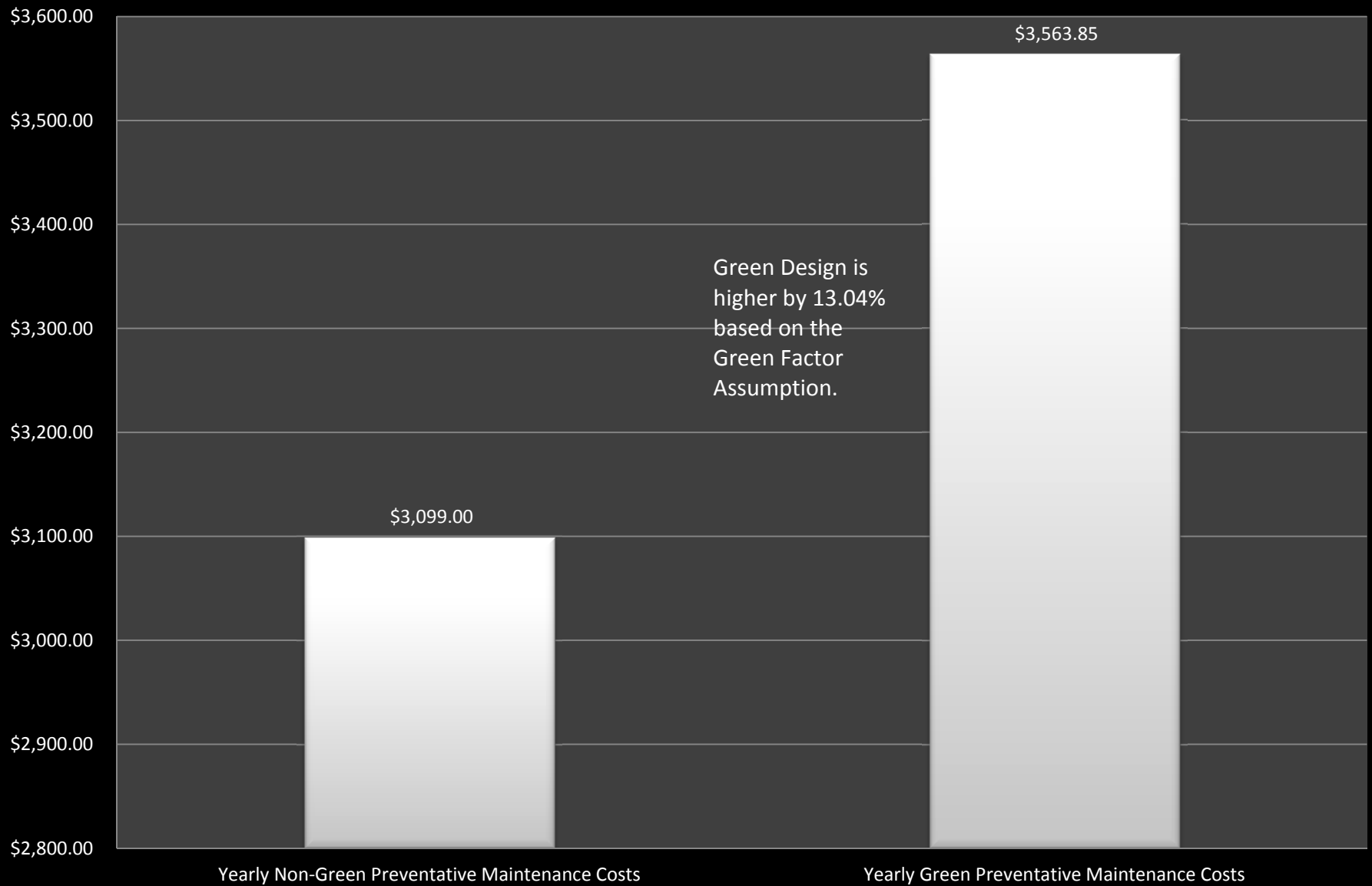


Frequency and Magnitude of Major Repair and Replacement Costs (10% Green Factor)

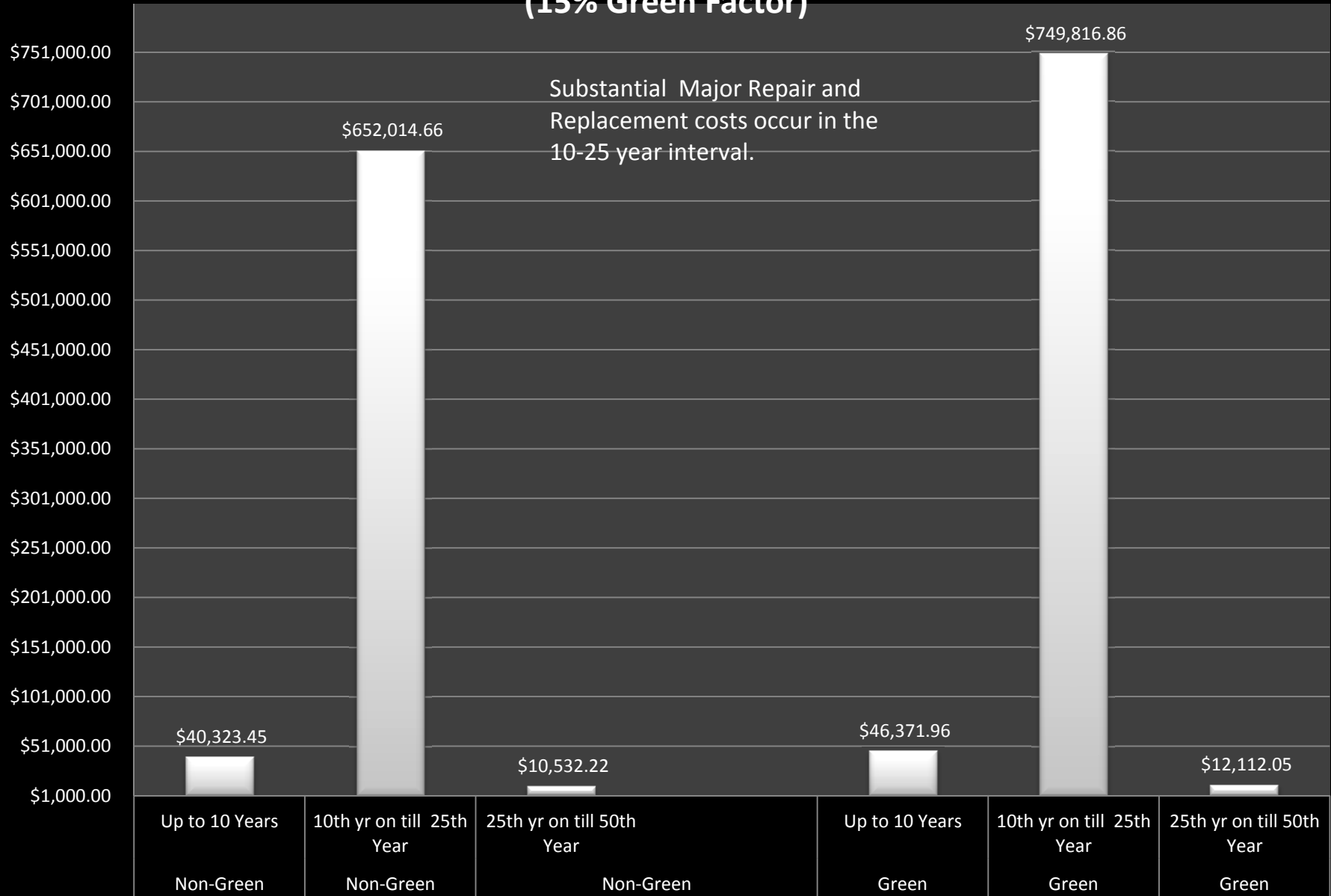


Appendix C-SW3 Graph: 15% Frequency Maintenance Repair and Replacement Costs
and Yearly Preventative Maintenance Costs (Plumbing)

Plumbing: Green v. Non-Green Yearly Preventative Maintenance Costs (15% Green Factor)



Frequency and Magnitude of Major Repair and Replacement Costs (15% Green Factor)



Appendix C-SW4 15% GF Analysis of YPM

PLUMBING PREVENTATIVE MAINTENANCE¹
Annualized Items-15% GF
CostWorks 2010
National Averages Adjusted to Reflect East Hall Location

Escalation	6%										
De-Escalation to July 2009	1.03										
De-Escalation Factor to be Applied	0.97										
Green Factor	1.15	Assumed Value									

Qty	Assembly #	Description	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Release	Location Adjustment
1.000	D2015 100 0000	Facility Plumbing Fixture Service									
1.000	D2015 100 1950	Urinals, annualized	0.23	\$ -	\$ 11.85	\$ -	\$ 11.85	\$ 14.70	\$ 18.40	2010	1.095
1.000	D2015 100 2950	Toilet (vacuum breaker type), annualized	0.23	\$ -	\$ 11.85	\$ -	\$ 11.85	\$ 14.70	\$ 18.40	2010	1.095
1.000	D2015 100 3950	Toilet (tank type), annualized	0.39	\$ -	\$ 20.00	\$ -	\$ 20.00	\$ 25.00	\$ 31.50	2010	1.095
1.000	D2015 100 4950	Lavatories, annualized	0.35	\$ 6.25	\$ 14.85	\$ -	\$ 21.10	\$ 26.50	\$ 32.00	2010	1.095
1.000	D2015 100 5950	Showers, annualized	0.23	\$ 7.50	\$ 9.70	\$ -	\$ 17.20	\$ 21.00	\$ 25.00	2010	1.095
1.000	D2015 800 0000	Drinking Fountain									
1.000	D2015 800 1950	Drink fountain, annualized	0.62	\$ 15.95	\$ 26.50	\$ -	\$ 42.45	\$ 52.00	\$ 62.50	2010	1.095
1.000	D2025 120 0000	Valve, Butterfly									
1.000	D2025 120 1950	Valve, butterfly, above 4", annualized	0.17	\$ 7.10	\$ 7.05	\$ -	\$ 14.15	\$ 17.05	\$ 20.50	2010	1.095
1.000	D2025 120 2950	Valve, butterfly, auto, above 4", annualized	0.35	\$ 7.10	\$ 14.80	\$ -	\$ 21.90	\$ 27.00	\$ 33.00	2010	1.095
1.000	D2025 125 0000	Valve, Check									
1.000	D2025 125 1950	Valve, check, above 4", annualized	0.26	\$ 7.10	\$ 10.95	\$ -	\$ 18.05	\$ 22.00	\$ 26.50	2010	1.095
1.000	D2025 130 0000	Valve, Cock									
1.000	D2025 130 1950	Valve, ball, above 4", annualized	0.17	\$ 7.10	\$ 7.05	\$ -	\$ 14.15	\$ 17.05	\$ 20.50	2010	1.095
1.000	D2025 135 0000	Valve, Diaphragm									
1.000	D2025 135 1950	Valve, diaphragm, above 4", annualized	0.12	\$ 7.10	\$ 5.20	\$ -	\$ 12.30	\$ 14.60	\$ 17.30	2010	1.095
1.000	D2025 140 0000	Valve, Gate									
1.000	D2025 140 1950	Valve, gate, above 4", annualized	0.16	\$ 7.10	\$ 6.75	\$ -	\$ 13.85	\$ 16.65	\$ 19.85	2010	1.095
1.000	D2025 145 0000	Valve, Globe									
1.000	D2025 145 1950	Valve, globe, above 4", annualized	0.16	\$ 7.10	\$ 6.75	\$ -	\$ 13.85	\$ 16.65	\$ 19.85	2010	1.095
1.000	D2025 145 2950	Valve, globe, auto, above 4", annualized	0.33	\$ 7.10	\$ 13.85	\$ -	\$ 20.95	\$ 26.00	\$ 31.50	2010	1.095
1.000	D2025 150 0000	Valve, Motor Operated									
1.000	D2025 150 1950	Valve, motor operated, above 4", annualized	1.00	\$ 14.15	\$ 42.50	\$ -	\$ 56.65	\$ 71.50	\$ 86.50	2010	1.095
1.000	D2025 155 0000	Valve, OS&Y									
1.000	D2025 155 1950	Valve, OS&Y, above 4", annualized	0.16	\$ 7.10	\$ 6.75	\$ -	\$ 13.85	\$ 16.65	\$ 19.85	2010	1.095

PLUMBING PREVENTATIVE MAINTENANCE¹

Annualized Items-15% GF

CostWorks 2010

National Averages Adjusted to Reflect East Hall Location

Escalation	6%								
De-Escalation to July 2009	1.03								
De-Escalation Factor to be Applied	0.97								
Green Factor	1.15	Assumed Value							

Qty	Assembly #	Description	Total Adjusted	De-Escalation Factor to July 2009	Total Non-Green	Green Factor	Total Adjusted Green Factor	De-Escalation Factor to July 2009	Total with All Adjustments
1.000	D2015 100 0000	Facility Plumbing Fixture Service							
1.000	D2015 100 1950	Urinals, annualized	\$ 20.15	0.97	\$ 19.55	1.15	\$ 23.17	0.97	\$ 22.49
1.000	D2015 100 2950	Toilet (vacuum breaker type), annualized	\$ 20.15	0.97	\$ 19.55	1.15	\$ 23.17	0.97	\$ 22.49
1.000	D2015 100 3950	Toilet (tank type), annualized	\$ 34.49	0.97	\$ 33.47	1.15	\$ 39.67	0.97	\$ 38.49
1.000	D2015 100 4950	Lavatories, annualized	\$ 35.04	0.97	\$ 34.00	1.15	\$ 40.30	0.97	\$ 39.10
1.000	D2015 100 5950	Showers, annualized	\$ 27.38	0.97	\$ 26.57	1.15	\$ 31.48	0.97	\$ 30.55
1.000	D2015 800 0000	Drinking Fountain							
1.000	D2015 800 1950	Drink fountain, annualized	\$ 68.44	0.97	\$ 66.41	1.15	\$ 78.70	0.97	\$ 76.38
1.000	D2025 120 0000	Valve, Butterfly							
1.000	D2025 120 1950	Valve, butterfly, above 4", annualized	\$ 22.45	0.97	\$ 21.78	1.15	\$ 25.81	0.97	\$ 25.05
1.000	D2025 120 2950	Valve, butterfly, auto, above 4", annualized	\$ 36.14	0.97	\$ 35.07	1.15	\$ 41.56	0.97	\$ 40.33
1.000	D2025 125 0000	Valve, Check							
1.000	D2025 125 1950	Valve, check, above 4", annualized	\$ 29.02	0.97	\$ 28.16	1.15	\$ 33.37	0.97	\$ 32.38
1.000	D2025 130 0000	Valve, Cock							
1.000	D2025 130 1950	Valve, ball, above 4", annualized	\$ 22.45	0.97	\$ 21.78	1.15	\$ 25.81	0.97	\$ 25.05
1.000	D2025 135 0000	Valve, Diaphragm							
1.000	D2025 135 1950	Valve, diaphragm, above 4", annualized	\$ 18.94	0.97	\$ 18.38	1.15	\$ 21.79	0.97	\$ 21.14
1.000	D2025 140 0000	Valve, Gate							
1.000	D2025 140 1950	Valve, gate, above 4", annualized	\$ 21.74	0.97	\$ 21.09	1.15	\$ 25.00	0.97	\$ 24.26
1.000	D2025 145 0000	Valve, Globe							
1.000	D2025 145 1950	Valve, globe, above 4", annualized	\$ 21.74	0.97	\$ 21.09	1.15	\$ 25.00	0.97	\$ 24.26
1.000	D2025 145 2950	Valve, globe, auto, above 4", annualized	\$ 34.49	0.97	\$ 33.47	1.15	\$ 39.67	0.97	\$ 38.49
1.000	D2025 150 0000	Valve, Motor Operated							
1.000	D2025 150 1950	Valve, motor operated, above 4", annualized	\$ 94.72	0.97	\$ 91.92	1.15	\$ 108.93	0.97	\$ 105.70
1.000	D2025 155 0000	Valve, OS&Y							
1.000	D2025 155 1950	Valve, OS&Y, above 4", annualized	\$ 21.74	0.97	\$ 21.09	1.15	\$ 25.00	0.97	\$ 24.26

PLUMBING PREVENTATIVE MAINTENANCE¹
Annualized Items-15% GF
CostWorks 2010
National Averages Adjusted to Reflect East Hall Location

Escalation	6%										
De-Escalation to July 2009	1.03										
De-Escalation Factor to be Applied	0.97										
Green Factor	1.15	Assumed Value									

Qty	Assembly #	Description	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Release	Location Adjustment
1.000	D2025 190 0000	Water Heater, Solar									
1.000	D2025 190 1950	Water heating systemclosed loop, panels, annualized	3.40	\$ 214.00	\$ 176.00	\$ -	\$ 390.00	\$ 455.00	\$ 540.00	2010	1.095
1.000	D2025 260 0000	Water Heater, Gas/Oil/Steam									
1.000	D2025 260 1950	Water heater, gas, to 120 gal., annualized	1.72	\$ 57.00	\$ 89.00	\$ -	\$ 146.00	\$ 173.00	\$ 209.00	2010	1.095
1.000	D2025 260 2950	Water heater, oil fired, to 100 gal., annualized	2.85	\$ 71.00	\$ 148.00	\$ -	\$ 219.00	\$ 261.00	\$ 320.00	2010	1.095
1.000	D2025 260 3950	Water heater, steam 2500 gal., annualized	1.55	\$ 28.50	\$ 80.50	\$ -	\$ 109.00	\$ 131.00	\$ 161.00	2010	1.095
1.000	D2025 262 0000	Valve, Pressure Relief									
1.000	D2025 262 1950	Valve, pressure relief, above 4", annualized	0.15	\$ -	\$ 6.30	\$ -	\$ 6.30	\$ 8.25	\$ 10.20	2010	1.095
1.000	D2025 265 0000	Valve, Pressure Regulator									
1.000	D2025 265 1950	Valve, pressure regular, above 4", annualized	0.36	\$ -	\$ 15.30	\$ -	\$ 15.30	\$ 20.00	\$ 24.50	2010	1.095
1.000	D2025 270 0000	Valve, Sediment Strainer									
1.000	D2025 270 1950	Valve, sediment strainer, above 4", annualized	0.31	\$ -	\$ 13.35	\$ -	\$ 13.35	\$ 17.45	\$ 21.50	2010	1.095
1.000	D2025 310 0000	Valve, Automatic									
1.000	D2025 310 1950	Valve, automatic, above 4", annualized	0.19	\$ 7.10	\$ 7.95	\$ -	\$ 15.05	\$ 18.25	\$ 22.00	2010	1.095
1.000	D2025 310 2950	Valve, auto diaphragm, above 4", annualized	0.18	\$ 7.10	\$ 7.45	\$ -	\$ 14.55	\$ 17.55	\$ 21.00	2010	1.095
1.000	D2095 905 0000	Duplex Sump									
1.000	D2095 905 1950	Duplex sump, annualized	1.65	\$ 28.50	\$ 86.00	\$ -	\$ 114.50	\$ 139.00	\$ 169.00	2010	1.095
1.000	D2095 910 0000	Pump, Submersible									
1.000	D2095 910 1950	Submersible, 1 H.P. and over, annualized	3.85	\$ 28.50	\$ 200.00	\$ -	\$ 228.50	\$ 281.00	\$ 345.00	2010	1.095
1.000	D2095 930 0000	Oxygen Monitor									
1.000	D2095 930 1950	Oxygen monitor, annualized	5.00	\$ 195.00	\$ 213.00	\$ -	\$ 408.00	\$ 495.00	\$ 590.00	2010	1.095

PLUMBING PREVENTATIVE MAINTENANCE ¹										
Annualized Items-15% GF										
CostWorks 2010										
National Averages Adjusted to Reflect East Hall Location										
Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.15	Assumed Value								
Qty	Assembly #	Description	Total Adjusted	De-Escalation Factor to July 2009	Total Non-Green	Green Factor	Total Adjusted Green Factor	De-Escalation Factor to July 2009	Total with All Adjustments	
1.000	D2025 190 0000	Water Heater, Solar								
1.000	D2025 190 1950	Water heating systemclosed loop, panels, annualized	\$ 591.30	0.97	\$ 573.82	1.15	\$ 680.00	0.97	\$ 659.89	
1.000	D2025 260 0000	Water Heater, Gas/Oil/Steam								
1.000	D2025 260 1950	Water heater, gas, to 120 gal., annualized	\$ 228.86	0.97	\$ 222.09	1.15	\$ 263.18	0.97	\$ 255.40	
1.000	D2025 260 2950	Water heater, oil fired, to 100 gal., annualized	\$ 350.40	0.97	\$ 340.04	1.15	\$ 402.96	0.97	\$ 391.05	
1.000	D2025 260 3950	Water heater, steam 2500 gal., annualized	\$ 176.30	0.97	\$ 171.08	1.15	\$ 202.74	0.97	\$ 196.75	
1.000	D2025 262 0000	Valve, Pressure Relief								
1.000	D2025 262 1950	Valve, pressure relief, above 4", annualized	\$ 11.17	0.97	\$ 10.84	1.15	\$ 12.84	0.97	\$ 12.46	
1.000	D2025 265 0000	Valve, Pressure Regulator								
1.000	D2025 265 1950	Valve, pressure regular, above 4", annualized	\$ 26.83	0.97	\$ 26.03	1.15	\$ 30.85	0.97	\$ 29.94	
1.000	D2025 270 0000	Valve, Sediment Strainer								
1.000	D2025 270 1950	Valve, sediment strainer, above 4", annualized	\$ 23.54	0.97	\$ 22.85	1.15	\$ 27.07	0.97	\$ 26.27	
1.000	D2025 310 0000	Valve, Automatic								
1.000	D2025 310 1950	Valve, automatic, above 4", annualized	\$ 24.09	0.97	\$ 23.38	1.15	\$ 27.70	0.97	\$ 26.88	
1.000	D2025 310 2950	Valve, auto diaphragm, above 4", annualized	\$ 23.00	0.97	\$ 22.32	1.15	\$ 26.44	0.97	\$ 25.66	
1.000	D2095 905 0000	Duplex Sump								
1.000	D2095 905 1950	Duplex sump, annualized	\$ 185.06	0.97	\$ 179.58	1.15	\$ 212.81	0.97	\$ 206.52	
1.000	D2095 910 0000	Pump, Submersible								
1.000	D2095 910 1950	Submersible, 1 H.P. and over, annualized	\$ 377.78	0.97	\$ 366.61	1.15	\$ 434.44	0.97	\$ 421.60	
1.000	D2095 930 0000	Oxygen Monitor								
1.000	D2095 930 1950	Oxygen monitor, annualized	\$ 646.05	0.97	\$ 626.95	1.15	\$ 742.96	0.97	\$ 720.99	
					\$ 3,099.00				\$ 3,563.85	
					Total Yearly Preventative Maintenance Cost			Total Yearly Preventative Maintenance Cost		
					Non-Green			Green		

PLUMBING PREVENTATIVE MAINTENANCE ¹											
Annualized Items-15% GF											
CostWorks 2010											
National Averages Adjusted to Reflect East Hall Location											
Escalation	6%										
De-Escalation to July 2009	1.03										
De-Escalation Factor to be Applied	0.97										
Green Factor	1.15	Assumed Value									
SUMMARY OF FINDINGS											
Qty	Assembly #	Description	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Release	Location Adjustment
		Description	Cost	% Difference	Comments						
		Yearly Non-Green Preventative Maintenance Costs	\$ 3,099.00								
		Yearly Green Preventative Maintenance Costs	\$ 3,563.85	13.04%	Green Costs are 13.04% higher than Non-Green based on this analysis						
FOOTNOTES:											
1											
		RS Means CostWorks 2010 Operations and Maintenance									

Appendix C-SW5 15% GF Analysis of FMRRC

PLUMBING REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

15% GF
CostWorks 2010

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.15	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2023 260 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/12 HP	0.5	1 Plum	Ea.	\$ 7.04	\$ 8.79	1.095	\$ 9.63	0.97
1.000	D2023 266 0020	Inspect/check pump/motor operation, lub. circulation pump, bronze 1 HP	0.5	1 Plum	Ea.	\$ 7.04	\$ 8.79	1.095	\$ 9.63	0.97
1.000	D2023 267 0020	Insp/chk pump/mtr oper, lub, chk align circulation pump, CI 1-1/2 HP	0.5	1 Plum	Ea.	\$ 10.48	\$ 13.09	1.095	\$ 14.33	0.97
1.000	D2013 810 0010	Check / minor repairs drinking fountain	1	1 Plum	Ea.	\$ 43.00	\$ 54.00	1.095	\$ 59.13	0.97
1.000	D2023 210 0020	Clean and service water heater, gas / oil, 30 gallon	1	1 Plum	Ea.	\$ 172.00	\$ 215.00	1.095	\$ 235.43	0.97
1.000	D2023 212 0020	Clean & service water heater, gas / oil, 70 gallon	1	1 Plum	Ea.	\$ 172.00	\$ 215.00	1.095	\$ 235.43	0.97
1.000	D2023 230 0020	Inspect for leaks steam converter, domestic hot water	1	1 Plum	Ea.	\$ 5.94	\$ 7.43	1.095	\$ 8.14	0.97
1.000	D2023 261 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/8 HP	1	1 Plum	Ea.	\$ 7.04	\$ 8.79	1.095	\$ 9.63	0.97
1.000	D2023 262 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/6 HP	1	1 Plum	Ea.	\$ 7.04	\$ 8.79	1.095	\$ 9.63	0.97
1.000	D2023 264 0020	Insp./chk. pump/mtr. oper., lub., chk. align. circulation pump, 1/2 HP	1	1 Plum	Ea.	\$ 10.48	\$ 13.09	1.095	\$ 14.33	0.97
1.000	D2043 110 1010	General maintenance & repair distribution: gutters, pipe	1	1 Plum	M.L.F.	\$ 264.70	\$ 333.40	1.095	\$ 365.07	0.97
1.000	D2043 210 1010	General maintenance & repair drain: roof, scupper, area	1	1 Plum	Ea.	\$ 32.70	\$ 40.90	1.095	\$ 44.79	0.97
1.000	D2043 310 1020	Insp./chk. pump/mtr. oper., lub., chk. align. rainwater sump pump	1	1 Plum	Ea.	\$ 10.48	\$ 13.09	1.095	\$ 14.33	0.97
1.000	D2093 946 1010	Check and adjust 2 H.P. compressor	1	1 Plum	Ea.	\$ 74.29	\$ 92.78	1.095	\$ 101.59	0.97
1.000	D2093 946 3010	Check and adjust 10 H.P. compressor	1	1 Plum	Ea.	\$ 74.29	\$ 92.78	1.095	\$ 101.59	0.97
1.000	D2093 946 4010	Check and adjust 25 H.P. compressor	1	1 Plum	Ea.	\$ 74.29	\$ 92.78	1.095	\$ 101.59	0.97
1.000	D2093 946 5030	Check operation compressed air systems	1	1 Stpi	Ea.	\$ 20.50	\$ 25.50	1.095	\$ 27.92	0.97
1.000	D2013 310 0020	Replace washer in faucet lavatory, iron, enamel	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 310 0050	Clean out strainer and P trap lavatory, iron, enamel	2	1 Plum	Ea.	\$ 30.60	\$ 38.65	1.095	\$ 42.32	0.97
1.000	D2013 330 0020	Replace washer in faucet lavatory, vitreous china	2	1 Plum	Ea.	\$ 11.22	\$ 13.97	1.095	\$ 15.30	0.97
1.000	D2013 330 0050	Clean out strainer and P trap lavatory, vitreous china	2	1 Plum	Ea.	\$ 30.60	\$ 38.65	1.095	\$ 42.32	0.97
1.000	D2013 350 0020	Replace washer in faucet lavatory, enameled steel	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97

PLUMBING REPAIR AND REPLACEMENT MAINTENANCE COSTS¹
15% GF
CostWorks 2010
Costs Reflect National Averages

Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value			GREEN		

Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2023 260 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/12 HP	\$ 9.34	1.15	\$ 11.07	0.97	\$ 10.74
1.000	D2023 266 0020	Inspect/check pump/motor operation, lub. circulation pump, bronze 1 HP	\$ 9.34	1.15	\$ 11.07	0.97	\$ 10.74
1.000	D2023 267 0020	Insp/chk pump/mtr oper, lub, chk align circulation pump, CI 1-1/2 HP	\$ 13.91	1.15	\$ 16.48	0.97	\$ 16.00
			\$ 32.59				\$ 37.48

			\$ 32.59	Assumed 100%		Assumed 100%	\$ 37.48
				PER 0.5 YR		PER 0.5 YR	

1.000	D2013 810 0010	Check / minor repairs drinking fountain	\$ 57.38	1.15	\$ 68.00	0.97	\$ 65.99
1.000	D2023 210 0020	Clean and service water heater, gas / oil, 30 gallon	\$ 228.47	1.15	\$ 270.74	0.97	\$ 262.73
1.000	D2023 212 0020	Clean & service water heater, gas / oil, 70 gallon	\$ 228.47	1.15	\$ 270.74	0.97	\$ 262.73
1.000	D2023 230 0020	Inspect for leaks steam converter, domestic hot water	\$ 7.90	1.15	\$ 9.36	0.97	\$ 9.08
1.000	D2023 261 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/8 HP	\$ 9.34	1.15	\$ 11.07	0.97	\$ 10.74
1.000	D2023 262 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/6 HP	\$ 9.34	1.15	\$ 11.07	0.97	\$ 10.74
1.000	D2023 264 0020	Insp./chk. pump/mtr. oper., lub., chk. align. circulation pump, 1/2 HP	\$ 13.91	1.15	\$ 16.48	0.97	\$ 16.00
1.000	D2043 110 1010	General maintenance & repair distribution: gutters, pipe	\$ 354.28	1.15	\$ 419.83	0.97	\$ 407.42
1.000	D2043 210 1010	General maintenance & repair drain: roof, scupper, area	\$ 43.46	1.15	\$ 51.50	0.97	\$ 49.98
1.000	D2043 310 1020	Insp./chk. pump/mtr. oper., lub., chk. align. rainwater sump pump	\$ 13.91	1.15	\$ 16.48	0.97	\$ 16.00
1.000	D2093 946 1010	Check and adjust 2 H.P. compressor	\$ 98.59	1.15	\$ 116.83	0.97	\$ 113.38
1.000	D2093 946 3010	Check and adjust 10 H.P. compressor	\$ 98.59	1.15	\$ 116.83	0.97	\$ 113.38
1.000	D2093 946 4010	Check and adjust 25 H.P. compressor	\$ 98.59	1.15	\$ 116.83	0.97	\$ 113.38
1.000	D2093 946 5030	Check operation compressed air systems	\$ 27.10	1.15	\$ 32.11	0.97	\$ 31.16

			\$ 1,289.32				\$ 1,482.72
			\$ 1,289.32	Assumed 100%		Assumed 100%	\$ 1,482.72
				PER 1 YR		PER 1 YR	

1.000	D2013 310 0020	Replace washer in faucet lavatory, iron, enamel	\$ 14.75	1.15	\$ 17.48	0.97	\$ 16.96
1.000	D2013 310 0050	Clean out strainer and P trap lavatory, iron, enamel	\$ 41.07	1.15	\$ 48.67	0.97	\$ 47.23
1.000	D2013 330 0020	Replace washer in faucet lavatory, vitreous china	\$ 14.84	1.15	\$ 17.59	0.97	\$ 17.07
1.000	D2013 330 0050	Clean out strainer and P trap lavatory, vitreous china	\$ 41.07	1.15	\$ 48.67	0.97	\$ 47.23
1.000	D2013 350 0020	Replace washer in faucet lavatory, enameled steel	\$ 14.75	1.15	\$ 17.48	0.97	\$ 16.96

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.15	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2013 350 0050	Clean out strainer and P trap lavatory, enameled steel	2	1 Plum	Ea.	\$ 30.60	\$ 38.65	1.095	\$ 42.32	0.97
1.000	D2013 410 0010	Replace faucet washer sink, iron enamel	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 410 0040	Unstop sink sink, iron enamel	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 420 0010	Replace faucet washer sink, enameled steel	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 420 0040	Unstop sink enameled steel	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 430 0010	Replace faucet washer sink, stainless steel	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 430 0040	Unstop sink, stainless steel	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 440 0010	Replace faucet washer sink, plastic	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 440 0040	Unstop, sink, plastic	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 450 0020	Replace washer in faucet laundry sink, plastic	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 450 0050	Clean out strainer and P trap laundry sink, plastic	2	1 Plum	Ea.	\$ 30.60	\$ 38.65	1.095	\$ 42.32	0.97
1.000	D2013 460 0010	Replace faucet washer	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 460 0040	Unstop sink	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 510 0020	Replace mixing valve barrel bathtub, cast iron enamel	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 530 0020	Replace mixing valve barrel bathtub, enameled steel	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 550 0020	Replace mixing valve barrel bathtub, fiberglass	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 710 0020	Replace mixing valve barrel shower, terrazzo	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 730 0020	Replace mixing valve barrel shower, enameled steel	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 750 0020	Replace mixing valve barrel shower, fiberglass	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 770 0020	Replace mixing valve barrel shower, misc.	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 810 0030	Correct water pressure drinking fountain	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 810 0040	Replace refrigerant drinking fountain	2	1 Plum	Ea.	\$ 22.50	\$ 26.50	1.095	\$ 29.02	0.97
1.000	D2023 214 0010	Minor repairs, adjustments water heater, gas / oil, 1150 GPH	2	2 Plum	Ea.	\$ 86.00	\$ 108.00	1.095	\$ 118.26	0.97
1.000	D2023 214 0020	Clean & service water heater, gas / oil, 1150 GPH	2	2 Plum	Ea.	\$ 515.00	\$ 645.00	1.095	\$ 706.28	0.97
1.000	D2093 910 1010	General maintenance pipe & fittings, industrial gas	2	1 Plum	M.L.F.	\$ 32.50	\$ 40.50	1.095	\$ 44.35	0.97
1.000	D2093 940 1010	General maintenance pipe & fittings, compressed air	2	1 Plum	M.L.F.	\$ 32.50	\$ 40.50	1.095	\$ 44.35	0.97
1.000	D2013 410 0020	Clean trap sink, iron enamel	3	1 Plum	Ea.	\$ 7.51	\$ 9.39	1.095	\$ 10.28	0.97
1.000	D2013 420 0020	Clean trap sink, enameled steel	3	1 Plum	Ea.	\$ 7.51	\$ 9.39	1.095	\$ 10.28	0.97
1.000	D2013 430 0020	Clean trap sink, stainless steel	3	1 Plum	Ea.	\$ 7.51	\$ 9.39	1.095	\$ 10.28	0.97
1.000	D2013 440 0020	Clean trap sink, plastic	3	1 Plum	Ea.	\$ 7.51	\$ 9.39	1.095	\$ 10.28	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2013 350 0050	Clean out strainer and P trap lavatory, enameled steel	\$ 41.07	1.15	\$ 48.67	0.97	\$ 47.23
1.000	D2013 410 0010	Replace faucet washer sink, iron enamel	\$ 14.75	1.15	\$ 17.48	0.97	\$ 16.96
1.000	D2013 410 0040	Unstop sink sink, iron enamel	\$ 48.88	1.15	\$ 57.93	0.97	\$ 56.21
1.000	D2013 420 0010	Replace faucet washer sink, enameled steel	\$ 14.75	1.15	\$ 17.48	0.97	\$ 16.96
1.000	D2013 420 0040	Unstop sink enameled steel	\$ 48.88	1.15	\$ 57.93	0.97	\$ 56.21
1.000	D2013 430 0010	Replace faucet washer sink, stainless steel	\$ 14.75	1.15	\$ 17.48	0.97	\$ 16.96
1.000	D2013 430 0040	Unstop sink, stainless steel	\$ 48.88	1.15	\$ 57.93	0.97	\$ 56.21
1.000	D2013 440 0010	Replace faucet washer sink, plastic	\$ 14.75	1.15	\$ 17.48	0.97	\$ 16.96
1.000	D2013 440 0040	Unstop, sink, plastic	\$ 48.88	1.15	\$ 57.93	0.97	\$ 56.21
1.000	D2013 450 0020	Replace washer in faucet laundry sink, plastic	\$ 14.75	1.15	\$ 17.48	0.97	\$ 16.96
1.000	D2013 450 0050	Clean out strainer and P trap laundry sink, plastic	\$ 41.07	1.15	\$ 48.67	0.97	\$ 47.23
1.000	D2013 460 0010	Replace faucet washer	\$ 14.75	1.15	\$ 17.48	0.97	\$ 16.96
1.000	D2013 460 0040	Unstop sink	\$ 48.88	1.15	\$ 57.93	0.97	\$ 56.21
1.000	D2013 510 0020	Replace mixing valve barrel bathtub, cast iron enamel	\$ 213.72	1.15	\$ 253.26	0.97	\$ 245.77
1.000	D2013 530 0020	Replace mixing valve barrel bathtub, enameled steel	\$ 213.72	1.15	\$ 253.26	0.97	\$ 245.77
1.000	D2013 550 0020	Replace mixing valve barrel bathtub, fiberglass	\$ 213.72	1.15	\$ 253.26	0.97	\$ 245.77
1.000	D2013 710 0020	Replace mixing valve barrel shower, terrazzo	\$ 213.72	1.15	\$ 253.26	0.97	\$ 245.77
1.000	D2013 730 0020	Replace mixing valve barrel shower, enameled steel	\$ 213.72	1.15	\$ 253.26	0.97	\$ 245.77
1.000	D2013 750 0020	Replace mixing valve barrel shower, fiberglass	\$ 213.72	1.15	\$ 253.26	0.97	\$ 245.77
1.000	D2013 770 0020	Replace mixing valve barrel shower, misc.	\$ 213.72	1.15	\$ 253.26	0.97	\$ 245.77
1.000	D2013 810 0030	Correct water pressure drinking fountain	\$ 48.88	1.15	\$ 57.93	0.97	\$ 56.21
1.000	D2013 810 0040	Replace refrigerant drinking fountain	\$ 28.16	1.15	\$ 33.37	0.97	\$ 32.38
1.000	D2023 214 0010	Minor repairs, adjustments water heater, gas / oil, 1150 GPH	\$ 114.76	1.15	\$ 136.00	0.97	\$ 131.98
1.000	D2023 214 0020	Clean & service water heater, gas / oil, 1150 GPH	\$ 685.40	1.15	\$ 812.22	0.97	\$ 788.20
1.000	D2093 910 1010	General maintenance pipe & fittings, industrial gas	\$ 43.04	1.15	\$ 51.00	0.97	\$ 49.49
1.000	D2093 940 1010	General maintenance pipe & fittings, compressed air	\$ 43.04	1.15	\$ 51.00	0.97	\$ 49.49
			\$ 3,000.81				\$ 3,450.93
			\$ 3,000.81	Assumed 100%		Assumed 100%	\$ 3,450.93
				PER 1 YR		PER 1 YR	
1.000	D2013 410 0020	Clean trap sink, iron enamel	\$ 9.98	1.15	\$ 11.82	0.97	\$ 11.47
1.000	D2013 420 0020	Clean trap sink, enameled steel	\$ 9.98	1.15	\$ 11.82	0.97	\$ 11.47
1.000	D2013 430 0020	Clean trap sink, stainless steel	\$ 9.98	1.15	\$ 11.82	0.97	\$ 11.47
1.000	D2013 440 0020	Clean trap sink, plastic	\$ 9.98	1.15	\$ 11.82	0.97	\$ 11.47

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.15	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2013 460 0020	Clean trap	3	1 Plum	Ea.	\$ 7.51	\$ 9.39	1.095	\$ 10.28	0.97
1.000	D2013 510 0010	Inspect / clean shower head bathtub, cast iron enamel	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 530 0010	Inspect / clean shower head bathtub, enameled steel	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 550 0010	Inspect / clean shower head bathtub, fiberglass	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 710 0010	Inspect / clean shower head shower, terrazzo	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 730 0010	Inspect / clean shower head shower, enameled steel	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 750 0010	Inspect / clean shower head fiberglass	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 770 0010	Inspect / clean shower head	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 910 0020	Inspect and clean shower head emergency shower station	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 920 0020	Inspect and clean spray heads, emergency eye wash	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2023 220 0020	Check operation water heater, electric, 120 gallon	3	1 Plum	Ea.	\$ 2.27	\$ 2.83	1.095	\$ 3.10	0.97
1.000	D2023 222 0020	Check operation water heater, electric, 300 gallon	3	1 Plum	Ea.	\$ 2.27	\$ 2.83	1.095	\$ 3.10	0.97
1.000	D2023 224 0020	Check operation water heater, electric, 1000 gallon	3	1 Plum	Ea.	\$ 2.27	\$ 2.83	1.095	\$ 3.10	0.97
1.000	D2023 226 0020	Check operation water heater, electric, 2000 gallon	3	1 Plum	Ea.	\$ 2.27	\$ 2.83	1.095	\$ 3.10	0.97
1.000	D2013 810 0020	Repair internal leaks drinking fountain	4	1 Plum	Ea.	\$ 39.50	\$ 49.50	1.095	\$ 54.20	0.97
1.000	D2013 810 0050	Repair drain leak drinking fountain	4	1 Plum	Ea.	\$ 25.85	\$ 31.19	1.095	\$ 34.15	0.97
1.000	D2033 310 0010	Clean floor drain w/o bucket	4	1 Plum	Ea.	\$ 103.00	\$ 128.00	1.095	\$ 140.16	0.97
1.000	D2013 110 0020	Unplug clogged line tankless water closet	5	1 Plum	Ea.	\$ 191.32	\$ 239.44	1.095	\$ 262.19	0.97
1.000	D2013 110 0050	Replace wax ring gasket tankless water closet	5	1 Plum	Ea.	\$ 124.82	\$ 155.94	1.095	\$ 170.75	0.97
1.000	D2013 130 0010	Unplug clogged line flush-tank water closet	5	1 Plum	Ea.	\$ 191.32	\$ 239.44	1.095	\$ 262.19	0.97
1.000	D2013 130 0020	Replace washer / diaphragm in ball cock flush-tank water closet	5	1 Plum	Ea.	\$ 15.72	\$ 19.48	1.095	\$ 21.33	0.97
1.000	D2013 210 0020	Unplug line urinal	5	1 Plum	Ea.	\$ 127.32	\$ 159.44	1.095	\$ 174.59	0.97
1.000	D2023 210 0010	Overhaul water heater, gas / oil, 30 gallon	5	1 Plum	Ea.	\$ 102.58	\$ 128.45	1.095	\$ 140.65	0.97
1.000	D2023 212 0010	Overhaul water heater, gas / oil, 70 gallon	5	1 Plum	Ea.	\$ 143.80	\$ 180.22	1.095	\$ 197.34	0.97
1.000	D2023 250 0010	Refill expansion chamber	5	1 Plum	Ea.	\$ 2.52	\$ 3.15	1.095	\$ 3.45	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2013 460 0020	Clean trap	\$ 9.98	1.15	\$ 11.82	0.97	\$ 11.47
1.000	D2013 510 0010	Inspect / clean shower head bathtub, cast iron enamel	\$ 57.40	1.15	\$ 68.02	0.97	\$ 66.01
1.000	D2013 530 0010	Inspect / clean shower head bathtub, enameled steel	\$ 57.40	1.15	\$ 68.02	0.97	\$ 66.01
1.000	D2013 550 0010	Inspect / clean shower head bathtub, fiberglass	\$ 57.40	1.15	\$ 68.02	0.97	\$ 66.01
1.000	D2013 710 0010	Inspect / clean shower head shower, terrazzo	\$ 57.40	1.15	\$ 68.02	0.97	\$ 66.01
1.000	D2013 730 0010	Inspect / clean shower head shower, enameled steel	\$ 57.40	1.15	\$ 68.02	0.97	\$ 66.01
1.000	D2013 750 0010	Inspect / clean shower head fiberglass	\$ 57.40	1.15	\$ 68.02	0.97	\$ 66.01
1.000	D2013 770 0010	Inspect / clean shower head	\$ 57.40	1.15	\$ 68.02	0.97	\$ 66.01
1.000	D2013 910 0020	Inspect and clean shower head emergency shower station	\$ 57.40	1.15	\$ 68.02	0.97	\$ 66.01
1.000	D2013 920 0020	Inspect and clean spray heads, emergency eye wash	\$ 57.40	1.15	\$ 68.02	0.97	\$ 66.01
1.000	D2023 220 0020	Check operation water heater, electric, 120 gallon	\$ 3.01	1.15	\$ 3.56	0.97	\$ 3.46
1.000	D2023 222 0020	Check operation water heater, electric, 300 gallon	\$ 3.01	1.15	\$ 3.56	0.97	\$ 3.46
1.000	D2023 224 0020	Check operation water heater, electric, 1000 gallon	\$ 3.01	1.15	\$ 3.56	0.97	\$ 3.46
1.000	D2023 226 0020	Check operation water heater, electric, 2000 gallon	\$ 3.01	1.15	\$ 3.56	0.97	\$ 3.46
			\$ 578.55				\$ 665.33
			\$ 578.55	Assumed 100%		Assumed 100%	\$ 665.33
				PER 3 YR		PER 3 YR	
1.000	D2013 810 0020	Repair internal leaks drinking fountain	\$ 52.60	1.15	\$ 62.33	0.97	\$ 60.49
1.000	D2013 810 0050	Repair drain leak drinking fountain	\$ 33.14	1.15	\$ 39.28	0.97	\$ 38.11
1.000	D2033 310 0010	Clean floor drain w/o bucket	\$ 136.02	1.15	\$ 161.18	0.97	\$ 156.42
			\$ 221.76				\$ 255.02
			\$ 221.76	Assumed 100%		Assumed 100%	\$ 255.02
				PER 4 YR		PER 4 YR	
1.000	D2013 110 0020	Unplug clogged line tankless water closet	\$ 254.44	1.15	\$ 301.51	0.97	\$ 292.60
1.000	D2013 110 0050	Replace wax ring gasket tankless water closet	\$ 165.71	1.15	\$ 196.37	0.97	\$ 190.56
1.000	D2013 130 0010	Unplug clogged line flush-tank water closet	\$ 254.44	1.15	\$ 301.51	0.97	\$ 292.60
1.000	D2013 130 0020	Replace washer / diaphragm in ball cock flush-tank water closet	\$ 20.70	1.15	\$ 24.53	0.97	\$ 23.81
1.000	D2013 210 0020	Unplug line urinal	\$ 169.43	1.15	\$ 200.77	0.97	\$ 194.84
1.000	D2023 210 0010	Overhaul water heater, gas / oil, 30 gallon	\$ 136.49	1.15	\$ 161.75	0.97	\$ 156.97
1.000	D2023 212 0010	Overhaul water heater, gas / oil, 70 gallon	\$ 191.51	1.15	\$ 226.94	0.97	\$ 220.23
1.000	D2023 250 0010	Refill expansion chamber	\$ 3.35	1.15	\$ 3.97	0.97	\$ 3.85

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.15	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2033 330 0010	Clean out bucket floor drain with bucket	5	1 Plum	Ea.	\$ 258.00	\$ 325.00	1.095	\$ 355.88	0.97
1.000	D2013 210 0010	Replace flush valve diaphragm urinal	7	1 Plum	Ea.	\$ 34.51	\$ 41.39	1.095	\$ 45.32	0.97
1.000	D2013 310 0010	Replace washer in spud connection lavatory, iron, enamel	7	1 Plum	Ea.	\$ 21.74	\$ 25.46	1.095	\$ 27.88	0.97
1.000	D2013 330 0010	Replace washer in spud connection lavatory, vitreous china	7	1 Plum	Ea.	\$ 25.80	\$ 30.54	1.095	\$ 33.44	0.97
1.000	D2013 350 0010	Replace washer in spud connection lavatory, enameled steel	7	1 Plum	Ea.	\$ 26.01	\$ 30.80	1.095	\$ 33.73	0.97
1.000	D2023 220 0010	Drain and flush water heater, electric, 120 gallon	7	1 Plum	Ea.	\$ 258.00	\$ 325.00	1.095	\$ 355.88	0.97
1.000	D2023 222 0010	Drain and flush water heater, electric, 300 gallon	7	1 Plum	Ea.	\$ 258.00	\$ 325.00	1.095	\$ 355.88	0.97
1.000	D2023 224 0010	Drain and flush water heater, electric, 1000 gallon	7	1 Plum	Ea.	\$ 258.00	\$ 325.00	1.095	\$ 355.88	0.97
1.000	D2023 226 0010	Drain and flush water heater, electric, 2000 gallon	7	1 Plum	Ea.	\$ 258.00	\$ 325.00	1.095	\$ 355.88	0.97
1.000	D2013 110 0010	Replace flush valve diaphragm tankless water closet	10	1 Plum	Ea.	\$ 34.51	\$ 41.39	1.095	\$ 45.32	0.97
1.000	D2013 310 0040	Replace faucets lavatory, iron, enamel	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 330 0040	Replace faucets lavatory, vitreous china	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 350 0040	Replace faucets lavatory, enameled steel	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 410 0030	Replace faucets sink, iron enamel	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 420 0030	Replace faucets sink, enameled steel	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 430 0030	Replace faucets sink, stainless steel	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 440 0030	Replace faucets sink, plastic	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 450 0040	Replace faucets laundry sink, plastic	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 460 0030	Replace faucets	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 510 0030	Replace mixing valve bathtub, cast iron enamel	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 530 0030	Replace mixing valve bathtub, enameled steel	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 550 0030	Replace mixing valve bathtub, fiberglass	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 710 0030	Replace mixing valve shower, terrazzo	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 730 0030	Replace mixing valve shower, enameled steel	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 750 0030	Replace mixing valve shower, fiberglass	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2033 330 0010	Clean out bucket floor drain with bucket	\$ 345.35	1.15	\$ 409.26	0.97	\$ 397.16
			\$ 1,541.41				\$ 1,772.62
			\$ 1,541.41	Assumed 100%		Assumed 100%	\$ 1,772.62
				PER 5 YR		PER 5 YR	
1.000	D2013 210 0010	Replace flush valve diaphragm urinal	\$ 43.98	1.15	\$ 52.12	0.97	\$ 50.58
1.000	D2013 310 0010	Replace washer in spud connection lavatory, iron, enamel	\$ 27.05	1.15	\$ 32.06	0.97	\$ 31.11
1.000	D2013 330 0010	Replace washer in spud connection lavatory, vitreous china	\$ 32.45	1.15	\$ 38.46	0.97	\$ 37.32
1.000	D2013 350 0010	Replace washer in spud connection lavatory, enameled steel	\$ 32.73	1.15	\$ 38.78	0.97	\$ 37.64
1.000	D2023 220 0010	Drain and flush water heater, electric, 120 gallon	\$ 345.35	1.15	\$ 409.26	0.97	\$ 397.16
1.000	D2023 222 0010	Drain and flush water heater, electric, 300 gallon	\$ 345.35	1.15	\$ 409.26	0.97	\$ 397.16
1.000	D2023 224 0010	Drain and flush water heater, electric, 1000 gallon	\$ 345.35	1.15	\$ 409.26	0.97	\$ 397.16
1.000	D2023 226 0010	Drain and flush water heater, electric, 2000 gallon	\$ 345.35	1.15	\$ 409.26	0.97	\$ 397.16
			\$ 1,517.64				\$ 1,745.28
			\$ 1,517.64	Assumed 100%		Assumed 100%	\$ 1,745.28
				PER 7 YR		PER 7 YR	
1.000	D2013 110 0010	Replace flush valve diaphragm tankless water closet	\$ 43.98	1.15	\$ 52.12	0.97	\$ 50.58
1.000	D2013 310 0040	Replace faucets lavatory, iron, enamel	\$ 183.96	1.15	\$ 218.00	0.97	\$ 211.56
1.000	D2013 330 0040	Replace faucets lavatory, vitreous china	\$ 183.96	1.15	\$ 218.00	0.97	\$ 211.56
1.000	D2013 350 0040	Replace faucets lavatory, enameled steel	\$ 183.96	1.15	\$ 218.00	0.97	\$ 211.56
1.000	D2013 410 0030	Replace faucets sink, iron enamel	\$ 183.96	1.15	\$ 218.00	0.97	\$ 211.56
1.000	D2013 420 0030	Replace faucets sink, enameled steel	\$ 183.96	1.15	\$ 218.00	0.97	\$ 211.56
1.000	D2013 430 0030	Replace faucets sink, stainless steel	\$ 183.96	1.15	\$ 218.00	0.97	\$ 211.56
1.000	D2013 440 0030	Replace faucets sink, plastic	\$ 183.96	1.15	\$ 218.00	0.97	\$ 211.56
1.000	D2013 450 0040	Replace faucets laundry sink, plastic	\$ 183.96	1.15	\$ 218.00	0.97	\$ 211.56
1.000	D2013 460 0030	Replace faucets	\$ 183.96	1.15	\$ 218.00	0.97	\$ 211.56
1.000	D2013 510 0030	Replace mixing valve bathtub, cast iron enamel	\$ 417.21	1.15	\$ 494.41	0.97	\$ 479.79
1.000	D2013 530 0030	Replace mixing valve bathtub, enameled steel	\$ 417.21	1.15	\$ 494.41	0.97	\$ 479.79
1.000	D2013 550 0030	Replace mixing valve bathtub, fiberglass	\$ 417.21	1.15	\$ 494.41	0.97	\$ 479.79
1.000	D2013 710 0030	Replace mixing valve shower, terrazzo	\$ 417.21	1.15	\$ 494.41	0.97	\$ 479.79
1.000	D2013 730 0030	Replace mixing valve shower, enameled steel	\$ 417.21	1.15	\$ 494.41	0.97	\$ 479.79
1.000	D2013 750 0030	Replace mixing valve shower, fiberglass	\$ 417.21	1.15	\$ 494.41	0.97	\$ 479.79

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.15	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2013 770 0030	Replace mixing valve shower, misc.	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 770 0070	Replace shower head with water conserving head	10	1 Plum	Ea.	\$ 127.67	\$ 149.29	1.095	\$ 163.47	0.97
1.000	D2013 810 0070	Replace fountain drinking fountain	10	2 Plum	Ea.	\$ 1,086.00	\$ 1,289.00	1.095	\$ 1,411.46	0.97
1.000	D2023 110 0010	Resolder joint pipe & fittings, copper	10	1 Plum	Ea.	\$ 37.94	\$ 47.30	1.095	\$ 51.79	0.97
1.000	D2023 130 0010	Reglue joint, install 1" tee solar piping: pipe & fittings, PVC	10	1 Plum	Ea.	\$ 65.15	\$ 81.65	1.095	\$ 89.41	0.97
1.000	D2023 130 0110	Reglue joint, install 1-1/4" tee solar piping: pipe & fittings, PVC	10	1 Plum	Ea.	\$ 71.15	\$ 88.65	1.095	\$ 97.07	0.97
1.000	D2023 130 0210	Reglue joint, install 1-1/2" tee solar piping: pipe & fittings, PVC	10	1 Plum	Ea.	\$ 77.65	\$ 96.65	1.095	\$ 105.83	0.97
1.000	D2023 130 0310	Reglue joint, install 2" tee solar piping: pipe & fittings, PVC	10	Q1	Ea.	\$ 82.65	\$ 103.15	1.095	\$ 112.95	0.97
1.000	D2023 150 0020	Replace old valve, non-drain, less than 1-1/2"	10	1 Plum	Ea.	\$ 322.00	\$ 372.50	1.095	\$ 407.89	0.97
1.000	D2023 152 0020	Replace old valve, non-drain, 2"	10	1 Plum	Ea.	\$ 1,396.50	\$ 1,608.00	1.095	\$ 1,760.76	0.97
1.000	D2023 154 0020	Replace old valve, non-drain, 3"	10	1 Plum	Ea.	\$ 1,396.50	\$ 1,608.00	1.095	\$ 1,760.76	0.97
1.000	D2023 156 0020	Replace old valve, non-drain, 4"	10	2 Plum	Ea.	\$ 1,690.00	\$ 1,990.00	1.095	\$ 2,179.05	0.97
1.000	D2023 156 0030	Replace old valve, non-drain, 6"	10	2 Plum	Ea.	\$ 2,528.00	\$ 2,970.00	1.095	\$ 3,252.15	0.97
1.000	D2023 156 0040	Replace old valve, non-drain, 8"	10	2 Plum	Ea.	\$ 3,758.00	\$ 4,366.00	1.095	\$ 4,780.77	0.97
1.000	D2023 156 0050	Replace old valve, non-drain, 10"	10	3 Plum	Ea.	\$ 5,953.00	\$ 6,904.00	1.095	\$ 7,559.88	0.97
1.000	D2023 210 0030	Replace water heater, gas / oil, 30 gallon	10	2 Plum	Ea.	\$ 1,506.95	\$ 1,777.45	1.095	\$ 1,946.31	0.97
1.000	D2023 250 0020	Remove old chamber, install new expansion chamber	10	1 Plum	Ea.	\$ 625.00	\$ 720.00	1.095	\$ 788.40	0.97
1.000	D2023 260 0030	Replace pump / motor assembly circulation pump, 1/12 HP	10	2 Plum	Ea.	\$ 846.00	\$ 996.00	1.095	\$ 1,090.62	0.97
1.000	D2023 310 0020	Replace old valve with new hose bibb	10	1 Plum	Ea.	\$ 51.00	\$ 62.45	1.095	\$ 68.38	0.97
1.000	D2033 110 0020	Unclog main drain pipe & fittings, cast iron	10	1 Plum	Ea.	\$ 40.50	\$ 51.00	1.095	\$ 55.85	0.97
1.000	D2033 130 0020	Unclog main drain pipe, PVC	10	1 Plum	M.L.F.	\$ 40.50	\$ 51.00	1.095	\$ 55.85	0.97
1.000	D2033 130 0040	Repair joint pipe and fittings, PVC	10	1 Plum	Ea.	\$ 131.55	\$ 164.15	1.095	\$ 179.74	0.97
1.000	D2033 305 3010	Unclog floor drain per M.L.F. pipe	10	1 Plum	Ea.	\$ 285.50	\$ 352.50	1.095	\$ 385.99	0.97
1.000	D2033 305 3020	Unclog main drain per M.L.F. pipe	10	1 Plum	Ea.	\$ 40.50	\$ 50.50	1.095	\$ 55.30	0.97
1.000	D2023 212 0030	Replace water heater, gas / oil, 70 gallon	12	2 Plum	Ea.	\$ 2,518.00	\$ 2,935.00	1.095	\$ 3,213.83	0.97
1.000	D2093 920 1010	Resolder joint pipe & fittings, anesthesia	12	1 Plum	Ea.	\$ 45.44	\$ 56.30	1.095	\$ 61.65	0.97
1.000	D2093 930 1010	Resolder joint pipe & fittings, oxygen	12	1 Plum	Ea.	\$ 60.65	\$ 75.50	1.095	\$ 82.67	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2013 770 0030	Replace mixing valve shower, misc.	\$ 417.21	1.15	\$ 494.41	0.97	\$ 479.79
1.000	D2013 770 0070	Replace shower head with water conserving head	\$ 158.64	1.15	\$ 187.99	0.97	\$ 182.44
1.000	D2013 810 0070	Replace fountain drinking fountain	\$ 1,369.73	1.15	\$ 1,623.17	0.97	\$ 1,575.19
1.000	D2023 110 0010	Resolder joint pipe & fittings, copper	\$ 50.26	1.15	\$ 59.56	0.97	\$ 57.80
1.000	D2023 130 0010	Reglue joint, install 1" tee solar piping: pipe & fittings, PVC	\$ 86.76	1.15	\$ 102.82	0.97	\$ 99.78
1.000	D2023 130 0110	Reglue joint, install 1-1/4" tee solar piping: pipe & fittings, PVC	\$ 94.20	1.15	\$ 111.63	0.97	\$ 108.33
1.000	D2023 130 0210	Reglue joint, install 1-1/2" tee solar piping: pipe & fittings, PVC	\$ 102.70	1.15	\$ 121.71	0.97	\$ 118.11
1.000	D2023 130 0310	Reglue joint, install 2" tee solar piping: pipe & fittings, PVC	\$ 109.61	1.15	\$ 129.89	0.97	\$ 126.05
1.000	D2023 150 0020	Replace old valve, non-drain, less than 1-1/2"	\$ 395.83	1.15	\$ 469.07	0.97	\$ 455.20
1.000	D2023 152 0020	Replace old valve, non-drain, 2"	\$ 1,708.71	1.15	\$ 2,024.87	0.97	\$ 1,965.01
1.000	D2023 154 0020	Replace old valve, non-drain, 3"	\$ 1,708.71	1.15	\$ 2,024.87	0.97	\$ 1,965.01
1.000	D2023 156 0020	Replace old valve, non-drain, 4"	\$ 2,114.63	1.15	\$ 2,505.91	0.97	\$ 2,431.83
1.000	D2023 156 0030	Replace old valve, non-drain, 6"	\$ 3,156.01	1.15	\$ 3,739.97	0.97	\$ 3,629.41
1.000	D2023 156 0040	Replace old valve, non-drain, 8"	\$ 4,639.44	1.15	\$ 5,497.89	0.97	\$ 5,335.35
1.000	D2023 156 0050	Replace old valve, non-drain, 10"	\$ 7,336.39	1.15	\$ 8,693.86	0.97	\$ 8,436.85
1.000	D2023 210 0030	Replace water heater, gas / oil, 30 gallon	\$ 1,888.77	1.15	\$ 2,238.25	0.97	\$ 2,172.08
1.000	D2023 250 0020	Remove old chamber, install new expansion chamber	\$ 765.09	1.15	\$ 906.66	0.97	\$ 879.86
1.000	D2023 260 0030	Replace pump / motor assembly circulation pump, 1/12 HP	\$ 1,058.38	1.15	\$ 1,254.21	0.97	\$ 1,217.13
1.000	D2023 310 0020	Replace old valve with new hose bibb	\$ 66.36	1.15	\$ 78.64	0.97	\$ 76.32
1.000	D2033 110 0020	Unclog main drain pipe & fittings, cast iron	\$ 54.19	1.15	\$ 64.22	0.97	\$ 62.32
1.000	D2033 130 0020	Unclog main drain pipe, PVC	\$ 54.19	1.15	\$ 64.22	0.97	\$ 62.32
1.000	D2033 130 0040	Repair joint pipe and fittings, PVC	\$ 174.43	1.15	\$ 206.71	0.97	\$ 200.60
1.000	D2033 305 3010	Unclog floor drain per M.L.F. pipe	\$ 374.58	1.15	\$ 443.89	0.97	\$ 430.76
1.000	D2033 305 3020	Unclog main drain per M.L.F. pipe	\$ 53.66	1.15	\$ 63.59	0.97	\$ 61.71
			\$ 32,141.38				\$ 36,962.58
			\$ 32,141.38	Assumed 100%		Assumed 100%	\$ 36,962.58
				PER 10 YR		PER 10 YR	
1.000	D2023 212 0030	Replace water heater, gas / oil, 70 gallon	\$ 3,118.81	1.15	\$ 3,695.90	0.97	\$ 3,586.64
1.000	D2093 920 1010	Resolder joint pipe & fittings, anesthesia	\$ 59.83	1.15	\$ 70.90	0.97	\$ 68.80
1.000	D2093 930 1010	Resolder joint pipe & fittings, oxygen	\$ 80.23	1.15	\$ 95.07	0.97	\$ 92.26
			\$ 3,258.87				\$ 3,747.70
			\$ 3,258.87	Assumed 100%		Assumed 100%	\$ 3,747.70

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.15	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2023 320 0010	Overhaul water meter	13	1 Plum	Ea.	\$ 33.00	\$ 39.50	1.095	\$ 43.25	0.97
1.000	D2013 130 0030	Replace valve and ball cock assembly flush-tank water closet	15	1 Plum	Ea.	\$ 83.77	\$ 102.79	1.095	\$ 112.56	0.97
1.000	D2013 440 0060	Replace sink and fittings, polyethylene sink, plastic	15	2 Plum	Ea.	\$ 1,951.00	\$ 2,277.00	1.095	\$ 2,493.32	0.97
1.000	D2023 160 0020	Remove old insulation & replace with new, pipe 1/2", wall 1"	15	1 Plum	L.F.	\$ 7.25	\$ 8.90	1.095	\$ 9.75	0.97
1.000	D2023 160 0030	Remove old insulation & replace with new, pipe 3/4", wall 1"	15	1 Plum	L.F.	\$ 7.55	\$ 9.25	1.095	\$ 10.13	0.97
1.000	D2023 160 0040	Remove old insulation & replace with new, pipe 1-1/2", wall 1"	15	1 Plum	L.F.	\$ 8.30	\$ 10.15	1.095	\$ 11.11	0.97
1.000	D2023 160 0050	Remove old insulation & replace with new, pipe 1/2", wall 3/4"	15	1 Plum	L.F.	\$ 9.60	\$ 11.80	1.095	\$ 12.92	0.97
1.000	D2023 160 0060	Remove old insulation & replace with new, pipe 3/4", wall 3/4"	15	1 Plum	L.F.	\$ 9.85	\$ 12.10	1.095	\$ 13.25	0.97
1.000	D2023 160 0070	Remove old insulation & replace with new, pipe 1-1/2", wall 3/4"	15	1 Plum	L.F.	\$ 11.00	\$ 13.45	1.095	\$ 14.73	0.97
1.000	D2023 220 0030	Replace water heater, electric, 120 gallon	15	2 Plum	Ea.	\$ 9,305.00	\$ 10,650.00	1.095	\$ 11,661.75	0.97
1.000	D2023 222 0030	Replace water heater, electric, 300 gallon	15	2 Plum	Ea.	\$ 38,365.00	\$ 43,780.00	1.095	\$ 47,939.10	0.97
1.000	D2023 224 0030	Replace water heater, electric, 1000 gallon	15	2 Plum	Ea.	\$ 85,850.00	\$ 98,175.00	1.095	\$ 107,501.63	0.97
1.000	D2023 226 0030	Replace water heater, electric, 2000 gallon	15	2 Plum	Ea.	\$ 123,875.00	\$ 141,350.00	1.095	\$ 154,778.25	0.97
1.000	D2023 370 0030	Replace water softener	15	2 Plum	Ea.	\$ 1,318.00	\$ 1,560.00	1.095	\$ 1,708.20	0.97
1.000	D2013 110 0015	Rebuild flush valve tankless water closet	20	1 Plum	Ea.	\$ 155.17	\$ 186.83	1.095	\$ 204.58	0.97
1.000	D2013 130 0040	Install gasket between tank and bowl flush-tank water closet	20	1 Plum	Ea.	\$ 34.66	\$ 43.22	1.095	\$ 47.33	0.97
1.000	D2013 210 0015	Rebuild flush valve urinal	20	1 Plum	Ea.	\$ 155.17	\$ 186.83	1.095	\$ 204.58	0.97
1.000	D2013 450 0060	Replace laundry sink ,plastic	20	2 Plum	Ea.	\$ 550.43	\$ 667.78	1.095	\$ 731.22	0.97
1.000	D2013 550 0070	Replace bathtub, fiberglass	20	2 Plum	Ea.	\$ 1,276.00	\$ 1,514.00	1.095	\$ 1,657.83	0.97
1.000	D2013 750 0060	Replace shower and fittings, fiberglass	20	2 Plum	Ea.	\$ 1,027.00	\$ 1,220.00	1.095	\$ 1,335.90	0.97
1.000	D2013 770 0120	Replace shower, C.M.U.	20	D8	Ea.	\$ 878.00	\$ 1,061.00	1.095	\$ 1,161.80	0.97
1.000	D2023 110 0020	Replace pipe and fittings, copper 3/4"	20	2 Plum	L.F.	\$ 20.23	\$ 24.60	1.095	\$ 26.94	0.97
1.000	D2023 130 1020	Install 10' section PVC 1" diameter solar piping	20	1 Plum	Ea.	\$ 299.40	\$ 370.75	1.095	\$ 405.97	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor PER 12 YR	TOTAL with Green Factor	De-Escalation Factor PER 12 YR	Total Green with All Adjustments
1.000	D2023 320 0010	Overhaul water meter	\$ 41.97	1.15	\$ 49.74	0.97	\$ 48.27
			\$ 41.97				\$ 48.27
			\$ 41.97	Assumed 100%		Assumed 100%	\$ 48.27
				PER 12 YR		PER 12 YR	
1.000	D2013 130 0030	Replace valve and ball cock assembly flush-tank water closet	\$ 109.23	1.15	\$ 129.44	0.97	\$ 125.61
1.000	D2013 440 0060	Replace sink and fittings, polyethylene sink, plastic	\$ 2,419.61	1.15	\$ 2,867.31	0.97	\$ 2,782.55
1.000	D2023 160 0020	Remove old insulation & replace with new, pipe 1/2", wall 1"	\$ 9.46	1.15	\$ 11.21	0.97	\$ 10.88
1.000	D2023 160 0030	Remove old insulation & replace with new, pipe 3/4", wall 1"	\$ 9.83	1.15	\$ 11.65	0.97	\$ 11.30
1.000	D2023 160 0040	Remove old insulation & replace with new, pipe 1-1/2", wall 1"	\$ 10.79	1.15	\$ 12.78	0.97	\$ 12.40
1.000	D2023 160 0050	Remove old insulation & replace with new, pipe 1/2", wall 3/4"	\$ 12.54	1.15	\$ 14.86	0.97	\$ 14.42
1.000	D2023 160 0060	Remove old insulation & replace with new, pipe 3/4", wall 3/4"	\$ 12.86	1.15	\$ 15.24	0.97	\$ 14.79
1.000	D2023 160 0070	Remove old insulation & replace with new, pipe 1-1/2", wall 3/4"	\$ 14.29	1.15	\$ 16.94	0.97	\$ 16.44
1.000	D2023 220 0030	Replace water heater, electric, 120 gallon	\$ 11,316.99	1.15	\$ 13,411.01	0.97	\$ 13,014.54
1.000	D2023 222 0030	Replace water heater, electric, 300 gallon	\$ 46,521.88	1.15	\$ 55,129.97	0.97	\$ 53,500.16
1.000	D2023 224 0030	Replace water heater, electric, 1000 gallon	\$ 104,323.55	1.15	\$ 123,626.87	0.97	\$ 119,972.09
1.000	D2023 226 0030	Replace water heater, electric, 2000 gallon	\$ 150,202.54	1.15	\$ 177,994.99	0.97	\$ 172,732.92
1.000	D2023 370 0030	Replace water softener	\$ 1,657.70	1.15	\$ 1,964.43	0.97	\$ 1,906.36
			\$ 316,621.26				\$ 364,114.44
			\$ 316,621.26	Assumed 100%		Assumed 100%	\$ 364,114.44
				PER 15 YR		PER 15 YR	
1.000	D2013 110 0015	Rebuild flush valve tankless water closet	\$ 198.53	1.15	\$ 235.27	0.97	\$ 228.31
1.000	D2013 130 0040	Install gasket between tank and bowl flush-tank water closet	\$ 45.93	1.15	\$ 54.42	0.97	\$ 52.82
1.000	D2013 210 0015	Rebuild flush valve urinal	\$ 198.53	1.15	\$ 235.27	0.97	\$ 228.31
1.000	D2013 450 0060	Replace laundry sink ,plastic	\$ 709.60	1.15	\$ 840.90	0.97	\$ 816.04
1.000	D2013 550 0070	Replace bathtub, fiberglass	\$ 1,608.82	1.15	\$ 1,906.50	0.97	\$ 1,850.14
1.000	D2013 750 0060	Replace shower and fittings, fiberglass	\$ 1,296.41	1.15	\$ 1,536.29	0.97	\$ 1,490.87
1.000	D2013 770 0120	Replace shower, C.M.U.	\$ 1,127.45	1.15	\$ 1,336.06	0.97	\$ 1,296.57
1.000	D2023 110 0020	Replace pipe and fittings, copper 3/4"	\$ 26.14	1.15	\$ 30.98	0.97	\$ 30.06
1.000	D2023 130 1020	Install 10' section PVC 1" diameter solar piping	\$ 393.97	1.15	\$ 466.87	0.97	\$ 453.06

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.15	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2023 130 1120	Install 10' PVC 1-1/4" diameter solar piping	20	1 Plum	Ea.	\$ 331.40	\$ 411.75	1.095	\$ 450.87	0.97
1.000	D2023 130 1220	Install 10' PVC 1-1/2" diameter solar piping	20	1 Plum	Ea.	\$ 384.40	\$ 478.75	1.095	\$ 524.23	0.97
1.000	D2023 130 1320	Install 10' section PVC 2" diameter solar piping	20	Q1	Ea.	\$ 428.40	\$ 524.75	1.095	\$ 574.60	0.97
1.000	D2023 214 0030	Replace water heater, gas / oil, 1150 GPH	20	2 Plum	Ea.	\$ 31,800.00	\$ 36,700.00	1.095	\$ 40,186.50	0.97
1.000	D2023 230 0030	Replace steam converter	20	2 Plum	Ea.	\$ 2,212.00	\$ 2,540.00	1.095	\$ 2,781.30	0.97
1.000	D2023 245 0010	Replace 1000 gallon solar storage tank	20	Q9	Ea.	\$ 6,895.00	\$ 7,980.00	1.095	\$ 8,738.10	0.97
1.000	D2023 261 0030	Replace pump / motor assembly circulation pump, 1/8 HP	20	2 Plum	Ea.	\$ 1,251.00	\$ 1,451.00	1.095	\$ 1,588.85	0.97
1.000	D2023 262 0030	Replace pump / motor assembly circulation pump, 1/6 HP	20	2 Plum	Ea.	\$ 1,509.00	\$ 1,743.00	1.095	\$ 1,908.59	0.97
1.000	D2023 264 0030	Replace pump / motor assembly, partial circulation pump, 1/2 HP	20	2 Plum	Ea.	\$ 2,651.00	\$ 3,064.00	1.095	\$ 3,355.08	0.97
1.000	D2023 266 0040	Replace pump / motor assembly circulation pump, bronze 1 HP	20	2 Plum	Ea.	\$ 4,351.00	\$ 5,014.00	1.095	\$ 5,490.33	0.97
1.000	D2023 267 0040	Replace pump / motor assembly circulation pump, CI 1-1/2 HP	20	2 Plum	Ea.	\$ 2,251.00	\$ 2,589.00	1.095	\$ 2,834.96	0.97
1.000	D2033 130 0010	Unclog floor drain, PVC	20	1 Plum	Ea.	\$ 42.00	\$ 52.50	1.095	\$ 57.49	0.97
1.000	D2043 110 1020	Replace pipe or gutter distribution	20	1 Plum	L.F.	\$ 53.10	\$ 64.75	1.095	\$ 70.90	0.97
1.000	D2043 310 1030	Replace rainwater sump pump / motor assembly	20	2 Plum	Ea.	\$ 479.00	\$ 570.00	1.095	\$ 624.15	0.97

1.000	D2013 110 0040	Replace tankless flush valve	25	1 Plum	Ea.	\$ 262.67	\$ 306.83	1.095	\$ 335.98	0.97
1.000	D2013 770 0060	Replace shower and fittings, aluminum	25	2 Plum	Ea.	\$ 1,027.00	\$ 1,220.00	1.095	\$ 1,335.90	0.97
1.000	D2013 770 0200	Replace shower, glazed C.M.U.	25	D8	Ea.	\$ 1,398.00	\$ 1,673.00	1.095	\$ 1,831.94	0.97
1.000	D2013 910 0030	Replace shower emergency shower station	25	2 Plum	Ea.	\$ 826.00	\$ 989.00	1.095	\$ 1,082.96	0.97
1.000	D2013 920 0030	Replace eye wash station, emergency eye wash	25	2 Plum	Ea.	\$ 871.00	\$ 1,039.00	1.095	\$ 1,137.71	0.97
1.000	D2023 110 0030	Replace pipe and fittings, copper 1"	25	2 Plum	L.F.	\$ 23.58	\$ 28.35	1.095	\$ 31.04	0.97
1.000	D2023 110 0050	Replace pipe and fittings, copper 1-1/2"	25	2 Plum	L.F.	\$ 34.20	\$ 41.40	1.095	\$ 45.33	0.97
1.000	D2023 110 0060	Replace pipe and fittings, copper 2"	25	2 Plum	L.F.	\$ 47.40	\$ 56.50	1.095	\$ 61.87	0.97
1.000	D2023 110 0070	Replace pipe and fittings, copper 4"	25	2 Plum	L.F.	\$ 127.90	\$ 150.90	1.095	\$ 165.24	0.97
1.000	D2023 110 0080	Replace pipe and fittings, copper 8"	25	2 Plum	L.F.	\$ 657.00	\$ 757.00	1.095	\$ 828.92	0.97
1.000	D2023 120 0010	Install new gasket, 4" pipe size, steel/iron	25	1 Plum	Ea.	\$ 169.50	\$ 210.50	1.095	\$ 230.50	0.97
1.000	D2023 320 0020	Remove old meter, install new water meter 5/8"	25	1 Plum	Ea.	\$ 109.00	\$ 131.00	1.095	\$ 143.45	0.97
1.000	D2023 320 0025	Remove old meter, install new water meter 3/4"	25	1 Plum	Ea.	\$ 156.00	\$ 186.00	1.095	\$ 203.67	0.97
1.000	D2023 320 0030	Remove old meter, install new water meter 1"	25	1 Plum	Ea.	\$ 212.00	\$ 250.00	1.095	\$ 273.75	0.97
1.000	D2023 320 0035	Remove old meter, install new water meter 1-1/2"	25	1 Plum	Ea.	\$ 437.00	\$ 512.50	1.095	\$ 561.19	0.97
1.000	D2023 320 0040	Remove old meter, install new water meter 2"	25	1 Plum	Ea.	\$ 591.00	\$ 690.00	1.095	\$ 755.55	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2023 130 1120	Install 10' PVC 1-1/4" diameter solar piping	\$ 437.54	1.15	\$ 518.50	0.97	\$ 503.17
1.000	D2023 130 1220	Install 10' PVC 1-1/2" diameter solar piping	\$ 508.73	1.15	\$ 602.87	0.97	\$ 585.04
1.000	D2023 130 1320	Install 10' section PVC 2" diameter solar piping	\$ 557.61	1.15	\$ 660.79	0.97	\$ 641.26
1.000	D2023 214 0030	Replace water heater, gas / oil, 1150 GPH	\$ 38,998.47	1.15	\$ 46,214.48	0.97	\$ 44,848.24
1.000	D2023 230 0030	Replace steam converter	\$ 2,699.08	1.15	\$ 3,198.50	0.97	\$ 3,103.94
1.000	D2023 245 0010	Replace 1000 gallon solar storage tank	\$ 8,479.78	1.15	\$ 10,048.82	0.97	\$ 9,751.74
1.000	D2023 261 0030	Replace pump / motor assembly circulation pump, 1/8 HP	\$ 1,541.87	1.15	\$ 1,827.17	0.97	\$ 1,773.16
1.000	D2023 262 0030	Replace pump / motor assembly circulation pump, 1/6 HP	\$ 1,852.16	1.15	\$ 2,194.87	0.97	\$ 2,129.99
1.000	D2023 264 0030	Replace pump / motor assembly, partial circulation pump, 1/2 HP	\$ 3,255.89	1.15	\$ 3,858.34	0.97	\$ 3,744.28
1.000	D2023 266 0040	Replace pump / motor assembly circulation pump, bronze 1 HP	\$ 5,328.02	1.15	\$ 6,313.88	0.97	\$ 6,127.22
1.000	D2023 267 0040	Replace pump / motor assembly circulation pump, CI 1-1/2 HP	\$ 2,751.15	1.15	\$ 3,260.20	0.97	\$ 3,163.82
1.000	D2033 130 0010	Unclog floor drain, PVC	\$ 55.79	1.15	\$ 66.11	0.97	\$ 64.16
1.000	D2043 110 1020	Replace pipe or gutter distribution	\$ 68.81	1.15	\$ 81.54	0.97	\$ 79.13
1.000	D2043 310 1030	Replace rainwater sump pump / motor assembly	\$ 605.70	1.15	\$ 717.77	0.97	\$ 696.55
			\$ 72,745.96				\$ 83,657.86
			\$ 72,745.96	Assumed 100%		Assumed 100%	\$ 83,657.86
				PER 20 YR		PER 20 YR	
1.000	D2013 110 0040	Replace tankless flush valve	\$ 326.05	1.15	\$ 386.38	0.97	\$ 374.95
1.000	D2013 770 0060	Replace shower and fittings, aluminum	\$ 1,296.41	1.15	\$ 1,536.29	0.97	\$ 1,490.87
1.000	D2013 770 0200	Replace shower, glazed C.M.U.	\$ 1,777.78	1.15	\$ 2,106.73	0.97	\$ 2,044.44
1.000	D2013 910 0030	Replace shower emergency shower station	\$ 1,050.94	1.15	\$ 1,245.40	0.97	\$ 1,208.58
1.000	D2013 920 0030	Replace eye wash station, emergency eye wash	\$ 1,104.07	1.15	\$ 1,308.36	0.97	\$ 1,269.68
1.000	D2023 110 0030	Replace pipe and fittings, copper 1"	\$ 30.13	1.15	\$ 35.70	0.97	\$ 34.64
1.000	D2023 110 0050	Replace pipe and fittings, copper 1-1/2"	\$ 43.99	1.15	\$ 52.13	0.97	\$ 50.59
1.000	D2023 110 0060	Replace pipe and fittings, copper 2"	\$ 60.04	1.15	\$ 71.15	0.97	\$ 69.04
1.000	D2023 110 0070	Replace pipe and fittings, copper 4"	\$ 160.35	1.15	\$ 190.02	0.97	\$ 184.40
1.000	D2023 110 0080	Replace pipe and fittings, copper 8"	\$ 804.41	1.15	\$ 953.25	0.97	\$ 925.07
1.000	D2023 120 0010	Install new gasket, 4" pipe size, steel/iron	\$ 223.68	1.15	\$ 265.07	0.97	\$ 257.24
1.000	D2023 320 0020	Remove old meter, install new water meter 5/8"	\$ 139.20	1.15	\$ 164.96	0.97	\$ 160.08
1.000	D2023 320 0025	Remove old meter, install new water meter 3/4"	\$ 197.65	1.15	\$ 234.22	0.97	\$ 227.30
1.000	D2023 320 0030	Remove old meter, install new water meter 1"	\$ 265.66	1.15	\$ 314.81	0.97	\$ 305.51
1.000	D2023 320 0035	Remove old meter, install new water meter 1-1/2"	\$ 544.60	1.15	\$ 645.37	0.97	\$ 626.29
1.000	D2023 320 0040	Remove old meter, install new water meter 2"	\$ 733.21	1.15	\$ 868.88	0.97	\$ 843.20

Costs Reflect National Averages										
Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.15	Assumed Value							NON GREEN	
Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2023 320 0045	Remove old meter, install new water meter 3"	25	Q1	Ea.	\$ 3,501.00	\$ 4,027.00	1.095	\$ 4,409.57	0.97
1.000	D2023 320 0050	Remove old meter, install new water meter 4"	25	Q1	Ea.	\$ 5,825.00	\$ 6,755.00	1.095	\$ 7,396.73	0.97
1.000	D2023 320 0055	Remove old meter, install new water meter 6"	25	Q1	Ea.	\$ 9,155.00	\$ 10,605.00	1.095	\$ 11,612.48	0.97
1.000	D2023 320 0060	Remove old meter, install new water meter 8"	25	Q1	Ea.	\$ 13,855.00	\$ 15,945.00	1.095	\$ 17,459.78	0.97
1.000	D2093 920 1030	Replace pipe and fittings, anesthesia	25	2 Plum	L.F.	\$ 20.12	\$ 24.45	1.095	\$ 26.77	0.97
1.000	D2093 930 1030	Replace pipe and fittings, oxygen	25	2 Plum	L.F.	\$ 20.12	\$ 24.45	1.095	\$ 26.77	0.97
1.000	D2093 946 1030	Replace 2 H.P. compressor	25	2 Plum	Ea.	\$ 4,567.00	\$ 5,285.00	1.095	\$ 5,787.08	0.97
1.000	D2093 946 3030	Replace 10 H.P. compressor	25	2 Plum	Ea.	\$ 9,525.00	\$ 11,150.00	1.095	\$ 12,209.25	0.97
1.000	D2093 946 4030	Replace 25 H.P. compressor	25	2 Plum	Ea.	\$ 18,150.00	\$ 21,250.00	1.095	\$ 23,268.75	0.97
1.000	D2013 710 0060	Replace terrazzo shower surface	30	2 Plum	Ea.	\$ 1,102.00	\$ 1,322.00	1.095	\$ 1,447.59	0.97
1.000	D2013 770 0280	Replace shower surface, ceramic tile	30	D7	Ea.	\$ 757.00	\$ 923.00	1.095	\$ 1,010.69	0.97
1.000	D2023 130 2030	Replace 1000' PVC pipe 1" diameter solar piping	30	1 Plum	M.L.F.	\$ 24,840.00	\$ 30,775.00	1.095	\$ 33,698.63	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2023 320 0045	Remove old meter, install new water meter 3"	\$ 4,279.20	1.15	\$ 5,071.00	0.97	\$ 4,921.09
1.000	D2023 320 0050	Remove old meter, install new water meter 4"	\$ 7,178.06	1.15	\$ 8,506.23	0.97	\$ 8,254.76
1.000	D2023 320 0055	Remove old meter, install new water meter 6"	\$ 11,269.18	1.15	\$ 13,354.35	0.97	\$ 12,959.55
1.000	D2023 320 0060	Remove old meter, install new water meter 8"	\$ 16,943.61	1.15	\$ 20,078.74	0.97	\$ 19,485.15
1.000	D2093 920 1030	Replace pipe and fittings, anesthesia	\$ 25.98	1.15	\$ 30.79	0.97	\$ 29.88
1.000	D2093 930 1030	Replace pipe and fittings, oxygen	\$ 25.98	1.15	\$ 30.79	0.97	\$ 29.88
1.000	D2093 946 1030	Replace 2 H.P. compressor	\$ 5,615.99	1.15	\$ 6,655.14	0.97	\$ 6,458.39
1.000	D2093 946 3030	Replace 10 H.P. compressor	\$ 11,848.31	1.15	\$ 14,040.64	0.97	\$ 13,625.55
1.000	D2093 946 4030	Replace 25 H.P. compressor	\$ 22,580.86	1.15	\$ 26,759.06	0.97	\$ 25,967.98
			\$ 88,525.33				\$ 101,804.13
			\$ 88,525.33	Assumed 100%		Assumed 100%	\$ 101,804.13
				PER 25 YR		PER 25 YR	
1.000	D2013 710 0060	Replace terrazzo shower surface	\$ 1,404.79	1.15	\$ 1,664.73	0.97	\$ 1,615.51
1.000	D2013 770 0280	Replace shower surface, ceramic tile	\$ 980.81	1.15	\$ 1,162.29	0.97	\$ 1,127.93
1.000	D2023 130 2030	Replace 1000' PVC pipe 1" diameter solar piping	\$ 32,702.39	1.15	\$ 38,753.42	0.97	\$ 37,607.75

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.15	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2023 130 2130	Replace 1000' PVC pipe 1-1/4" diameter solar piping	30	1 Plum	M.L.F.	\$ 27,540.00	\$ 34,075.00	1.095	\$ 37,312.13	0.97
1.000	D2023 130 2230	Replace 1000' PVC pipe 1-1/2" diameter solar piping	30	1 Plum	M.L.F.	\$ 31,840.00	\$ 39,575.00	1.095	\$ 43,334.63	0.97
1.000	D2023 130 2330	Replace 1000' PVC pipe 2" diameter solar piping	30	Q1	M.L.F.	\$ 35,340.00	\$ 43,375.00	1.095	\$ 47,495.63	0.97
1.000	D2033 130 0060	Replace pipe, 1-1/2" pipe and fittings, PVC	30	2 Plum	L.F.	\$ 51.75	\$ 64.40	1.095	\$ 70.52	0.97
1.000	D2033 130 0080	Replace pipe, 2" pipe and fittings, PVC	30	2 Plum	L.F.	\$ 55.75	\$ 69.30	1.095	\$ 75.88	0.97
1.000	D2033 130 0100	Replace pipe, 4" pipe and fittings, PVC	30	2 Plum	L.F.	\$ 69.10	\$ 85.75	1.095	\$ 93.90	0.97
1.000	D2033 130 0120	Replace pipe, 6" pipe and fittings, PVC	30	2 Plum	L.F.	\$ 90.00	\$ 110.85	1.095	\$ 121.38	0.97
1.000	D2033 130 0140	Replace pipe, 8" pipe and fittings, PVC	30	2 Plum	L.F.	\$ 108.05	\$ 132.50	1.095	\$ 145.09	0.97
1.000	D2013 110 0030	Replace tankless water closet	35	2 Plum	Ea.	\$ 541.32	\$ 637.99	1.095	\$ 698.60	0.97
1.000	D2013 130 0050	Replace two piece water closet flush-tank	35	2 Plum	Ea.	\$ 526.01	\$ 622.39	1.095	\$ 681.52	0.97
1.000	D2013 130 0060	Replace one piece water closet flush-tank	35	2 Plum	Ea.	\$ 866.01	\$ 1,012.39	1.095	\$ 1,108.57	0.97
1.000	D2013 210 0030	Replace wall-hung urinal	35	2 Plum	Ea.	\$ 843.02	\$ 1,016.39	1.095	\$ 1,112.95	0.97
1.000	D2013 330 0060	Replace lavatory, vitreous china	35	2 Plum	Ea.	\$ 613.43	\$ 731.78	1.095	\$ 801.30	0.97
1.000	D2013 350 0060	Replace lavatory lavatory, enameled steel	35	2 Plum	Ea.	\$ 593.43	\$ 721.78	1.095	\$ 790.35	0.97
1.000	D2013 410 0060	Replace sink, P.E.C.I. sink, iron enamel	35	2 Plum	Ea.	\$ 759.50	\$ 893.00	1.095	\$ 977.84	0.97
1.000	D2013 420 0060	Replace sink, enameled steel	35	2 Plum	Ea.	\$ 519.00	\$ 625.00	1.095	\$ 684.38	0.97
1.000	D2013 460 0060	Replace sink, P.E.C.I.	35	1 Plum	Ea.	\$ 1,094.50	\$ 1,293.00	1.095	\$ 1,415.84	0.97
1.000	D2013 530 0070	Replace tub bathtub, enameled steel	35	2 Plum	Ea.	\$ 755.00	\$ 892.00	1.095	\$ 976.74	0.97
1.000	D2013 730 0060	Replace shower, enameled steel	35	2 Plum	Ea.	\$ 1,525.00	\$ 1,800.00	1.095	\$ 1,971.00	0.97
1.000	D2013 310 0060	Replace lavatory, iron, enamel	40	2 Plum	Ea.	\$ 657.93	\$ 771.28	1.095	\$ 844.55	0.97
1.000	D2013 430 0060	Replace sink, stainless steel	40	2 Plum	Ea.	\$ 984.50	\$ 1,168.00	1.095	\$ 1,278.96	0.97
1.000	D2013 510 0070	Replace tub bathtub, cast iron enamel	40	2 Plum	Ea.	\$ 1,360.00	\$ 1,587.00	1.095	\$ 1,737.77	0.97
1.000	D2033 110 0030	Replace pipe & fittings, cast iron	40	2 Plum	L.F.	\$ 47.45	\$ 57.70	1.095	\$ 63.18	0.97
1.000	D2033 310 0030	Replace floor drain w/o bucket	40	1 Plum	Ea.	\$ 1,027.00	\$ 1,184.00	1.095	\$ 1,296.48	0.97
1.000	D2033 330 0030	Replace floor drain with bucket	40	1 Plum	Ea.	\$ 1,027.00	\$ 1,184.00	1.095	\$ 1,296.48	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2023 130 2130	Replace 1000' PVC pipe 1-1/4" diameter solar piping	\$ 36,209.07	1.15	\$ 42,908.94	0.97	\$ 41,640.43
1.000	D2023 130 2230	Replace 1000' PVC pipe 1-1/2" diameter solar piping	\$ 42,053.52	1.15	\$ 49,834.82	0.97	\$ 48,361.55
1.000	D2023 130 2330	Replace 1000' PVC pipe 2" diameter solar piping	\$ 46,091.51	1.15	\$ 54,619.97	0.97	\$ 53,005.24
1.000	D2033 130 0060	Replace pipe, 1-1/2" pipe and fittings, PVC	\$ 68.43	1.15	\$ 81.10	0.97	\$ 78.70
1.000	D2033 130 0080	Replace pipe, 2" pipe and fittings, PVC	\$ 73.64	1.15	\$ 87.27	0.97	\$ 84.69
1.000	D2033 130 0100	Replace pipe, 4" pipe and fittings, PVC	\$ 91.12	1.15	\$ 107.98	0.97	\$ 104.79
1.000	D2033 130 0120	Replace pipe, 6" pipe and fittings, PVC	\$ 117.79	1.15	\$ 139.59	0.97	\$ 135.46
1.000	D2033 130 0140	Replace pipe, 8" pipe and fittings, PVC	\$ 140.80	1.15	\$ 166.85	0.97	\$ 161.92
			\$ 159,933.88				\$ 183,923.96
			\$ 159,933.88	Assumed 100%		Assumed 100%	\$ 183,923.96
				PER 25 YR		PER 25 YR	
1.000	D2013 110 0030	Replace tankless water closet	\$ 677.95	1.15	\$ 803.39	0.97	\$ 779.64
1.000	D2013 130 0050	Replace two piece water closet flush-tank	\$ 661.37	1.15	\$ 783.74	0.97	\$ 760.57
1.000	D2013 130 0060	Replace one piece water closet flush-tank	\$ 1,075.79	1.15	\$ 1,274.85	0.97	\$ 1,237.16
1.000	D2013 210 0030	Replace wall-hung urinal	\$ 1,080.04	1.15	\$ 1,279.89	0.97	\$ 1,242.05
1.000	D2013 330 0060	Replace lavatory, vitreous china	\$ 777.61	1.15	\$ 921.49	0.97	\$ 894.25
1.000	D2013 350 0060	Replace lavatory lavatory, enameled steel	\$ 766.98	1.15	\$ 908.90	0.97	\$ 882.03
1.000	D2013 410 0060	Replace sink, P.E.C.I. sink, iron enamel	\$ 948.93	1.15	\$ 1,124.51	0.97	\$ 1,091.27
1.000	D2013 420 0060	Replace sink, enameled steel	\$ 664.14	1.15	\$ 787.03	0.97	\$ 763.76
1.000	D2013 460 0060	Replace sink, P.E.C.I.	\$ 1,373.98	1.15	\$ 1,628.21	0.97	\$ 1,580.08
1.000	D2013 530 0070	Replace tub bathtub, enameled steel	\$ 947.86	1.15	\$ 1,123.25	0.97	\$ 1,090.04
1.000	D2013 730 0060	Replace shower, enameled steel	\$ 1,912.73	1.15	\$ 2,266.65	0.97	\$ 2,199.64
			\$ 10,887.39				\$ 12,520.50
			\$ 10,887.39	Assumed 100%		Assumed 100%	\$ 12,520.50
				PER 25 YR		PER 25 YR	
1.000	D2013 310 0060	Replace lavatory, iron, enamel	\$ 819.58	1.15	\$ 971.23	0.97	\$ 942.52
1.000	D2013 430 0060	Replace sink, stainless steel	\$ 1,241.15	1.15	\$ 1,470.80	0.97	\$ 1,427.32
1.000	D2013 510 0070	Replace tub bathtub, cast iron enamel	\$ 1,686.39	1.15	\$ 1,998.43	0.97	\$ 1,939.35
1.000	D2033 110 0030	Replace pipe & fittings, cast iron	\$ 61.31	1.15	\$ 72.66	0.97	\$ 70.51
1.000	D2033 310 0030	Replace floor drain w/o bucket	\$ 1,258.15	1.15	\$ 1,490.95	0.97	\$ 1,446.87
1.000	D2033 330 0030	Replace floor drain with bucket	\$ 1,258.15	1.15	\$ 1,490.95	0.97	\$ 1,446.87

Costs Reflect National Averages										
Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.15	Assumed Value								NON GREEN
Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2043 210 1020	Replace drain: roof, scupper, area	40	1 Plum	Ea.	\$ 481.50	\$ 563.00	1.095	\$ 616.49	0.97
1.000	D2023 240 0020	Replace storage tank, glass lined, P.E., 80 gal.	50	2 Plum	Ea.	\$ 2,962.50	\$ 3,396.50	1.095	\$ 3,719.17	0.97
FOOTNOTES:										
1										
RS Means CostWorks 2010 Operations and Maintenance										

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.15	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2043 210 1020	Replace drain: roof, scupper, area	\$ 598.26	1.15	\$ 708.96	0.97	\$ 688.00
			\$ 6,923.00				\$ 7,961.45
			\$ 6,923.00	Assumed 100%		Assumed 100%	\$ 7,961.45
				PER 40 YR		PER 40 YR	
1.000	D2023 240 0020	Replace storage tank, glass lined, P.E., 80 gal.	\$ 3,609.22	1.15	\$ 4,277.04	0.97	\$ 4,150.60
			\$ 3,609.22				\$ 4,150.60
			\$ 3,609.22	Assumed 100%		Assumed 100%	\$ 4,150.60
				PER 50 YR		PER 50 YR	
FOOTNOTES:							
1							
RS Means CostWorks 2010 Operations and Maintenance							

Appendix C-SW6 15% GF Summary of FMRRC

Summary of Green versus Non-Green Major Repair and Replacement Costs based on Frequency (Plumbing) 15% GF			
Type of Construction	Description	TOTAL COST	COMMENTS
Non-Green	Up to 10 Years	\$ 40,323.45	
Non-Green	10 th yr on till 25 th Year	\$ 652,014.66	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
Non-Green	25 th yr on till 50 th Year	\$ 10,532.22	
Green	Up to 10 Years	\$ 46,371.96	
Green	10 th yr on till 25 th Year	\$ 749,816.86	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
Green	25 th yr on till 50 th Year	\$ 12,112.05	
SUMMARY OF FINDINGS			
Green v. Non-Green	13.04%	Green Major Repair and Replacement is 13.04% higher in cost than that of a traditional building	

Appendix C-SW7 10% GF Analysis of YPM

PLUMBING PREVENTATIVE MAINTENANCE¹
Annualized Items-10% GF
CostWorks 2010
National Averages Adjusted to Reflect East Hall Location

Escalation	6%										
De-Escalation to July 2009	1.03										
De-Escalation Factor to be Applied	0.97										
Green Factor	1.10	Assumed Value									

Qty	Assembly #	Description	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Release	Location Adjustment
1.000	D2015 100 0000	Facility Plumbing Fixture Service									
1.000	D2015 100 1950	Urinals, annualized	0.23	\$ -	\$ 11.85	\$ -	\$ 11.85	\$ 14.70	\$ 18.40	2010	1.095
1.000	D2015 100 2950	Toilet (vacuum breaker type), annualized	0.23	\$ -	\$ 11.85	\$ -	\$ 11.85	\$ 14.70	\$ 18.40	2010	1.095
1.000	D2015 100 3950	Toilet (tank type), annualized	0.39	\$ -	\$ 20.00	\$ -	\$ 20.00	\$ 25.00	\$ 31.50	2010	1.095
1.000	D2015 100 4950	Lavatories, annualized	0.35	\$ 6.25	\$ 14.85	\$ -	\$ 21.10	\$ 26.50	\$ 32.00	2010	1.095
1.000	D2015 100 5950	Showers, annualized	0.23	\$ 7.50	\$ 9.70	\$ -	\$ 17.20	\$ 21.00	\$ 25.00	2010	1.095
1.000	D2015 800 0000	Drinking Fountain									
1.000	D2015 800 1950	Drink fountain, annualized	0.62	\$ 15.95	\$ 26.50	\$ -	\$ 42.45	\$ 52.00	\$ 62.50	2010	1.095
1.000	D2025 120 0000	Valve, Butterfly									
1.000	D2025 120 1950	Valve, butterfly, above 4", annualized	0.17	\$ 7.10	\$ 7.05	\$ -	\$ 14.15	\$ 17.05	\$ 20.50	2010	1.095
1.000	D2025 120 2950	Valve, butterfly, auto, above 4", annualized	0.35	\$ 7.10	\$ 14.80	\$ -	\$ 21.90	\$ 27.00	\$ 33.00	2010	1.095
1.000	D2025 125 0000	Valve, Check									
1.000	D2025 125 1950	Valve, check, above 4", annualized	0.26	\$ 7.10	\$ 10.95	\$ -	\$ 18.05	\$ 22.00	\$ 26.50	2010	1.095
1.000	D2025 130 0000	Valve, Cock									
1.000	D2025 130 1950	Valve, ball, above 4", annualized	0.17	\$ 7.10	\$ 7.05	\$ -	\$ 14.15	\$ 17.05	\$ 20.50	2010	1.095
1.000	D2025 135 0000	Valve, Diaphragm									
1.000	D2025 135 1950	Valve, diaphragm, above 4", annualized	0.12	\$ 7.10	\$ 5.20	\$ -	\$ 12.30	\$ 14.60	\$ 17.30	2010	1.095
1.000	D2025 140 0000	Valve, Gate									
1.000	D2025 140 1950	Valve, gate, above 4", annualized	0.16	\$ 7.10	\$ 6.75	\$ -	\$ 13.85	\$ 16.65	\$ 19.85	2010	1.095
1.000	D2025 145 0000	Valve, Globe									
1.000	D2025 145 1950	Valve, globe, above 4", annualized	0.16	\$ 7.10	\$ 6.75	\$ -	\$ 13.85	\$ 16.65	\$ 19.85	2010	1.095
1.000	D2025 145 2950	Valve, globe, auto, above 4", annualized	0.33	\$ 7.10	\$ 13.85	\$ -	\$ 20.95	\$ 26.00	\$ 31.50	2010	1.095
1.000	D2025 150 0000	Valve, Motor Operated									
1.000	D2025 150 1950	Valve, motor operated, above 4", annualized	1.00	\$ 14.15	\$ 42.50	\$ -	\$ 56.65	\$ 71.50	\$ 86.50	2010	1.095
1.000	D2025 155 0000	Valve, OS&Y									
1.000	D2025 155 1950	Valve, OS&Y, above 4", annualized	0.16	\$ 7.10	\$ 6.75	\$ -	\$ 13.85	\$ 16.65	\$ 19.85	2010	1.095

PLUMBING PREVENTATIVE MAINTENANCE¹
Annualized Items-10% GF
CostWorks 2010
National Averages Adjusted to Reflect East Hall Location

Escalation	6%								
De-Escalation to July 2009	1.03								
De-Escalation Factor to be Applied	0.97								
Green Factor	1.10	Assumed Value							

Qty	Assembly #	Description	Total Adjusted	De-Escalation Factor to July 2009	Total Non-Green	Green Factor	Total Adjusted Green Factor	De-Escalation Factor to July 2009	Total with All Adjustments
1.000	D2015 100 0000	Facility Plumbing Fixture Service							
1.000	D2015 100 1950	Urinals, annualized	\$ 20.15	0.97	\$ 19.55	1.10	\$ 22.16	0.97	\$ 21.51
1.000	D2015 100 2950	Toilet (vacuum breaker type), annualized	\$ 20.15	0.97	\$ 19.55	1.10	\$ 22.16	0.97	\$ 21.51
1.000	D2015 100 3950	Toilet (tank type), annualized	\$ 34.49	0.97	\$ 33.47	1.10	\$ 37.94	0.97	\$ 36.82
1.000	D2015 100 4950	Lavatories, annualized	\$ 35.04	0.97	\$ 34.00	1.10	\$ 38.54	0.97	\$ 37.40
1.000	D2015 100 5950	Showers, annualized	\$ 27.38	0.97	\$ 26.57	1.10	\$ 30.11	0.97	\$ 29.22
1.000	D2015 800 0000	Drinking Fountain							
1.000	D2015 800 1950	Drink fountain, annualized	\$ 68.44	0.97	\$ 66.41	1.10	\$ 75.28	0.97	\$ 73.06
1.000	D2025 120 0000	Valve, Butterfly							
1.000	D2025 120 1950	Valve, butterfly, above 4", annualized	\$ 22.45	0.97	\$ 21.78	1.10	\$ 24.69	0.97	\$ 23.96
1.000	D2025 120 2950	Valve, butterfly, auto, above 4", annualized	\$ 36.14	0.97	\$ 35.07	1.10	\$ 39.75	0.97	\$ 38.57
1.000	D2025 125 0000	Valve, Check							
1.000	D2025 125 1950	Valve, check, above 4", annualized	\$ 29.02	0.97	\$ 28.16	1.10	\$ 31.92	0.97	\$ 30.98
1.000	D2025 130 0000	Valve, Cock							
1.000	D2025 130 1950	Valve, ball, above 4", annualized	\$ 22.45	0.97	\$ 21.78	1.10	\$ 24.69	0.97	\$ 23.96
1.000	D2025 135 0000	Valve, Diaphragm							
1.000	D2025 135 1950	Valve, diaphragm, above 4", annualized	\$ 18.94	0.97	\$ 18.38	1.10	\$ 20.84	0.97	\$ 20.22
1.000	D2025 140 0000	Valve, Gate							
1.000	D2025 140 1950	Valve, gate, above 4", annualized	\$ 21.74	0.97	\$ 21.09	1.10	\$ 23.91	0.97	\$ 23.20
1.000	D2025 145 0000	Valve, Globe							
1.000	D2025 145 1950	Valve, globe, above 4", annualized	\$ 21.74	0.97	\$ 21.09	1.10	\$ 23.91	0.97	\$ 23.20
1.000	D2025 145 2950	Valve, globe, auto, above 4", annualized	\$ 34.49	0.97	\$ 33.47	1.10	\$ 37.94	0.97	\$ 36.82
1.000	D2025 150 0000	Valve, Motor Operated							
1.000	D2025 150 1950	Valve, motor operated, above 4", annualized	\$ 94.72	0.97	\$ 91.92	1.10	\$ 104.19	0.97	\$ 101.11
1.000	D2025 155 0000	Valve, OS&Y							
1.000	D2025 155 1950	Valve, OS&Y, above 4", annualized	\$ 21.74	0.97	\$ 21.09	1.10	\$ 23.91	0.97	\$ 23.20

PLUMBING PREVENTATIVE MAINTENANCE¹
Annualized Items-10% GF
CostWorks 2010
National Averages Adjusted to Reflect East Hall Location

Escalation	6%										
De-Escalation to July 2009	1.03										
De-Escalation Factor to be Applied	0.97										
Green Factor	1.10	Assumed Value									

Qty	Assembly #	Description	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Release	Location Adjustment
1.000	D2025 190 0000	Water Heater, Solar									
1.000	D2025 190 1950	Water heating systemclosed loop, panels, annualized	3.40	\$ 214.00	\$ 176.00	\$ -	\$ 390.00	\$ 455.00	\$ 540.00	2010	1.095
1.000	D2025 260 0000	Water Heater, Gas/Oil/Steam									
1.000	D2025 260 1950	Water heater, gas, to 120 gal., annualized	1.72	\$ 57.00	\$ 89.00	\$ -	\$ 146.00	\$ 173.00	\$ 209.00	2010	1.095
1.000	D2025 260 2950	Water heater, oil fired, to 100 gal., annualized	2.85	\$ 71.00	\$ 148.00	\$ -	\$ 219.00	\$ 261.00	\$ 320.00	2010	1.095
1.000	D2025 260 3950	Water heater, steam 2500 gal., annualized	1.55	\$ 28.50	\$ 80.50	\$ -	\$ 109.00	\$ 131.00	\$ 161.00	2010	1.095
1.000	D2025 262 0000	Valve, Pressure Relief									
1.000	D2025 262 1950	Valve, pressure relief, above 4", annualized	0.15	\$ -	\$ 6.30	\$ -	\$ 6.30	\$ 8.25	\$ 10.20	2010	1.095
1.000	D2025 265 0000	Valve, Pressure Regulator									
1.000	D2025 265 1950	Valve, pressure regular, above 4", annualized	0.36	\$ -	\$ 15.30	\$ -	\$ 15.30	\$ 20.00	\$ 24.50	2010	1.095
1.000	D2025 270 0000	Valve, Sediment Strainer									
1.000	D2025 270 1950	Valve, sediment strainer, above 4", annualized	0.31	\$ -	\$ 13.35	\$ -	\$ 13.35	\$ 17.45	\$ 21.50	2010	1.095
1.000	D2025 310 0000	Valve, Automatic									
1.000	D2025 310 1950	Valve, automatic, above 4", annualized	0.19	\$ 7.10	\$ 7.95	\$ -	\$ 15.05	\$ 18.25	\$ 22.00	2010	1.095
1.000	D2025 310 2950	Valve, auto diaphragm, above 4", annualized	0.18	\$ 7.10	\$ 7.45	\$ -	\$ 14.55	\$ 17.55	\$ 21.00	2010	1.095
1.000	D2095 905 0000	Duplex Sump									
1.000	D2095 905 1950	Duplex sump, annualized	1.65	\$ 28.50	\$ 86.00	\$ -	\$ 114.50	\$ 139.00	\$ 169.00	2010	1.095
1.000	D2095 910 0000	Pump, Submersible									
1.000	D2095 910 1950	Submersible, 1 H.P. and over, annualized	3.85	\$ 28.50	\$ 200.00	\$ -	\$ 228.50	\$ 281.00	\$ 345.00	2010	1.095
1.000	D2095 930 0000	Oxygen Monitor									
1.000	D2095 930 1950	Oxygen monitor, annualized	5.00	\$ 195.00	\$ 213.00	\$ -	\$ 408.00	\$ 495.00	\$ 590.00	2010	1.095

PLUMBING PREVENTATIVE MAINTENANCE ¹										
Annualized Items-10% GF										
CostWorks 2010										
National Averages Adjusted to Reflect East Hall Location										
Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.10	Assumed Value								
Qty	Assembly #	Description	Total Adjusted	De-Escalation Factor to July 2009	Total Non-Green	Green Factor	Total Adjusted Green Factor	De-Escalation Factor to July 2009	Total with All Adjustments	
1.000	D2025 190 0000	Water Heater, Solar								
1.000	D2025 190 1950	Water heating systemclosed loop, panels, annualized	\$ 591.30	0.97	\$ 573.82	1.10	\$ 650.43	0.97	\$ 631.20	
1.000	D2025 260 0000	Water Heater, Gas/Oil/Steam								
1.000	D2025 260 1950	Water heater, gas, to 120 gal., annualized	\$ 228.86	0.97	\$ 222.09	1.10	\$ 251.74	0.97	\$ 244.30	
1.000	D2025 260 2950	Water heater, oil fired, to 100 gal., annualized	\$ 350.40	0.97	\$ 340.04	1.10	\$ 385.44	0.97	\$ 374.05	
1.000	D2025 260 3950	Water heater, steam 2500 gal., annualized	\$ 176.30	0.97	\$ 171.08	1.10	\$ 193.92	0.97	\$ 188.19	
1.000	D2025 262 0000	Valve, Pressure Relief								
1.000	D2025 262 1950	Valve, pressure relief, above 4", annualized	\$ 11.17	0.97	\$ 10.84	1.10	\$ 12.29	0.97	\$ 11.92	
1.000	D2025 265 0000	Valve, Pressure Regulator								
1.000	D2025 265 1950	Valve, pressure regular, above 4", annualized	\$ 26.83	0.97	\$ 26.03	1.10	\$ 29.51	0.97	\$ 28.64	
1.000	D2025 270 0000	Valve, Sediment Strainer								
1.000	D2025 270 1950	Valve, sediment strainer, above 4", annualized	\$ 23.54	0.97	\$ 22.85	1.10	\$ 25.90	0.97	\$ 25.13	
1.000	D2025 310 0000	Valve, Automatic								
1.000	D2025 310 1950	Valve, automatic, above 4", annualized	\$ 24.09	0.97	\$ 23.38	1.10	\$ 26.50	0.97	\$ 25.72	
1.000	D2025 310 2950	Valve, auto diaphragm, above 4", annualized	\$ 23.00	0.97	\$ 22.32	1.10	\$ 25.29	0.97	\$ 24.55	
1.000	D2095 905 0000	Duplex Sump								
1.000	D2095 905 1950	Duplex sump, annualized	\$ 185.06	0.97	\$ 179.58	1.10	\$ 203.56	0.97	\$ 197.54	
1.000	D2095 910 0000	Pump, Submersible								
1.000	D2095 910 1950	Submersible, 1 H.P. and over, annualized	\$ 377.78	0.97	\$ 366.61	1.10	\$ 415.55	0.97	\$ 403.27	
1.000	D2095 930 0000	Oxygen Monitor								
1.000	D2095 930 1950	Oxygen monitor, annualized	\$ 646.05	0.97	\$ 626.95	1.10	\$ 710.66	0.97	\$ 689.65	
					\$ 3,099.00				\$ 3,408.90	
					Total Yearly Preventative Maintenance Cost			Total Yearly Preventative Maintenance Cost		
					Non-Green			Green		

PLUMBING PREVENTATIVE MAINTENANCE¹
Annualized Items-10% GF
CostWorks 2010
National Averages Adjusted to Reflect East Hall Location

Escalation	6%										
De-Escalation to July 2009	1.03										
De-Escalation Factor to be Applied	0.97										
Green Factor	1.10	Assumed Value									

Qty	Assembly #	Description	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Release	Location Adjustment
SUMMARY OF FINDINGS											
		Description	Cost	% Difference	Comments						
		Yearly Non-Green Preventative Maintenance Costs	\$ 3,099.00								
		Yearly Green Preventative Maintenance Costs	\$ 3,408.90	9.09%	Green Costs are 9.09% higher than Non-Green based on this analysis						
FOOTNOTES:											
1											
RS Means CostWorks 2010 Operations and Maintenance											

Appendix C-SW8 10% GF Analysis of FMRRC

PLUMBING REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

10% GF
CostWorks 2010

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.10	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2023 260 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/12 HP	0.5	1 Plum	Ea.	\$ 7.04	\$ 8.79	1.095	\$ 9.63	0.97
1.000	D2023 266 0020	Inspect/check pump/motor operation, lub. circulation pump, bronze 1 HP	0.5	1 Plum	Ea.	\$ 7.04	\$ 8.79	1.095	\$ 9.63	0.97
1.000	D2023 267 0020	Insp/chk pump/mtr oper, lub, chk align circulation pump, CI 1-1/2 HP	0.5	1 Plum	Ea.	\$ 10.48	\$ 13.09	1.095	\$ 14.33	0.97
1.000	D2013 810 0010	Check / minor repairs drinking fountain	1	1 Plum	Ea.	\$ 43.00	\$ 54.00	1.095	\$ 59.13	0.97
1.000	D2023 210 0020	Clean and service water heater, gas / oil, 30 gallon	1	1 Plum	Ea.	\$ 172.00	\$ 215.00	1.095	\$ 235.43	0.97
1.000	D2023 212 0020	Clean & service water heater, gas / oil, 70 gallon	1	1 Plum	Ea.	\$ 172.00	\$ 215.00	1.095	\$ 235.43	0.97
1.000	D2023 230 0020	Inspect for leaks steam converter, domestic hot water	1	1 Plum	Ea.	\$ 5.94	\$ 7.43	1.095	\$ 8.14	0.97
1.000	D2023 261 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/8 HP	1	1 Plum	Ea.	\$ 7.04	\$ 8.79	1.095	\$ 9.63	0.97
1.000	D2023 262 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/6 HP	1	1 Plum	Ea.	\$ 7.04	\$ 8.79	1.095	\$ 9.63	0.97
1.000	D2023 264 0020	Insp./chk. pump/mtr. oper., lub., chk. align. circulation pump, 1/2 HP	1	1 Plum	Ea.	\$ 10.48	\$ 13.09	1.095	\$ 14.33	0.97
1.000	D2043 110 1010	General maintenance & repair distribution: gutters, pipe	1	1 Plum	M.L.F.	\$ 264.70	\$ 333.40	1.095	\$ 365.07	0.97
1.000	D2043 210 1010	General maintenance & repair drain: roof, scupper, area	1	1 Plum	Ea.	\$ 32.70	\$ 40.90	1.095	\$ 44.79	0.97
1.000	D2043 310 1020	Insp./chk. pump/mtr. oper., lub., chk. align. rainwater sump pump	1	1 Plum	Ea.	\$ 10.48	\$ 13.09	1.095	\$ 14.33	0.97
1.000	D2093 946 1010	Check and adjust 2 H.P. compressor	1	1 Plum	Ea.	\$ 74.29	\$ 92.78	1.095	\$ 101.59	0.97
1.000	D2093 946 3010	Check and adjust 10 H.P. compressor	1	1 Plum	Ea.	\$ 74.29	\$ 92.78	1.095	\$ 101.59	0.97
1.000	D2093 946 4010	Check and adjust 25 H.P. compressor	1	1 Plum	Ea.	\$ 74.29	\$ 92.78	1.095	\$ 101.59	0.97
1.000	D2093 946 5030	Check operation compressed air systems	1	1 Stpi	Ea.	\$ 20.50	\$ 25.50	1.095	\$ 27.92	0.97
1.000	D2013 310 0020	Replace washer in faucet lavatory, iron, enamel	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 310 0050	Clean out strainer and P trap lavatory, iron, enamel	2	1 Plum	Ea.	\$ 30.60	\$ 38.65	1.095	\$ 42.32	0.97
1.000	D2013 330 0020	Replace washer in faucet lavatory, vitreous china	2	1 Plum	Ea.	\$ 11.22	\$ 13.97	1.095	\$ 15.30	0.97
1.000	D2013 330 0050	Clean out strainer and P trap lavatory, vitreous china	2	1 Plum	Ea.	\$ 30.60	\$ 38.65	1.095	\$ 42.32	0.97
1.000	D2013 350 0020	Replace washer in faucet lavatory, enameled steel	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97

PLUMBING REPAIR AND REPLACEMENT MAINTENANCE COSTS ¹							
10% GF							
CostWorks 2010							
Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2023 260 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/12 HP	\$ 9.34	1.10	\$ 10.59	0.97	\$ 10.27
1.000	D2023 266 0020	Inspect/check pump/motor operation, lub. circulation pump, bronze 1 HP	\$ 9.34	1.10	\$ 10.59	0.97	\$ 10.27
1.000	D2023 267 0020	Insp/chk pump/mtr oper, lub, chk align circulation pump, CI 1-1/2 HP	\$ 13.91	1.10	\$ 15.77	0.97	\$ 15.30
			\$ 32.59				\$ 35.85
			\$ 32.59	Assumed 100%		Assumed 100%	\$ 35.85
				PER 0.5 YR		PER 0.5 YR	
1.000	D2013 810 0010	Check / minor repairs drinking fountain	\$ 57.38	1.10	\$ 65.04	0.97	\$ 63.12
1.000	D2023 210 0020	Clean and service water heater, gas / oil, 30 gallon	\$ 228.47	1.10	\$ 258.97	0.97	\$ 251.31
1.000	D2023 212 0020	Clean & service water heater, gas / oil, 70 gallon	\$ 228.47	1.10	\$ 258.97	0.97	\$ 251.31
1.000	D2023 230 0020	Inspect for leaks steam converter, domestic hot water	\$ 7.90	1.10	\$ 8.95	0.97	\$ 8.68
1.000	D2023 261 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/8 HP	\$ 9.34	1.10	\$ 10.59	0.97	\$ 10.27
1.000	D2023 262 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/6 HP	\$ 9.34	1.10	\$ 10.59	0.97	\$ 10.27
1.000	D2023 264 0020	Insp./chk. pump/mtr. oper., lub., chk. align. circulation pump, 1/2 HP	\$ 13.91	1.10	\$ 15.77	0.97	\$ 15.30
1.000	D2043 110 1010	General maintenance & repair distribution: gutters, pipe	\$ 354.28	1.10	\$ 401.58	0.97	\$ 389.71
1.000	D2043 210 1010	General maintenance & repair drain: roof, scupper, area	\$ 43.46	1.10	\$ 49.26	0.97	\$ 47.81
1.000	D2043 310 1020	Insp./chk. pump/mtr. oper., lub., chk. align. rainwater sump pump	\$ 13.91	1.10	\$ 15.77	0.97	\$ 15.30
1.000	D2093 946 1010	Check and adjust 2 H.P. compressor	\$ 98.59	1.10	\$ 111.75	0.97	\$ 108.45
1.000	D2093 946 3010	Check and adjust 10 H.P. compressor	\$ 98.59	1.10	\$ 111.75	0.97	\$ 108.45
1.000	D2093 946 4010	Check and adjust 25 H.P. compressor	\$ 98.59	1.10	\$ 111.75	0.97	\$ 108.45
1.000	D2093 946 5030	Check operation compressed air systems	\$ 27.10	1.10	\$ 30.71	0.97	\$ 29.81
			\$ 1,289.32				\$ 1,418.25
			\$ 1,289.32	Assumed 100%		Assumed 100%	\$ 1,418.25
				PER 1 YR		PER 1 YR	
1.000	D2013 310 0020	Replace washer in faucet lavatory, iron, enamel	\$ 14.75	1.10	\$ 16.72	0.97	\$ 16.22
1.000	D2013 310 0050	Clean out strainer and P trap lavatory, iron, enamel	\$ 41.07	1.10	\$ 46.55	0.97	\$ 45.18
1.000	D2013 330 0020	Replace washer in faucet lavatory, vitreous china	\$ 14.84	1.10	\$ 16.83	0.97	\$ 16.33
1.000	D2013 330 0050	Clean out strainer and P trap lavatory, vitreous china	\$ 41.07	1.10	\$ 46.55	0.97	\$ 45.18
1.000	D2013 350 0020	Replace washer in faucet lavatory, enameled steel	\$ 14.75	1.10	\$ 16.72	0.97	\$ 16.22

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.10	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2013 350 0050	Clean out strainer and P trap lavatory, enameled steel	2	1 Plum	Ea.	\$ 30.60	\$ 38.65	1.095	\$ 42.32	0.97
1.000	D2013 410 0010	Replace faucet washer sink, iron enamel	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 410 0040	Unstop sink sink, iron enamel	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 420 0010	Replace faucet washer sink, enameled steel	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 420 0040	Unstop sink enameled steel	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 430 0010	Replace faucet washer sink, stainless steel	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 430 0040	Unstop sink, stainless steel	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 440 0010	Replace faucet washer sink, plastic	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 440 0040	Unstop, sink, plastic	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 450 0020	Replace washer in faucet laundry sink, plastic	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 450 0050	Clean out strainer and P trap laundry sink, plastic	2	1 Plum	Ea.	\$ 30.60	\$ 38.65	1.095	\$ 42.32	0.97
1.000	D2013 460 0010	Replace faucet washer	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 460 0040	Unstop sink	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 510 0020	Replace mixing valve barrel bathtub, cast iron enamel	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 530 0020	Replace mixing valve barrel bathtub, enameled steel	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 550 0020	Replace mixing valve barrel bathtub, fiberglass	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 710 0020	Replace mixing valve barrel shower, terrazzo	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 730 0020	Replace mixing valve barrel shower, enameled steel	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 750 0020	Replace mixing valve barrel shower, fiberglass	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 770 0020	Replace mixing valve barrel shower, misc.	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 810 0030	Correct water pressure drinking fountain	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 810 0040	Replace refrigerant drinking fountain	2	1 Plum	Ea.	\$ 22.50	\$ 26.50	1.095	\$ 29.02	0.97
1.000	D2023 214 0010	Minor repairs, adjustments water heater, gas / oil, 1150 GPH	2	2 Plum	Ea.	\$ 86.00	\$ 108.00	1.095	\$ 118.26	0.97
1.000	D2023 214 0020	Clean & service water heater, gas / oil, 1150 GPH	2	2 Plum	Ea.	\$ 515.00	\$ 645.00	1.095	\$ 706.28	0.97
1.000	D2093 910 1010	General maintenance pipe & fittings, industrial gas	2	1 Plum	M.L.F.	\$ 32.50	\$ 40.50	1.095	\$ 44.35	0.97
1.000	D2093 940 1010	General maintenance pipe & fittings, compressed air	2	1 Plum	M.L.F.	\$ 32.50	\$ 40.50	1.095	\$ 44.35	0.97
1.000	D2013 410 0020	Clean trap sink, iron enamel	3	1 Plum	Ea.	\$ 7.51	\$ 9.39	1.095	\$ 10.28	0.97
1.000	D2013 420 0020	Clean trap sink, enameled steel	3	1 Plum	Ea.	\$ 7.51	\$ 9.39	1.095	\$ 10.28	0.97
1.000	D2013 430 0020	Clean trap sink, stainless steel	3	1 Plum	Ea.	\$ 7.51	\$ 9.39	1.095	\$ 10.28	0.97
1.000	D2013 440 0020	Clean trap sink, plastic	3	1 Plum	Ea.	\$ 7.51	\$ 9.39	1.095	\$ 10.28	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2013 350 0050	Clean out strainer and P trap lavatory, enameled steel	\$ 41.07	1.10	\$ 46.55	0.97	\$ 45.18
1.000	D2013 410 0010	Replace faucet washer sink, iron enamel	\$ 14.75	1.10	\$ 16.72	0.97	\$ 16.22
1.000	D2013 410 0040	Unstop sink sink, iron enamel	\$ 48.88	1.10	\$ 55.41	0.97	\$ 53.77
1.000	D2013 420 0010	Replace faucet washer sink, enameled steel	\$ 14.75	1.10	\$ 16.72	0.97	\$ 16.22
1.000	D2013 420 0040	Unstop sink enameled steel	\$ 48.88	1.10	\$ 55.41	0.97	\$ 53.77
1.000	D2013 430 0010	Replace faucet washer sink, stainless steel	\$ 14.75	1.10	\$ 16.72	0.97	\$ 16.22
1.000	D2013 430 0040	Unstop sink, stainless steel	\$ 48.88	1.10	\$ 55.41	0.97	\$ 53.77
1.000	D2013 440 0010	Replace faucet washer sink, plastic	\$ 14.75	1.10	\$ 16.72	0.97	\$ 16.22
1.000	D2013 440 0040	Unstop, sink, plastic	\$ 48.88	1.10	\$ 55.41	0.97	\$ 53.77
1.000	D2013 450 0020	Replace washer in faucet laundry sink, plastic	\$ 14.75	1.10	\$ 16.72	0.97	\$ 16.22
1.000	D2013 450 0050	Clean out strainer and P trap laundry sink, plastic	\$ 41.07	1.10	\$ 46.55	0.97	\$ 45.18
1.000	D2013 460 0010	Replace faucet washer	\$ 14.75	1.10	\$ 16.72	0.97	\$ 16.22
1.000	D2013 460 0040	Unstop sink	\$ 48.88	1.10	\$ 55.41	0.97	\$ 53.77
1.000	D2013 510 0020	Replace mixing valve barrel bathtub, cast iron enamel	\$ 213.72	1.10	\$ 242.25	0.97	\$ 235.09
1.000	D2013 530 0020	Replace mixing valve barrel bathtub, enameled steel	\$ 213.72	1.10	\$ 242.25	0.97	\$ 235.09
1.000	D2013 550 0020	Replace mixing valve barrel bathtub, fiberglass	\$ 213.72	1.10	\$ 242.25	0.97	\$ 235.09
1.000	D2013 710 0020	Replace mixing valve barrel shower, terrazzo	\$ 213.72	1.10	\$ 242.25	0.97	\$ 235.09
1.000	D2013 730 0020	Replace mixing valve barrel shower, enameled steel	\$ 213.72	1.10	\$ 242.25	0.97	\$ 235.09
1.000	D2013 750 0020	Replace mixing valve barrel shower, fiberglass	\$ 213.72	1.10	\$ 242.25	0.97	\$ 235.09
1.000	D2013 770 0020	Replace mixing valve barrel shower, misc.	\$ 213.72	1.10	\$ 242.25	0.97	\$ 235.09
1.000	D2013 810 0030	Correct water pressure drinking fountain	\$ 48.88	1.10	\$ 55.41	0.97	\$ 53.77
1.000	D2013 810 0040	Replace refrigerant drinking fountain	\$ 28.16	1.10	\$ 31.92	0.97	\$ 30.98
1.000	D2023 214 0010	Minor repairs, adjustments water heater, gas / oil, 1150 GPH	\$ 114.76	1.10	\$ 130.09	0.97	\$ 126.24
1.000	D2023 214 0020	Clean & service water heater, gas / oil, 1150 GPH	\$ 685.40	1.10	\$ 776.90	0.97	\$ 753.93
1.000	D2093 910 1010	General maintenance pipe & fittings, industrial gas	\$ 43.04	1.10	\$ 48.78	0.97	\$ 47.34
1.000	D2093 940 1010	General maintenance pipe & fittings, compressed air	\$ 43.04	1.10	\$ 48.78	0.97	\$ 47.34
			\$ 3,000.81				\$ 3,300.89
			\$ 3,000.81	Assumed 100%		Assumed 100%	\$ 3,300.89
				PER 1 YR		PER 1 YR	
1.000	D2013 410 0020	Clean trap sink, iron enamel	\$ 9.98	1.10	\$ 11.31	0.97	\$ 10.98
1.000	D2013 420 0020	Clean trap sink, enameled steel	\$ 9.98	1.10	\$ 11.31	0.97	\$ 10.98
1.000	D2013 430 0020	Clean trap sink, stainless steel	\$ 9.98	1.10	\$ 11.31	0.97	\$ 10.98
1.000	D2013 440 0020	Clean trap sink, plastic	\$ 9.98	1.10	\$ 11.31	0.97	\$ 10.98

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.10	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2013 460 0020	Clean trap	3	1 Plum	Ea.	\$ 7.51	\$ 9.39	1.095	\$ 10.28	0.97
1.000	D2013 510 0010	Inspect / clean shower head bathtub, cast iron enamel	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 530 0010	Inspect / clean shower head bathtub, enameled steel	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 550 0010	Inspect / clean shower head bathtub, fiberglass	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 710 0010	Inspect / clean shower head shower, terrazzo	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 730 0010	Inspect / clean shower head shower, enameled steel	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 750 0010	Inspect / clean shower head fiberglass	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 770 0010	Inspect / clean shower head	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 910 0020	Inspect and clean shower head emergency shower station	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 920 0020	Inspect and clean spray heads, emergency eye wash	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2023 220 0020	Check operation water heater, electric, 120 gallon	3	1 Plum	Ea.	\$ 2.27	\$ 2.83	1.095	\$ 3.10	0.97
1.000	D2023 222 0020	Check operation water heater, electric, 300 gallon	3	1 Plum	Ea.	\$ 2.27	\$ 2.83	1.095	\$ 3.10	0.97
1.000	D2023 224 0020	Check operation water heater, electric, 1000 gallon	3	1 Plum	Ea.	\$ 2.27	\$ 2.83	1.095	\$ 3.10	0.97
1.000	D2023 226 0020	Check operation water heater, electric, 2000 gallon	3	1 Plum	Ea.	\$ 2.27	\$ 2.83	1.095	\$ 3.10	0.97
1.000	D2013 810 0020	Repair internal leaks drinking fountain	4	1 Plum	Ea.	\$ 39.50	\$ 49.50	1.095	\$ 54.20	0.97
1.000	D2013 810 0050	Repair drain leak drinking fountain	4	1 Plum	Ea.	\$ 25.85	\$ 31.19	1.095	\$ 34.15	0.97
1.000	D2033 310 0010	Clean floor drain w/o bucket	4	1 Plum	Ea.	\$ 103.00	\$ 128.00	1.095	\$ 140.16	0.97
1.000	D2013 110 0020	Unplug clogged line tankless water closet	5	1 Plum	Ea.	\$ 191.32	\$ 239.44	1.095	\$ 262.19	0.97
1.000	D2013 110 0050	Replace wax ring gasket tankless water closet	5	1 Plum	Ea.	\$ 124.82	\$ 155.94	1.095	\$ 170.75	0.97
1.000	D2013 130 0010	Unplug clogged line flush-tank water closet	5	1 Plum	Ea.	\$ 191.32	\$ 239.44	1.095	\$ 262.19	0.97
1.000	D2013 130 0020	Replace washer / diaphragm in ball cock flush-tank water closet	5	1 Plum	Ea.	\$ 15.72	\$ 19.48	1.095	\$ 21.33	0.97
1.000	D2013 210 0020	Unplug line urinal	5	1 Plum	Ea.	\$ 127.32	\$ 159.44	1.095	\$ 174.59	0.97
1.000	D2023 210 0010	Overhaul water heater, gas / oil, 30 gallon	5	1 Plum	Ea.	\$ 102.58	\$ 128.45	1.095	\$ 140.65	0.97
1.000	D2023 212 0010	Overhaul water heater, gas / oil, 70 gallon	5	1 Plum	Ea.	\$ 143.80	\$ 180.22	1.095	\$ 197.34	0.97
1.000	D2023 250 0010	Refill expansion chamber	5	1 Plum	Ea.	\$ 2.52	\$ 3.15	1.095	\$ 3.45	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2013 460 0020	Clean trap	\$ 9.98	1.10	\$ 11.31	0.97	\$ 10.98
1.000	D2013 510 0010	Inspect / clean shower head bathtub, cast iron enamel	\$ 57.40	1.10	\$ 65.07	0.97	\$ 63.14
1.000	D2013 530 0010	Inspect / clean shower head bathtub, enameled steel	\$ 57.40	1.10	\$ 65.07	0.97	\$ 63.14
1.000	D2013 550 0010	Inspect / clean shower head bathtub, fiberglass	\$ 57.40	1.10	\$ 65.07	0.97	\$ 63.14
1.000	D2013 710 0010	Inspect / clean shower head shower, terrazzo	\$ 57.40	1.10	\$ 65.07	0.97	\$ 63.14
1.000	D2013 730 0010	Inspect / clean shower head shower, enameled steel	\$ 57.40	1.10	\$ 65.07	0.97	\$ 63.14
1.000	D2013 750 0010	Inspect / clean shower head fiberglass	\$ 57.40	1.10	\$ 65.07	0.97	\$ 63.14
1.000	D2013 770 0010	Inspect / clean shower head	\$ 57.40	1.10	\$ 65.07	0.97	\$ 63.14
1.000	D2013 910 0020	Inspect and clean shower head emergency shower station	\$ 57.40	1.10	\$ 65.07	0.97	\$ 63.14
1.000	D2013 920 0020	Inspect and clean spray heads, emergency eye wash	\$ 57.40	1.10	\$ 65.07	0.97	\$ 63.14
1.000	D2023 220 0020	Check operation water heater, electric, 120 gallon	\$ 3.01	1.10	\$ 3.41	0.97	\$ 3.31
1.000	D2023 222 0020	Check operation water heater, electric, 300 gallon	\$ 3.01	1.10	\$ 3.41	0.97	\$ 3.31
1.000	D2023 224 0020	Check operation water heater, electric, 1000 gallon	\$ 3.01	1.10	\$ 3.41	0.97	\$ 3.31
1.000	D2023 226 0020	Check operation water heater, electric, 2000 gallon	\$ 3.01	1.10	\$ 3.41	0.97	\$ 3.31
			\$ 578.55				\$ 636.40
			\$ 578.55	Assumed 100%		Assumed 100%	\$ 636.40
				PER 3 YR		PER 3 YR	
1.000	D2013 810 0020	Repair internal leaks drinking fountain	\$ 52.60	1.10	\$ 59.62	0.97	\$ 57.86
1.000	D2013 810 0050	Repair drain leak drinking fountain	\$ 33.14	1.10	\$ 37.57	0.97	\$ 36.46
1.000	D2033 310 0010	Clean floor drain w/o bucket	\$ 136.02	1.10	\$ 154.18	0.97	\$ 149.62
			\$ 221.76				\$ 243.94
			\$ 221.76	Assumed 100%		Assumed 100%	\$ 243.94
				PER 4 YR		PER 4 YR	
1.000	D2013 110 0020	Unplug clogged line tankless water closet	\$ 254.44	1.10	\$ 288.41	0.97	\$ 279.88
1.000	D2013 110 0050	Replace wax ring gasket tankless water closet	\$ 165.71	1.10	\$ 187.83	0.97	\$ 182.28
1.000	D2013 130 0010	Unplug clogged line flush-tank water closet	\$ 254.44	1.10	\$ 288.41	0.97	\$ 279.88
1.000	D2013 130 0020	Replace washer / diaphragm in ball cock flush-tank water closet	\$ 20.70	1.10	\$ 23.46	0.97	\$ 22.77
1.000	D2013 210 0020	Unplug line urinal	\$ 169.43	1.10	\$ 192.05	0.97	\$ 186.37
1.000	D2023 210 0010	Overhaul water heater, gas / oil, 30 gallon	\$ 136.49	1.10	\$ 154.72	0.97	\$ 150.14
1.000	D2023 212 0010	Overhaul water heater, gas / oil, 70 gallon	\$ 191.51	1.10	\$ 217.07	0.97	\$ 210.66
1.000	D2023 250 0010	Refill expansion chamber	\$ 3.35	1.10	\$ 3.79	0.97	\$ 3.68

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.10	Assumed Value							NON GREEN	

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2033 330 0010	Clean out bucket floor drain with bucket	5	1 Plum	Ea.	\$ 258.00	\$ 325.00	1.095	\$ 355.88	0.97
1.000	D2013 210 0010	Replace flush valve diaphragm urinal	7	1 Plum	Ea.	\$ 34.51	\$ 41.39	1.095	\$ 45.32	0.97
1.000	D2013 310 0010	Replace washer in spud connection lavatory, iron, enamel	7	1 Plum	Ea.	\$ 21.74	\$ 25.46	1.095	\$ 27.88	0.97
1.000	D2013 330 0010	Replace washer in spud connection lavatory, vitreous china	7	1 Plum	Ea.	\$ 25.80	\$ 30.54	1.095	\$ 33.44	0.97
1.000	D2013 350 0010	Replace washer in spud connection lavatory, enameled steel	7	1 Plum	Ea.	\$ 26.01	\$ 30.80	1.095	\$ 33.73	0.97
1.000	D2023 220 0010	Drain and flush water heater, electric, 120 gallon	7	1 Plum	Ea.	\$ 258.00	\$ 325.00	1.095	\$ 355.88	0.97
1.000	D2023 222 0010	Drain and flush water heater, electric, 300 gallon	7	1 Plum	Ea.	\$ 258.00	\$ 325.00	1.095	\$ 355.88	0.97
1.000	D2023 224 0010	Drain and flush water heater, electric, 1000 gallon	7	1 Plum	Ea.	\$ 258.00	\$ 325.00	1.095	\$ 355.88	0.97
1.000	D2023 226 0010	Drain and flush water heater, electric, 2000 gallon	7	1 Plum	Ea.	\$ 258.00	\$ 325.00	1.095	\$ 355.88	0.97
1.000	D2013 110 0010	Replace flush valve diaphragm tankless water closet	10	1 Plum	Ea.	\$ 34.51	\$ 41.39	1.095	\$ 45.32	0.97
1.000	D2013 310 0040	Replace faucets lavatory, iron, enamel	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 330 0040	Replace faucets lavatory, vitreous china	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 350 0040	Replace faucets lavatory, enameled steel	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 410 0030	Replace faucets sink, iron enamel	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 420 0030	Replace faucets sink, enameled steel	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 430 0030	Replace faucets sink, stainless steel	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 440 0030	Replace faucets sink, plastic	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 450 0040	Replace faucets laundry sink, plastic	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 460 0030	Replace faucets	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 510 0030	Replace mixing valve bathtub, cast iron enamel	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 530 0030	Replace mixing valve bathtub, enameled steel	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 550 0030	Replace mixing valve bathtub, fiberglass	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 710 0030	Replace mixing valve shower, terrazzo	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 730 0030	Replace mixing valve shower, enameled steel	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 750 0030	Replace mixing valve shower, fiberglass	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2033 330 0010	Clean out bucket floor drain with bucket	\$ 345.35	1.10	\$ 391.46	0.97	\$ 379.89
			\$ 1,541.41				\$ 1,695.55
			\$ 1,541.41	Assumed 100%		Assumed 100%	\$ 1,695.55
				PER 5 YR		PER 5 YR	
1.000	D2013 210 0010	Replace flush valve diaphragm urinal	\$ 43.98	1.10	\$ 49.85	0.97	\$ 48.38
1.000	D2013 310 0010	Replace washer in spud connection lavatory, iron, enamel	\$ 27.05	1.10	\$ 30.67	0.97	\$ 29.76
1.000	D2013 330 0010	Replace washer in spud connection lavatory, vitreous china	\$ 32.45	1.10	\$ 36.79	0.97	\$ 35.70
1.000	D2013 350 0010	Replace washer in spud connection lavatory, enameled steel	\$ 32.73	1.10	\$ 37.10	0.97	\$ 36.00
1.000	D2023 220 0010	Drain and flush water heater, electric, 120 gallon	\$ 345.35	1.10	\$ 391.46	0.97	\$ 379.89
1.000	D2023 222 0010	Drain and flush water heater, electric, 300 gallon	\$ 345.35	1.10	\$ 391.46	0.97	\$ 379.89
1.000	D2023 224 0010	Drain and flush water heater, electric, 1000 gallon	\$ 345.35	1.10	\$ 391.46	0.97	\$ 379.89
1.000	D2023 226 0010	Drain and flush water heater, electric, 2000 gallon	\$ 345.35	1.10	\$ 391.46	0.97	\$ 379.89
			\$ 1,517.64				\$ 1,669.40
			\$ 1,517.64	Assumed 100%		Assumed 100%	\$ 1,669.40
				PER 7 YR		PER 7 YR	
1.000	D2013 110 0010	Replace flush valve diaphragm tankless water closet	\$ 43.98	1.10	\$ 49.85	0.97	\$ 48.38
1.000	D2013 310 0040	Replace faucets lavatory, iron, enamel	\$ 183.96	1.10	\$ 208.52	0.97	\$ 202.36
1.000	D2013 330 0040	Replace faucets lavatory, vitreous china	\$ 183.96	1.10	\$ 208.52	0.97	\$ 202.36
1.000	D2013 350 0040	Replace faucets lavatory, enameled steel	\$ 183.96	1.10	\$ 208.52	0.97	\$ 202.36
1.000	D2013 410 0030	Replace faucets sink, iron enamel	\$ 183.96	1.10	\$ 208.52	0.97	\$ 202.36
1.000	D2013 420 0030	Replace faucets sink, enameled steel	\$ 183.96	1.10	\$ 208.52	0.97	\$ 202.36
1.000	D2013 430 0030	Replace faucets sink, stainless steel	\$ 183.96	1.10	\$ 208.52	0.97	\$ 202.36
1.000	D2013 440 0030	Replace faucets sink, plastic	\$ 183.96	1.10	\$ 208.52	0.97	\$ 202.36
1.000	D2013 450 0040	Replace faucets laundry sink, plastic	\$ 183.96	1.10	\$ 208.52	0.97	\$ 202.36
1.000	D2013 460 0030	Replace faucets	\$ 183.96	1.10	\$ 208.52	0.97	\$ 202.36
1.000	D2013 510 0030	Replace mixing valve bathtub, cast iron enamel	\$ 417.21	1.10	\$ 472.91	0.97	\$ 458.93
1.000	D2013 530 0030	Replace mixing valve bathtub, enameled steel	\$ 417.21	1.10	\$ 472.91	0.97	\$ 458.93
1.000	D2013 550 0030	Replace mixing valve bathtub, fiberglass	\$ 417.21	1.10	\$ 472.91	0.97	\$ 458.93
1.000	D2013 710 0030	Replace mixing valve shower, terrazzo	\$ 417.21	1.10	\$ 472.91	0.97	\$ 458.93
1.000	D2013 730 0030	Replace mixing valve shower, enameled steel	\$ 417.21	1.10	\$ 472.91	0.97	\$ 458.93
1.000	D2013 750 0030	Replace mixing valve shower, fiberglass	\$ 417.21	1.10	\$ 472.91	0.97	\$ 458.93

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.10	Assumed Value							NON GREEN	

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2013 770 0030	Replace mixing valve shower, misc.	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 770 0070	Replace shower head with water conserving head	10	1 Plum	Ea.	\$ 127.67	\$ 149.29	1.095	\$ 163.47	0.97
1.000	D2013 810 0070	Replace fountain drinking fountain	10	2 Plum	Ea.	\$ 1,086.00	\$ 1,289.00	1.095	\$ 1,411.46	0.97
1.000	D2023 110 0010	Resolder joint pipe & fittings, copper	10	1 Plum	Ea.	\$ 37.94	\$ 47.30	1.095	\$ 51.79	0.97
1.000	D2023 130 0010	Reglue joint, install 1" tee solar piping: pipe & fittings, PVC	10	1 Plum	Ea.	\$ 65.15	\$ 81.65	1.095	\$ 89.41	0.97
1.000	D2023 130 0110	Reglue joint, install 1-1/4" tee solar piping: pipe & fittings, PVC	10	1 Plum	Ea.	\$ 71.15	\$ 88.65	1.095	\$ 97.07	0.97
1.000	D2023 130 0210	Reglue joint, install 1-1/2" tee solar piping: pipe & fittings, PVC	10	1 Plum	Ea.	\$ 77.65	\$ 96.65	1.095	\$ 105.83	0.97
1.000	D2023 130 0310	Reglue joint, install 2" tee solar piping: pipe & fittings, PVC	10	Q1	Ea.	\$ 82.65	\$ 103.15	1.095	\$ 112.95	0.97
1.000	D2023 150 0020	Replace old valve, non-drain, less than 1-1/2"	10	1 Plum	Ea.	\$ 322.00	\$ 372.50	1.095	\$ 407.89	0.97
1.000	D2023 152 0020	Replace old valve, non-drain, 2"	10	1 Plum	Ea.	\$ 1,396.50	\$ 1,608.00	1.095	\$ 1,760.76	0.97
1.000	D2023 154 0020	Replace old valve, non-drain, 3"	10	1 Plum	Ea.	\$ 1,396.50	\$ 1,608.00	1.095	\$ 1,760.76	0.97
1.000	D2023 156 0020	Replace old valve, non-drain, 4"	10	2 Plum	Ea.	\$ 1,690.00	\$ 1,990.00	1.095	\$ 2,179.05	0.97
1.000	D2023 156 0030	Replace old valve, non-drain, 6"	10	2 Plum	Ea.	\$ 2,528.00	\$ 2,970.00	1.095	\$ 3,252.15	0.97
1.000	D2023 156 0040	Replace old valve, non-drain, 8"	10	2 Plum	Ea.	\$ 3,758.00	\$ 4,366.00	1.095	\$ 4,780.77	0.97
1.000	D2023 156 0050	Replace old valve, non-drain, 10"	10	3 Plum	Ea.	\$ 5,953.00	\$ 6,904.00	1.095	\$ 7,559.88	0.97
1.000	D2023 210 0030	Replace water heater, gas / oil, 30 gallon	10	2 Plum	Ea.	\$ 1,506.95	\$ 1,777.45	1.095	\$ 1,946.31	0.97
1.000	D2023 250 0020	Remove old chamber, install new expansion chamber	10	1 Plum	Ea.	\$ 625.00	\$ 720.00	1.095	\$ 788.40	0.97
1.000	D2023 260 0030	Replace pump / motor assembly circulation pump, 1/12 HP	10	2 Plum	Ea.	\$ 846.00	\$ 996.00	1.095	\$ 1,090.62	0.97
1.000	D2023 310 0020	Replace old valve with new hose bibb	10	1 Plum	Ea.	\$ 51.00	\$ 62.45	1.095	\$ 68.38	0.97
1.000	D2033 110 0020	Unclog main drain pipe & fittings, cast iron	10	1 Plum	Ea.	\$ 40.50	\$ 51.00	1.095	\$ 55.85	0.97
1.000	D2033 130 0020	Unclog main drain pipe, PVC	10	1 Plum	M.L.F.	\$ 40.50	\$ 51.00	1.095	\$ 55.85	0.97
1.000	D2033 130 0040	Repair joint pipe and fittings, PVC	10	1 Plum	Ea.	\$ 131.55	\$ 164.15	1.095	\$ 179.74	0.97
1.000	D2033 305 3010	Unclog floor drain per M.L.F. pipe	10	1 Plum	Ea.	\$ 285.50	\$ 352.50	1.095	\$ 385.99	0.97
1.000	D2033 305 3020	Unclog main drain per M.L.F. pipe	10	1 Plum	Ea.	\$ 40.50	\$ 50.50	1.095	\$ 55.30	0.97
1.000	D2023 212 0030	Replace water heater, gas / oil, 70 gallon	12	2 Plum	Ea.	\$ 2,518.00	\$ 2,935.00	1.095	\$ 3,213.83	0.97
1.000	D2093 920 1010	Resolder joint pipe & fittings, anesthesia	12	1 Plum	Ea.	\$ 45.44	\$ 56.30	1.095	\$ 61.65	0.97
1.000	D2093 930 1010	Resolder joint pipe & fittings, oxygen	12	1 Plum	Ea.	\$ 60.65	\$ 75.50	1.095	\$ 82.67	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2013 770 0030	Replace mixing valve shower, misc.	\$ 417.21	1.10	\$ 472.91	0.97	\$ 458.93
1.000	D2013 770 0070	Replace shower head with water conserving head	\$ 158.64	1.10	\$ 179.82	0.97	\$ 174.50
1.000	D2013 810 0070	Replace fountain drinking fountain	\$ 1,369.73	1.10	\$ 1,552.60	0.97	\$ 1,506.70
1.000	D2023 110 0010	Resolder joint pipe & fittings, copper	\$ 50.26	1.10	\$ 56.97	0.97	\$ 55.29
1.000	D2023 130 0010	Reglue joint, install 1" tee solar piping: pipe & fittings, PVC	\$ 86.76	1.10	\$ 98.35	0.97	\$ 95.44
1.000	D2023 130 0110	Reglue joint, install 1-1/4" tee solar piping: pipe & fittings, PVC	\$ 94.20	1.10	\$ 106.78	0.97	\$ 103.62
1.000	D2023 130 0210	Reglue joint, install 1-1/2" tee solar piping: pipe & fittings, PVC	\$ 102.70	1.10	\$ 116.41	0.97	\$ 112.97
1.000	D2023 130 0310	Reglue joint, install 2" tee solar piping: pipe & fittings, PVC	\$ 109.61	1.10	\$ 124.24	0.97	\$ 120.57
1.000	D2023 150 0020	Replace old valve, non-drain, less than 1-1/2"	\$ 395.83	1.10	\$ 448.68	0.97	\$ 435.41
1.000	D2023 152 0020	Replace old valve, non-drain, 2"	\$ 1,708.71	1.10	\$ 1,936.84	0.97	\$ 1,879.58
1.000	D2023 154 0020	Replace old valve, non-drain, 3"	\$ 1,708.71	1.10	\$ 1,936.84	0.97	\$ 1,879.58
1.000	D2023 156 0020	Replace old valve, non-drain, 4"	\$ 2,114.63	1.10	\$ 2,396.96	0.97	\$ 2,326.09
1.000	D2023 156 0030	Replace old valve, non-drain, 6"	\$ 3,156.01	1.10	\$ 3,577.37	0.97	\$ 3,471.61
1.000	D2023 156 0040	Replace old valve, non-drain, 8"	\$ 4,639.44	1.10	\$ 5,258.85	0.97	\$ 5,103.38
1.000	D2023 156 0050	Replace old valve, non-drain, 10"	\$ 7,336.39	1.10	\$ 8,315.87	0.97	\$ 8,070.03
1.000	D2023 210 0030	Replace water heater, gas / oil, 30 gallon	\$ 1,888.77	1.10	\$ 2,140.94	0.97	\$ 2,077.65
1.000	D2023 250 0020	Remove old chamber, install new expansion chamber	\$ 765.09	1.10	\$ 867.24	0.97	\$ 841.60
1.000	D2023 260 0030	Replace pump / motor assembly circulation pump, 1/12 HP	\$ 1,058.38	1.10	\$ 1,199.68	0.97	\$ 1,164.22
1.000	D2023 310 0020	Replace old valve with new hose bibb	\$ 66.36	1.10	\$ 75.22	0.97	\$ 73.00
1.000	D2033 110 0020	Unclog main drain pipe & fittings, cast iron	\$ 54.19	1.10	\$ 61.43	0.97	\$ 59.61
1.000	D2033 130 0020	Unclog main drain pipe, PVC	\$ 54.19	1.10	\$ 61.43	0.97	\$ 59.61
1.000	D2033 130 0040	Repair joint pipe and fittings, PVC	\$ 174.43	1.10	\$ 197.72	0.97	\$ 191.87
1.000	D2033 305 3010	Unclog floor drain per M.L.F. pipe	\$ 374.58	1.10	\$ 424.59	0.97	\$ 412.03
1.000	D2033 305 3020	Unclog main drain per M.L.F. pipe	\$ 53.66	1.10	\$ 60.83	0.97	\$ 59.03
			\$ 32,141.38				\$ 35,355.52
			\$ 32,141.38	Assumed 100%		Assumed 100%	\$ 35,355.52
				PER 10 YR		PER 10 YR	
1.000	D2023 212 0030	Replace water heater, gas / oil, 70 gallon	\$ 3,118.81	1.10	\$ 3,535.21	0.97	\$ 3,430.70
1.000	D2093 920 1010	Resolder joint pipe & fittings, anesthesia	\$ 59.83	1.10	\$ 67.81	0.97	\$ 65.81
1.000	D2093 930 1010	Resolder joint pipe & fittings, oxygen	\$ 80.23	1.10	\$ 90.94	0.97	\$ 88.25
			\$ 3,258.87				\$ 3,584.76
			\$ 3,258.87	Assumed 100%		Assumed 100%	\$ 3,584.76

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.10	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2023 320 0010	Overhaul water meter	13	1 Plum	Ea.	\$ 33.00	\$ 39.50	1.095	\$ 43.25	0.97
1.000	D2013 130 0030	Replace valve and ball cock assembly flush-tank water closet	15	1 Plum	Ea.	\$ 83.77	\$ 102.79	1.095	\$ 112.56	0.97
1.000	D2013 440 0060	Replace sink and fittings, polyethylene sink, plastic	15	2 Plum	Ea.	\$ 1,951.00	\$ 2,277.00	1.095	\$ 2,493.32	0.97
1.000	D2023 160 0020	Remove old insulation & replace with new, pipe 1/2", wall 1"	15	1 Plum	L.F.	\$ 7.25	\$ 8.90	1.095	\$ 9.75	0.97
1.000	D2023 160 0030	Remove old insulation & replace with new, pipe 3/4", wall 1"	15	1 Plum	L.F.	\$ 7.55	\$ 9.25	1.095	\$ 10.13	0.97
1.000	D2023 160 0040	Remove old insulation & replace with new, pipe 1-1/2", wall 1"	15	1 Plum	L.F.	\$ 8.30	\$ 10.15	1.095	\$ 11.11	0.97
1.000	D2023 160 0050	Remove old insulation & replace with new, pipe 1/2", wall 3/4"	15	1 Plum	L.F.	\$ 9.60	\$ 11.80	1.095	\$ 12.92	0.97
1.000	D2023 160 0060	Remove old insulation & replace with new, pipe 3/4", wall 3/4"	15	1 Plum	L.F.	\$ 9.85	\$ 12.10	1.095	\$ 13.25	0.97
1.000	D2023 160 0070	Remove old insulation & replace with new, pipe 1-1/2", wall 3/4"	15	1 Plum	L.F.	\$ 11.00	\$ 13.45	1.095	\$ 14.73	0.97
1.000	D2023 220 0030	Replace water heater, electric, 120 gallon	15	2 Plum	Ea.	\$ 9,305.00	\$ 10,650.00	1.095	\$ 11,661.75	0.97
1.000	D2023 222 0030	Replace water heater, electric, 300 gallon	15	2 Plum	Ea.	\$ 38,365.00	\$ 43,780.00	1.095	\$ 47,939.10	0.97
1.000	D2023 224 0030	Replace water heater, electric, 1000 gallon	15	2 Plum	Ea.	\$ 85,850.00	\$ 98,175.00	1.095	\$ 107,501.63	0.97
1.000	D2023 226 0030	Replace water heater, electric, 2000 gallon	15	2 Plum	Ea.	\$ 123,875.00	\$ 141,350.00	1.095	\$ 154,778.25	0.97
1.000	D2023 370 0030	Replace water softener	15	2 Plum	Ea.	\$ 1,318.00	\$ 1,560.00	1.095	\$ 1,708.20	0.97
1.000	D2013 110 0015	Rebuild flush valve tankless water closet	20	1 Plum	Ea.	\$ 155.17	\$ 186.83	1.095	\$ 204.58	0.97
1.000	D2013 130 0040	Install gasket between tank and bowl flush-tank water closet	20	1 Plum	Ea.	\$ 34.66	\$ 43.22	1.095	\$ 47.33	0.97
1.000	D2013 210 0015	Rebuild flush valve urinal	20	1 Plum	Ea.	\$ 155.17	\$ 186.83	1.095	\$ 204.58	0.97
1.000	D2013 450 0060	Replace laundry sink ,plastic	20	2 Plum	Ea.	\$ 550.43	\$ 667.78	1.095	\$ 731.22	0.97
1.000	D2013 550 0070	Replace bathtub, fiberglass	20	2 Plum	Ea.	\$ 1,276.00	\$ 1,514.00	1.095	\$ 1,657.83	0.97
1.000	D2013 750 0060	Replace shower and fittings, fiberglass	20	2 Plum	Ea.	\$ 1,027.00	\$ 1,220.00	1.095	\$ 1,335.90	0.97
1.000	D2013 770 0120	Replace shower, C.M.U.	20	D8	Ea.	\$ 878.00	\$ 1,061.00	1.095	\$ 1,161.80	0.97
1.000	D2023 110 0020	Replace pipe and fittings, copper 3/4"	20	2 Plum	L.F.	\$ 20.23	\$ 24.60	1.095	\$ 26.94	0.97
1.000	D2023 130 1020	Install 10' section PVC 1" diameter solar piping	20	1 Plum	Ea.	\$ 299.40	\$ 370.75	1.095	\$ 405.97	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor PER 12 YR	TOTAL with Green Factor	De-Escalation Factor PER 12 YR	Total Green with All Adjustments
1.000	D2023 320 0010	Overhaul water meter	\$ 41.97	1.10	\$ 47.58	0.97	\$ 46.17
			\$ 41.97				\$ 46.17
			\$ 41.97	Assumed 100%		Assumed 100%	\$ 46.17
				PER 12 YR		PER 12 YR	
1.000	D2013 130 0030	Replace valve and ball cock assembly flush-tank water closet	\$ 109.23	1.10	\$ 123.81	0.97	\$ 120.15
1.000	D2013 440 0060	Replace sink and fittings, polyethylene sink, plastic	\$ 2,419.61	1.10	\$ 2,742.65	0.97	\$ 2,661.57
1.000	D2023 160 0020	Remove old insulation & replace with new, pipe 1/2", wall 1"	\$ 9.46	1.10	\$ 10.72	0.97	\$ 10.40
1.000	D2023 160 0030	Remove old insulation & replace with new, pipe 3/4", wall 1"	\$ 9.83	1.10	\$ 11.14	0.97	\$ 10.81
1.000	D2023 160 0040	Remove old insulation & replace with new, pipe 1-1/2", wall 1"	\$ 10.79	1.10	\$ 12.23	0.97	\$ 11.86
1.000	D2023 160 0050	Remove old insulation & replace with new, pipe 1/2", wall 3/4"	\$ 12.54	1.10	\$ 14.21	0.97	\$ 13.79
1.000	D2023 160 0060	Remove old insulation & replace with new, pipe 3/4", wall 3/4"	\$ 12.86	1.10	\$ 14.57	0.97	\$ 14.14
1.000	D2023 160 0070	Remove old insulation & replace with new, pipe 1-1/2", wall 3/4"	\$ 14.29	1.10	\$ 16.20	0.97	\$ 15.72
1.000	D2023 220 0030	Replace water heater, electric, 120 gallon	\$ 11,316.99	1.10	\$ 12,827.93	0.97	\$ 12,448.69
1.000	D2023 222 0030	Replace water heater, electric, 300 gallon	\$ 46,521.88	1.10	\$ 52,733.01	0.97	\$ 51,174.06
1.000	D2023 224 0030	Replace water heater, electric, 1000 gallon	\$ 104,323.55	1.10	\$ 118,251.79	0.97	\$ 114,755.91
1.000	D2023 226 0030	Replace water heater, electric, 2000 gallon	\$ 150,202.54	1.10	\$ 170,256.08	0.97	\$ 165,222.79
1.000	D2023 370 0030	Replace water softener	\$ 1,657.70	1.10	\$ 1,879.02	0.97	\$ 1,823.47
			\$ 316,621.26				\$ 348,283.38
			\$ 316,621.26	Assumed 100%		Assumed 100%	\$ 348,283.38
				PER 15 YR		PER 15 YR	
1.000	D2013 110 0015	Rebuild flush valve tankless water closet	\$ 198.53	1.10	\$ 225.04	0.97	\$ 218.38
1.000	D2013 130 0040	Install gasket between tank and bowl flush-tank water closet	\$ 45.93	1.10	\$ 52.06	0.97	\$ 50.52
1.000	D2013 210 0015	Rebuild flush valve urinal	\$ 198.53	1.10	\$ 225.04	0.97	\$ 218.38
1.000	D2013 450 0060	Replace laundry sink ,plastic	\$ 709.60	1.10	\$ 804.34	0.97	\$ 780.56
1.000	D2013 550 0070	Replace bathtub, fiberglass	\$ 1,608.82	1.10	\$ 1,823.61	0.97	\$ 1,769.70
1.000	D2013 750 0060	Replace shower and fittings, fiberglass	\$ 1,296.41	1.10	\$ 1,469.49	0.97	\$ 1,426.05
1.000	D2013 770 0120	Replace shower, C.M.U.	\$ 1,127.45	1.10	\$ 1,277.97	0.97	\$ 1,240.19
1.000	D2023 110 0020	Replace pipe and fittings, copper 3/4"	\$ 26.14	1.10	\$ 29.63	0.97	\$ 28.75
1.000	D2023 130 1020	Install 10' section PVC 1" diameter solar piping	\$ 393.97	1.10	\$ 446.57	0.97	\$ 433.37

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.10	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2023 130 1120	Install 10' PVC 1-1/4" diameter solar piping	20	1 Plum	Ea.	\$ 331.40	\$ 411.75	1.095	\$ 450.87	0.97
1.000	D2023 130 1220	Install 10' PVC 1-1/2" diameter solar piping	20	1 Plum	Ea.	\$ 384.40	\$ 478.75	1.095	\$ 524.23	0.97
1.000	D2023 130 1320	Install 10' section PVC 2" diameter solar piping	20	Q1	Ea.	\$ 428.40	\$ 524.75	1.095	\$ 574.60	0.97
1.000	D2023 214 0030	Replace water heater, gas / oil, 1150 GPH	20	2 Plum	Ea.	\$ 31,800.00	\$ 36,700.00	1.095	\$ 40,186.50	0.97
1.000	D2023 230 0030	Replace steam converter	20	2 Plum	Ea.	\$ 2,212.00	\$ 2,540.00	1.095	\$ 2,781.30	0.97
1.000	D2023 245 0010	Replace 1000 gallon solar storage tank	20	Q9	Ea.	\$ 6,895.00	\$ 7,980.00	1.095	\$ 8,738.10	0.97
1.000	D2023 261 0030	Replace pump / motor assembly circulation pump, 1/8 HP	20	2 Plum	Ea.	\$ 1,251.00	\$ 1,451.00	1.095	\$ 1,588.85	0.97
1.000	D2023 262 0030	Replace pump / motor assembly circulation pump, 1/6 HP	20	2 Plum	Ea.	\$ 1,509.00	\$ 1,743.00	1.095	\$ 1,908.59	0.97
1.000	D2023 264 0030	Replace pump / motor assembly, partial circulation pump, 1/2 HP	20	2 Plum	Ea.	\$ 2,651.00	\$ 3,064.00	1.095	\$ 3,355.08	0.97
1.000	D2023 266 0040	Replace pump / motor assembly circulation pump, bronze 1 HP	20	2 Plum	Ea.	\$ 4,351.00	\$ 5,014.00	1.095	\$ 5,490.33	0.97
1.000	D2023 267 0040	Replace pump / motor assembly circulation pump, CI 1-1/2 HP	20	2 Plum	Ea.	\$ 2,251.00	\$ 2,589.00	1.095	\$ 2,834.96	0.97
1.000	D2033 130 0010	Unclog floor drain, PVC	20	1 Plum	Ea.	\$ 42.00	\$ 52.50	1.095	\$ 57.49	0.97
1.000	D2043 110 1020	Replace pipe or gutter distribution	20	1 Plum	L.F.	\$ 53.10	\$ 64.75	1.095	\$ 70.90	0.97
1.000	D2043 310 1030	Replace rainwater sump pump / motor assembly	20	2 Plum	Ea.	\$ 479.00	\$ 570.00	1.095	\$ 624.15	0.97

1.000	D2013 110 0040	Replace tankless flush valve	25	1 Plum	Ea.	\$ 262.67	\$ 306.83	1.095	\$ 335.98	0.97
1.000	D2013 770 0060	Replace shower and fittings, aluminum	25	2 Plum	Ea.	\$ 1,027.00	\$ 1,220.00	1.095	\$ 1,335.90	0.97
1.000	D2013 770 0200	Replace shower, glazed C.M.U.	25	D8	Ea.	\$ 1,398.00	\$ 1,673.00	1.095	\$ 1,831.94	0.97
1.000	D2013 910 0030	Replace shower emergency shower station	25	2 Plum	Ea.	\$ 826.00	\$ 989.00	1.095	\$ 1,082.96	0.97
1.000	D2013 920 0030	Replace eye wash station, emergency eye wash	25	2 Plum	Ea.	\$ 871.00	\$ 1,039.00	1.095	\$ 1,137.71	0.97
1.000	D2023 110 0030	Replace pipe and fittings, copper 1"	25	2 Plum	L.F.	\$ 23.58	\$ 28.35	1.095	\$ 31.04	0.97
1.000	D2023 110 0050	Replace pipe and fittings, copper 1-1/2"	25	2 Plum	L.F.	\$ 34.20	\$ 41.40	1.095	\$ 45.33	0.97
1.000	D2023 110 0060	Replace pipe and fittings, copper 2"	25	2 Plum	L.F.	\$ 47.40	\$ 56.50	1.095	\$ 61.87	0.97
1.000	D2023 110 0070	Replace pipe and fittings, copper 4"	25	2 Plum	L.F.	\$ 127.90	\$ 150.90	1.095	\$ 165.24	0.97
1.000	D2023 110 0080	Replace pipe and fittings, copper 8"	25	2 Plum	L.F.	\$ 657.00	\$ 757.00	1.095	\$ 828.92	0.97
1.000	D2023 120 0010	Install new gasket, 4" pipe size, steel/iron	25	1 Plum	Ea.	\$ 169.50	\$ 210.50	1.095	\$ 230.50	0.97
1.000	D2023 320 0020	Remove old meter, install new water meter 5/8"	25	1 Plum	Ea.	\$ 109.00	\$ 131.00	1.095	\$ 143.45	0.97
1.000	D2023 320 0025	Remove old meter, install new water meter 3/4"	25	1 Plum	Ea.	\$ 156.00	\$ 186.00	1.095	\$ 203.67	0.97
1.000	D2023 320 0030	Remove old meter, install new water meter 1"	25	1 Plum	Ea.	\$ 212.00	\$ 250.00	1.095	\$ 273.75	0.97
1.000	D2023 320 0035	Remove old meter, install new water meter 1-1/2"	25	1 Plum	Ea.	\$ 437.00	\$ 512.50	1.095	\$ 561.19	0.97
1.000	D2023 320 0040	Remove old meter, install new water meter 2"	25	1 Plum	Ea.	\$ 591.00	\$ 690.00	1.095	\$ 755.55	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2023 130 1120	Install 10' PVC 1-1/4" diameter solar piping	\$ 437.54	1.10	\$ 495.95	0.97	\$ 481.29
1.000	D2023 130 1220	Install 10' PVC 1-1/2" diameter solar piping	\$ 508.73	1.10	\$ 576.65	0.97	\$ 559.61
1.000	D2023 130 1320	Install 10' section PVC 2" diameter solar piping	\$ 557.61	1.10	\$ 632.06	0.97	\$ 613.38
1.000	D2023 214 0030	Replace water heater, gas / oil, 1150 GPH	\$ 38,998.47	1.10	\$ 44,205.15	0.97	\$ 42,898.31
1.000	D2023 230 0030	Replace steam converter	\$ 2,699.08	1.10	\$ 3,059.43	0.97	\$ 2,968.98
1.000	D2023 245 0010	Replace 1000 gallon solar storage tank	\$ 8,479.78	1.10	\$ 9,611.91	0.97	\$ 9,327.75
1.000	D2023 261 0030	Replace pump / motor assembly circulation pump, 1/8 HP	\$ 1,541.87	1.10	\$ 1,747.73	0.97	\$ 1,696.06
1.000	D2023 262 0030	Replace pump / motor assembly circulation pump, 1/6 HP	\$ 1,852.16	1.10	\$ 2,099.44	0.97	\$ 2,037.38
1.000	D2023 264 0030	Replace pump / motor assembly, partial circulation pump, 1/2 HP	\$ 3,255.89	1.10	\$ 3,690.59	0.97	\$ 3,581.48
1.000	D2023 266 0040	Replace pump / motor assembly circulation pump, bronze 1 HP	\$ 5,328.02	1.10	\$ 6,039.36	0.97	\$ 5,860.82
1.000	D2023 267 0040	Replace pump / motor assembly circulation pump, CI 1-1/2 HP	\$ 2,751.15	1.10	\$ 3,118.45	0.97	\$ 3,026.26
1.000	D2033 130 0010	Unclog floor drain, PVC	\$ 55.79	1.10	\$ 63.24	0.97	\$ 61.37
1.000	D2043 110 1020	Replace pipe or gutter distribution	\$ 68.81	1.10	\$ 77.99	0.97	\$ 75.69
1.000	D2043 310 1030	Replace rainwater sump pump / motor assembly	\$ 605.70	1.10	\$ 686.57	0.97	\$ 666.27
			\$ 72,745.96				\$ 80,020.56
			\$ 72,745.96	Assumed 100%		Assumed 100%	\$ 80,020.56
				PER 20 YR		PER 20 YR	
1.000	D2013 110 0040	Replace tankless flush valve	\$ 326.05	1.10	\$ 369.58	0.97	\$ 358.65
1.000	D2013 770 0060	Replace shower and fittings, aluminum	\$ 1,296.41	1.10	\$ 1,469.49	0.97	\$ 1,426.05
1.000	D2013 770 0200	Replace shower, glazed C.M.U.	\$ 1,777.78	1.10	\$ 2,015.13	0.97	\$ 1,955.56
1.000	D2013 910 0030	Replace shower emergency shower station	\$ 1,050.94	1.10	\$ 1,191.25	0.97	\$ 1,156.03
1.000	D2013 920 0030	Replace eye wash station, emergency eye wash	\$ 1,104.07	1.10	\$ 1,251.48	0.97	\$ 1,214.48
1.000	D2023 110 0030	Replace pipe and fittings, copper 1"	\$ 30.13	1.10	\$ 34.15	0.97	\$ 33.14
1.000	D2023 110 0050	Replace pipe and fittings, copper 1-1/2"	\$ 43.99	1.10	\$ 49.87	0.97	\$ 48.39
1.000	D2023 110 0060	Replace pipe and fittings, copper 2"	\$ 60.04	1.10	\$ 68.05	0.97	\$ 66.04
1.000	D2023 110 0070	Replace pipe and fittings, copper 4"	\$ 160.35	1.10	\$ 181.76	0.97	\$ 176.39
1.000	D2023 110 0080	Replace pipe and fittings, copper 8"	\$ 804.41	1.10	\$ 911.81	0.97	\$ 884.85
1.000	D2023 120 0010	Install new gasket, 4" pipe size, steel/iron	\$ 223.68	1.10	\$ 253.55	0.97	\$ 246.05
1.000	D2023 320 0020	Remove old meter, install new water meter 5/8"	\$ 139.20	1.10	\$ 157.79	0.97	\$ 153.12
1.000	D2023 320 0025	Remove old meter, install new water meter 3/4"	\$ 197.65	1.10	\$ 224.04	0.97	\$ 217.41
1.000	D2023 320 0030	Remove old meter, install new water meter 1"	\$ 265.66	1.10	\$ 301.13	0.97	\$ 292.22
1.000	D2023 320 0035	Remove old meter, install new water meter 1-1/2"	\$ 544.60	1.10	\$ 617.31	0.97	\$ 599.06
1.000	D2023 320 0040	Remove old meter, install new water meter 2"	\$ 733.21	1.10	\$ 831.11	0.97	\$ 806.54

Costs Reflect National Averages										
Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.10	Assumed Value							NON GREEN	
Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2023 320 0045	Remove old meter, install new water meter 3"	25	Q1	Ea.	\$ 3,501.00	\$ 4,027.00	1.095	\$ 4,409.57	0.97
1.000	D2023 320 0050	Remove old meter, install new water meter 4"	25	Q1	Ea.	\$ 5,825.00	\$ 6,755.00	1.095	\$ 7,396.73	0.97
1.000	D2023 320 0055	Remove old meter, install new water meter 6"	25	Q1	Ea.	\$ 9,155.00	\$ 10,605.00	1.095	\$ 11,612.48	0.97
1.000	D2023 320 0060	Remove old meter, install new water meter 8"	25	Q1	Ea.	\$ 13,855.00	\$ 15,945.00	1.095	\$ 17,459.78	0.97
1.000	D2093 920 1030	Replace pipe and fittings, anesthesia	25	2 Plum	L.F.	\$ 20.12	\$ 24.45	1.095	\$ 26.77	0.97
1.000	D2093 930 1030	Replace pipe and fittings, oxygen	25	2 Plum	L.F.	\$ 20.12	\$ 24.45	1.095	\$ 26.77	0.97
1.000	D2093 946 1030	Replace 2 H.P. compressor	25	2 Plum	Ea.	\$ 4,567.00	\$ 5,285.00	1.095	\$ 5,787.08	0.97
1.000	D2093 946 3030	Replace 10 H.P. compressor	25	2 Plum	Ea.	\$ 9,525.00	\$ 11,150.00	1.095	\$ 12,209.25	0.97
1.000	D2093 946 4030	Replace 25 H.P. compressor	25	2 Plum	Ea.	\$ 18,150.00	\$ 21,250.00	1.095	\$ 23,268.75	0.97
1.000	D2013 710 0060	Replace terrazzo shower surface	30	2 Plum	Ea.	\$ 1,102.00	\$ 1,322.00	1.095	\$ 1,447.59	0.97
1.000	D2013 770 0280	Replace shower surface, ceramic tile	30	D7	Ea.	\$ 757.00	\$ 923.00	1.095	\$ 1,010.69	0.97
1.000	D2023 130 2030	Replace 1000' PVC pipe 1" diameter solar piping	30	1 Plum	M.L.F.	\$ 24,840.00	\$ 30,775.00	1.095	\$ 33,698.63	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2023 320 0045	Remove old meter, install new water meter 3"	\$ 4,279.20	1.10	\$ 4,850.52	0.97	\$ 4,707.13
1.000	D2023 320 0050	Remove old meter, install new water meter 4"	\$ 7,178.06	1.10	\$ 8,136.40	0.97	\$ 7,895.86
1.000	D2023 320 0055	Remove old meter, install new water meter 6"	\$ 11,269.18	1.10	\$ 12,773.72	0.97	\$ 12,396.09
1.000	D2023 320 0060	Remove old meter, install new water meter 8"	\$ 16,943.61	1.10	\$ 19,205.75	0.97	\$ 18,637.97
1.000	D2093 920 1030	Replace pipe and fittings, anesthesia	\$ 25.98	1.10	\$ 29.45	0.97	\$ 28.58
1.000	D2093 930 1030	Replace pipe and fittings, oxygen	\$ 25.98	1.10	\$ 29.45	0.97	\$ 28.58
1.000	D2093 946 1030	Replace 2 H.P. compressor	\$ 5,615.99	1.10	\$ 6,365.78	0.97	\$ 6,177.59
1.000	D2093 946 3030	Replace 10 H.P. compressor	\$ 11,848.31	1.10	\$ 13,430.18	0.97	\$ 13,033.14
1.000	D2093 946 4030	Replace 25 H.P. compressor	\$ 22,580.86	1.10	\$ 25,595.63	0.97	\$ 24,838.94
			\$ 88,525.33				\$ 97,377.86
			\$ 88,525.33	Assumed 100%		Assumed 100%	\$ 97,377.86
				PER 25 YR		PER 25 YR	
1.000	D2013 710 0060	Replace terrazzo shower surface	\$ 1,404.79	1.10	\$ 1,592.35	0.97	\$ 1,545.27
1.000	D2013 770 0280	Replace shower surface, ceramic tile	\$ 980.81	1.10	\$ 1,111.75	0.97	\$ 1,078.89
1.000	D2023 130 2030	Replace 1000' PVC pipe 1" diameter solar piping	\$ 32,702.39	1.10	\$ 37,068.49	0.97	\$ 35,972.63

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.10	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2023 130 2130	Replace 1000' PVC pipe 1-1/4" diameter solar piping	30	1 Plum	M.L.F.	\$ 27,540.00	\$ 34,075.00	1.095	\$ 37,312.13	0.97
1.000	D2023 130 2230	Replace 1000' PVC pipe 1-1/2" diameter solar piping	30	1 Plum	M.L.F.	\$ 31,840.00	\$ 39,575.00	1.095	\$ 43,334.63	0.97
1.000	D2023 130 2330	Replace 1000' PVC pipe 2" diameter solar piping	30	Q1	M.L.F.	\$ 35,340.00	\$ 43,375.00	1.095	\$ 47,495.63	0.97
1.000	D2033 130 0060	Replace pipe, 1-1/2" pipe and fittings, PVC	30	2 Plum	L.F.	\$ 51.75	\$ 64.40	1.095	\$ 70.52	0.97
1.000	D2033 130 0080	Replace pipe, 2" pipe and fittings, PVC	30	2 Plum	L.F.	\$ 55.75	\$ 69.30	1.095	\$ 75.88	0.97
1.000	D2033 130 0100	Replace pipe, 4" pipe and fittings, PVC	30	2 Plum	L.F.	\$ 69.10	\$ 85.75	1.095	\$ 93.90	0.97
1.000	D2033 130 0120	Replace pipe, 6" pipe and fittings, PVC	30	2 Plum	L.F.	\$ 90.00	\$ 110.85	1.095	\$ 121.38	0.97
1.000	D2033 130 0140	Replace pipe, 8" pipe and fittings, PVC	30	2 Plum	L.F.	\$ 108.05	\$ 132.50	1.095	\$ 145.09	0.97
1.000	D2013 110 0030	Replace tankless water closet	35	2 Plum	Ea.	\$ 541.32	\$ 637.99	1.095	\$ 698.60	0.97
1.000	D2013 130 0050	Replace two piece water closet flush-tank	35	2 Plum	Ea.	\$ 526.01	\$ 622.39	1.095	\$ 681.52	0.97
1.000	D2013 130 0060	Replace one piece water closet flush-tank	35	2 Plum	Ea.	\$ 866.01	\$ 1,012.39	1.095	\$ 1,108.57	0.97
1.000	D2013 210 0030	Replace wall-hung urinal	35	2 Plum	Ea.	\$ 843.02	\$ 1,016.39	1.095	\$ 1,112.95	0.97
1.000	D2013 330 0060	Replace lavatory, vitreous china	35	2 Plum	Ea.	\$ 613.43	\$ 731.78	1.095	\$ 801.30	0.97
1.000	D2013 350 0060	Replace lavatory lavatory, enameled steel	35	2 Plum	Ea.	\$ 593.43	\$ 721.78	1.095	\$ 790.35	0.97
1.000	D2013 410 0060	Replace sink, P.E.C.I. sink, iron enamel	35	2 Plum	Ea.	\$ 759.50	\$ 893.00	1.095	\$ 977.84	0.97
1.000	D2013 420 0060	Replace sink, enameled steel	35	2 Plum	Ea.	\$ 519.00	\$ 625.00	1.095	\$ 684.38	0.97
1.000	D2013 460 0060	Replace sink, P.E.C.I.	35	1 Plum	Ea.	\$ 1,094.50	\$ 1,293.00	1.095	\$ 1,415.84	0.97
1.000	D2013 530 0070	Replace tub bathtub, enameled steel	35	2 Plum	Ea.	\$ 755.00	\$ 892.00	1.095	\$ 976.74	0.97
1.000	D2013 730 0060	Replace shower, enameled steel	35	2 Plum	Ea.	\$ 1,525.00	\$ 1,800.00	1.095	\$ 1,971.00	0.97
1.000	D2013 310 0060	Replace lavatory, iron, enamel	40	2 Plum	Ea.	\$ 657.93	\$ 771.28	1.095	\$ 844.55	0.97
1.000	D2013 430 0060	Replace sink, stainless steel	40	2 Plum	Ea.	\$ 984.50	\$ 1,168.00	1.095	\$ 1,278.96	0.97
1.000	D2013 510 0070	Replace tub bathtub, cast iron enamel	40	2 Plum	Ea.	\$ 1,360.00	\$ 1,587.00	1.095	\$ 1,737.77	0.97
1.000	D2033 110 0030	Replace pipe & fittings, cast iron	40	2 Plum	L.F.	\$ 47.45	\$ 57.70	1.095	\$ 63.18	0.97
1.000	D2033 310 0030	Replace floor drain w/o bucket	40	1 Plum	Ea.	\$ 1,027.00	\$ 1,184.00	1.095	\$ 1,296.48	0.97
1.000	D2033 330 0030	Replace floor drain with bucket	40	1 Plum	Ea.	\$ 1,027.00	\$ 1,184.00	1.095	\$ 1,296.48	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2023 130 2130	Replace 1000' PVC pipe 1-1/4" diameter solar piping	\$ 36,209.07	1.10	\$ 41,043.34	0.97	\$ 39,829.97
1.000	D2023 130 2230	Replace 1000' PVC pipe 1-1/2" diameter solar piping	\$ 42,053.52	1.10	\$ 47,668.09	0.97	\$ 46,258.88
1.000	D2023 130 2330	Replace 1000' PVC pipe 2" diameter solar piping	\$ 46,091.51	1.10	\$ 52,245.19	0.97	\$ 50,700.66
1.000	D2033 130 0060	Replace pipe, 1-1/2" pipe and fittings, PVC	\$ 68.43	1.10	\$ 77.57	0.97	\$ 75.28
1.000	D2033 130 0080	Replace pipe, 2" pipe and fittings, PVC	\$ 73.64	1.10	\$ 83.47	0.97	\$ 81.00
1.000	D2033 130 0100	Replace pipe, 4" pipe and fittings, PVC	\$ 91.12	1.10	\$ 103.29	0.97	\$ 100.23
1.000	D2033 130 0120	Replace pipe, 6" pipe and fittings, PVC	\$ 117.79	1.10	\$ 133.52	0.97	\$ 129.57
1.000	D2033 130 0140	Replace pipe, 8" pipe and fittings, PVC	\$ 140.80	1.10	\$ 159.60	0.97	\$ 154.88
			\$ 159,933.88				\$ 175,927.27
			\$ 159,933.88	Assumed 100%		Assumed 100%	\$ 175,927.27
				PER 25 YR		PER 25 YR	
1.000	D2013 110 0030	Replace tankless water closet	\$ 677.95	1.10	\$ 768.46	0.97	\$ 745.74
1.000	D2013 130 0050	Replace two piece water closet flush-tank	\$ 661.37	1.10	\$ 749.67	0.97	\$ 727.51
1.000	D2013 130 0060	Replace one piece water closet flush-tank	\$ 1,075.79	1.10	\$ 1,219.42	0.97	\$ 1,183.37
1.000	D2013 210 0030	Replace wall-hung urinal	\$ 1,080.04	1.10	\$ 1,224.24	0.97	\$ 1,188.05
1.000	D2013 330 0060	Replace lavatory, vitreous china	\$ 777.61	1.10	\$ 881.43	0.97	\$ 855.37
1.000	D2013 350 0060	Replace lavatory lavatory, enameled steel	\$ 766.98	1.10	\$ 869.38	0.97	\$ 843.68
1.000	D2013 410 0060	Replace sink, P.E.C.I. sink, iron enamel	\$ 948.93	1.10	\$ 1,075.62	0.97	\$ 1,043.82
1.000	D2013 420 0060	Replace sink, enameled steel	\$ 664.14	1.10	\$ 752.81	0.97	\$ 730.56
1.000	D2013 460 0060	Replace sink, P.E.C.I.	\$ 1,373.98	1.10	\$ 1,557.42	0.97	\$ 1,511.38
1.000	D2013 530 0070	Replace tub bathtub, enameled steel	\$ 947.86	1.10	\$ 1,074.41	0.97	\$ 1,042.65
1.000	D2013 730 0060	Replace shower, enameled steel	\$ 1,912.73	1.10	\$ 2,168.10	0.97	\$ 2,104.00
			\$ 10,887.39				\$ 11,976.13
			\$ 10,887.39	Assumed 100%		Assumed 100%	\$ 11,976.13
				PER 25 YR		PER 25 YR	
1.000	D2013 310 0060	Replace lavatory, iron, enamel	\$ 819.58	1.10	\$ 929.01	0.97	\$ 901.54
1.000	D2013 430 0060	Replace sink, stainless steel	\$ 1,241.15	1.10	\$ 1,406.86	0.97	\$ 1,365.27
1.000	D2013 510 0070	Replace tub bathtub, cast iron enamel	\$ 1,686.39	1.10	\$ 1,911.54	0.97	\$ 1,855.03
1.000	D2033 110 0030	Replace pipe & fittings, cast iron	\$ 61.31	1.10	\$ 69.50	0.97	\$ 67.45
1.000	D2033 310 0030	Replace floor drain w/o bucket	\$ 1,258.15	1.10	\$ 1,426.13	0.97	\$ 1,383.97
1.000	D2033 330 0030	Replace floor drain with bucket	\$ 1,258.15	1.10	\$ 1,426.13	0.97	\$ 1,383.97

Costs Reflect National Averages										
Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.10	Assumed Value								NON GREEN
Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2043 210 1020	Replace drain: roof, scupper, area	40	1 Plum	Ea.	\$ 481.50	\$ 563.00	1.095	\$ 616.49	0.97
1.000	D2023 240 0020	Replace storage tank, glass lined, P.E., 80 gal.	50	2 Plum	Ea.	\$ 2,962.50	\$ 3,396.50	1.095	\$ 3,719.17	0.97
FOOTNOTES:										
1										
RS Means CostWorks 2010 Operations and Maintenance										

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.10	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2043 210 1020	Replace drain: roof, scupper, area	\$ 598.26	1.10	\$ 678.13	0.97	\$ 658.09
			\$ 6,923.00				\$ 7,615.30
			\$ 6,923.00	Assumed 100%		Assumed 100%	\$ 7,615.30
				PER 40 YR		PER 40 YR	
1.000	D2023 240 0020	Replace storage tank, glass lined, P.E., 80 gal.	\$ 3,609.22	1.10	\$ 4,091.08	0.97	\$ 3,970.14
			\$ 3,609.22				\$ 3,970.14
			\$ 3,609.22	Assumed 100%		Assumed 100%	\$ 3,970.14
				PER 50 YR		PER 50 YR	
FOOTNOTES:							
1							
RS Means CostWorks 2010 Operations and Maintenance							

Appendix C-SW9 10% GF Summary of FMRRC

Summary of Green versus Non-Green Major Repair and Replacement Costs based on Frequency (Plumbing) 10% GF			
Type of Construction	Description	TOTAL COST	COMMENTS
Non-Green	Up to 10 Years	\$ 40,323.45	
Non-Green	10 th yr on till 25 th Year	\$ 652,014.66	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
Non-Green	25 th yr on till 50 th Year	\$ 10,532.22	
Green	Up to 10 Years	\$ 44,355.79	
Green	10 th yr on till 25 th Year	\$ 717,216.13	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
Green	25 th yr on till 50 th Year	\$ 11,585.44	
SUMMARY OF FINDINGS			
Green v. Non-Green	9.09%	Green Major Repair and Replacement is 9.09% higher in cost than that of a traditional building	

Appendix C-SW10 5% GF Analysis of YPM

PLUMBING PREVENTATIVE MAINTENANCE¹
Annualized Items-5% GF
CostWorks 2010
National Averages Adjusted to Reflect East Hall Location

Escalation	6%										
De-Escalation to July 2009	1.03										
De-Escalation Factor to be Applied	0.97										
Green Factor	1.05	Assumed Value									

Qty	Assembly #	Description	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Release	Location Adjustment
1.000	D2015 100 0000	Facility Plumbing Fixture Service									
1.000	D2015 100 1950	Urinals, annualized	0.23	\$ -	\$ 11.85	\$ -	\$ 11.85	\$ 14.70	\$ 18.40	2010	1.095
1.000	D2015 100 2950	Toilet (vacuum breaker type), annualized	0.23	\$ -	\$ 11.85	\$ -	\$ 11.85	\$ 14.70	\$ 18.40	2010	1.095
1.000	D2015 100 3950	Toilet (tank type), annualized	0.39	\$ -	\$ 20.00	\$ -	\$ 20.00	\$ 25.00	\$ 31.50	2010	1.095
1.000	D2015 100 4950	Lavatories, annualized	0.35	\$ 6.25	\$ 14.85	\$ -	\$ 21.10	\$ 26.50	\$ 32.00	2010	1.095
1.000	D2015 100 5950	Showers, annualized	0.23	\$ 7.50	\$ 9.70	\$ -	\$ 17.20	\$ 21.00	\$ 25.00	2010	1.095
1.000	D2015 800 0000	Drinking Fountain									
1.000	D2015 800 1950	Drink fountain, annualized	0.62	\$ 15.95	\$ 26.50	\$ -	\$ 42.45	\$ 52.00	\$ 62.50	2010	1.095
1.000	D2025 120 0000	Valve, Butterfly									
1.000	D2025 120 1950	Valve, butterfly, above 4", annualized	0.17	\$ 7.10	\$ 7.05	\$ -	\$ 14.15	\$ 17.05	\$ 20.50	2010	1.095
1.000	D2025 120 2950	Valve, butterfly, auto, above 4", annualized	0.35	\$ 7.10	\$ 14.80	\$ -	\$ 21.90	\$ 27.00	\$ 33.00	2010	1.095
1.000	D2025 125 0000	Valve, Check									
1.000	D2025 125 1950	Valve, check, above 4", annualized	0.26	\$ 7.10	\$ 10.95	\$ -	\$ 18.05	\$ 22.00	\$ 26.50	2010	1.095
1.000	D2025 130 0000	Valve, Cock									
1.000	D2025 130 1950	Valve, ball, above 4", annualized	0.17	\$ 7.10	\$ 7.05	\$ -	\$ 14.15	\$ 17.05	\$ 20.50	2010	1.095
1.000	D2025 135 0000	Valve, Diaphragm									
1.000	D2025 135 1950	Valve, diaphragm, above 4", annualized	0.12	\$ 7.10	\$ 5.20	\$ -	\$ 12.30	\$ 14.60	\$ 17.30	2010	1.095
1.000	D2025 140 0000	Valve, Gate									
1.000	D2025 140 1950	Valve, gate, above 4", annualized	0.16	\$ 7.10	\$ 6.75	\$ -	\$ 13.85	\$ 16.65	\$ 19.85	2010	1.095
1.000	D2025 145 0000	Valve, Globe									
1.000	D2025 145 1950	Valve, globe, above 4", annualized	0.16	\$ 7.10	\$ 6.75	\$ -	\$ 13.85	\$ 16.65	\$ 19.85	2010	1.095
1.000	D2025 145 2950	Valve, globe, auto, above 4", annualized	0.33	\$ 7.10	\$ 13.85	\$ -	\$ 20.95	\$ 26.00	\$ 31.50	2010	1.095
1.000	D2025 150 0000	Valve, Motor Operated									
1.000	D2025 150 1950	Valve, motor operated, above 4", annualized	1.00	\$ 14.15	\$ 42.50	\$ -	\$ 56.65	\$ 71.50	\$ 86.50	2010	1.095
1.000	D2025 155 0000	Valve, OS&Y									
1.000	D2025 155 1950	Valve, OS&Y, above 4", annualized	0.16	\$ 7.10	\$ 6.75	\$ -	\$ 13.85	\$ 16.65	\$ 19.85	2010	1.095

PLUMBING PREVENTATIVE MAINTENANCE¹

Annualized Items-5% GF

CostWorks 2010

National Averages Adjusted to Reflect East Hall Location

Escalation	6%								
De-Escalation to July 2009	1.03								
De-Escalation Factor to be Applied	0.97								
Green Factor	1.05	Assumed Value							

Qty	Assembly #	Description	Total Adjusted	De-Escalation Factor to July 2009	Total Non-Green	Green Factor	Total Adjusted Green Factor	De-Escalation Factor to July 2009	Total with All Adjustments
1.000	D2015 100 0000	Facility Plumbing Fixture Service							
1.000	D2015 100 1950	Urinals, annualized	\$ 20.15	0.97	\$ 19.55	1.05	\$ 21.16	0.97	\$ 20.53
1.000	D2015 100 2950	Toilet (vacuum breaker type), annualized	\$ 20.15	0.97	\$ 19.55	1.05	\$ 21.16	0.97	\$ 20.53
1.000	D2015 100 3950	Toilet (tank type), annualized	\$ 34.49	0.97	\$ 33.47	1.05	\$ 36.22	0.97	\$ 35.15
1.000	D2015 100 4950	Lavatories, annualized	\$ 35.04	0.97	\$ 34.00	1.05	\$ 36.79	0.97	\$ 35.70
1.000	D2015 100 5950	Showers, annualized	\$ 27.38	0.97	\$ 26.57	1.05	\$ 28.74	0.97	\$ 27.89
1.000	D2015 800 0000	Drinking Fountain							
1.000	D2015 800 1950	Drink fountain, annualized	\$ 68.44	0.97	\$ 66.41	1.05	\$ 71.86	0.97	\$ 69.73
1.000	D2025 120 0000	Valve, Butterfly							
1.000	D2025 120 1950	Valve, butterfly, above 4", annualized	\$ 22.45	0.97	\$ 21.78	1.05	\$ 23.57	0.97	\$ 22.87
1.000	D2025 120 2950	Valve, butterfly, auto, above 4", annualized	\$ 36.14	0.97	\$ 35.07	1.05	\$ 37.94	0.97	\$ 36.82
1.000	D2025 125 0000	Valve, Check							
1.000	D2025 125 1950	Valve, check, above 4", annualized	\$ 29.02	0.97	\$ 28.16	1.05	\$ 30.47	0.97	\$ 29.57
1.000	D2025 130 0000	Valve, Cock							
1.000	D2025 130 1950	Valve, ball, above 4", annualized	\$ 22.45	0.97	\$ 21.78	1.05	\$ 23.57	0.97	\$ 22.87
1.000	D2025 135 0000	Valve, Diaphragm							
1.000	D2025 135 1950	Valve, diaphragm, above 4", annualized	\$ 18.94	0.97	\$ 18.38	1.05	\$ 19.89	0.97	\$ 19.30
1.000	D2025 140 0000	Valve, Gate							
1.000	D2025 140 1950	Valve, gate, above 4", annualized	\$ 21.74	0.97	\$ 21.09	1.05	\$ 22.82	0.97	\$ 22.15
1.000	D2025 145 0000	Valve, Globe							
1.000	D2025 145 1950	Valve, globe, above 4", annualized	\$ 21.74	0.97	\$ 21.09	1.05	\$ 22.82	0.97	\$ 22.15
1.000	D2025 145 2950	Valve, globe, auto, above 4", annualized	\$ 34.49	0.97	\$ 33.47	1.05	\$ 36.22	0.97	\$ 35.15
1.000	D2025 150 0000	Valve, Motor Operated							
1.000	D2025 150 1950	Valve, motor operated, above 4", annualized	\$ 94.72	0.97	\$ 91.92	1.05	\$ 99.45	0.97	\$ 96.51
1.000	D2025 155 0000	Valve, OS&Y							
1.000	D2025 155 1950	Valve, OS&Y, above 4", annualized	\$ 21.74	0.97	\$ 21.09	1.05	\$ 22.82	0.97	\$ 22.15

PLUMBING PREVENTATIVE MAINTENANCE¹
Annualized Items-5% GF
CostWorks 2010
National Averages Adjusted to Reflect East Hall Location

Escalation	6%										
De-Escalation to July 2009	1.03										
De-Escalation Factor to be Applied	0.97										
Green Factor	1.05	Assumed Value									

Qty	Assembly #	Description	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Release	Location Adjustment
1.000	D2025 190 0000	Water Heater, Solar									
1.000	D2025 190 1950	Water heating systemclosed loop, panels, annualized	3.40	\$ 214.00	\$ 176.00	\$ -	\$ 390.00	\$ 455.00	\$ 540.00	2010	1.095
1.000	D2025 260 0000	Water Heater, Gas/Oil/Steam									
1.000	D2025 260 1950	Water heater, gas, to 120 gal., annualized	1.72	\$ 57.00	\$ 89.00	\$ -	\$ 146.00	\$ 173.00	\$ 209.00	2010	1.095
1.000	D2025 260 2950	Water heater, oil fired, to 100 gal., annualized	2.85	\$ 71.00	\$ 148.00	\$ -	\$ 219.00	\$ 261.00	\$ 320.00	2010	1.095
1.000	D2025 260 3950	Water heater, steam 2500 gal., annualized	1.55	\$ 28.50	\$ 80.50	\$ -	\$ 109.00	\$ 131.00	\$ 161.00	2010	1.095
1.000	D2025 262 0000	Valve, Pressure Relief									
1.000	D2025 262 1950	Valve, pressure relief, above 4", annualized	0.15	\$ -	\$ 6.30	\$ -	\$ 6.30	\$ 8.25	\$ 10.20	2010	1.095
1.000	D2025 265 0000	Valve, Pressure Regulator									
1.000	D2025 265 1950	Valve, pressure regular, above 4", annualized	0.36	\$ -	\$ 15.30	\$ -	\$ 15.30	\$ 20.00	\$ 24.50	2010	1.095
1.000	D2025 270 0000	Valve, Sediment Strainer									
1.000	D2025 270 1950	Valve, sediment strainer, above 4", annualized	0.31	\$ -	\$ 13.35	\$ -	\$ 13.35	\$ 17.45	\$ 21.50	2010	1.095
1.000	D2025 310 0000	Valve, Automatic									
1.000	D2025 310 1950	Valve, automatic, above 4", annualized	0.19	\$ 7.10	\$ 7.95	\$ -	\$ 15.05	\$ 18.25	\$ 22.00	2010	1.095
1.000	D2025 310 2950	Valve, auto diaphragm, above 4", annualized	0.18	\$ 7.10	\$ 7.45	\$ -	\$ 14.55	\$ 17.55	\$ 21.00	2010	1.095
1.000	D2095 905 0000	Duplex Sump									
1.000	D2095 905 1950	Duplex sump, annualized	1.65	\$ 28.50	\$ 86.00	\$ -	\$ 114.50	\$ 139.00	\$ 169.00	2010	1.095
1.000	D2095 910 0000	Pump, Submersible									
1.000	D2095 910 1950	Submersible, 1 H.P. and over, annualized	3.85	\$ 28.50	\$ 200.00	\$ -	\$ 228.50	\$ 281.00	\$ 345.00	2010	1.095
1.000	D2095 930 0000	Oxygen Monitor									
1.000	D2095 930 1950	Oxygen monitor, annualized	5.00	\$ 195.00	\$ 213.00	\$ -	\$ 408.00	\$ 495.00	\$ 590.00	2010	1.095

PLUMBING PREVENTATIVE MAINTENANCE ¹										
Annualized Items-5% GF										
CostWorks 2010										
National Averages Adjusted to Reflect East Hall Location										
Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.05	Assumed Value								
Qty	Assembly #	Description	Total Adjusted	De-Escalation Factor to July 2009	Total Non-Green	Green Factor	Total Adjusted Green Factor	De-Escalation Factor to July 2009	Total with All Adjustments	
1.000	D2025 190 0000	Water Heater, Solar								
1.000	D2025 190 1950	Water heating systemclosed loop, panels, annualized	\$ 591.30	0.97	\$ 573.82	1.05	\$ 620.87	0.97	\$ 602.51	
1.000	D2025 260 0000	Water Heater, Gas/Oil/Steam								
1.000	D2025 260 1950	Water heater, gas, to 120 gal., annualized	\$ 228.86	0.97	\$ 222.09	1.05	\$ 240.30	0.97	\$ 233.19	
1.000	D2025 260 2950	Water heater, oil fired, to 100 gal., annualized	\$ 350.40	0.97	\$ 340.04	1.05	\$ 367.92	0.97	\$ 357.04	
1.000	D2025 260 3950	Water heater, steam 2500 gal., annualized	\$ 176.30	0.97	\$ 171.08	1.05	\$ 185.11	0.97	\$ 179.64	
1.000	D2025 262 0000	Valve, Pressure Relief								
1.000	D2025 262 1950	Valve, pressure relief, above 4", annualized	\$ 11.17	0.97	\$ 10.84	1.05	\$ 11.73	0.97	\$ 11.38	
1.000	D2025 265 0000	Valve, Pressure Regulator								
1.000	D2025 265 1950	Valve, pressure regular, above 4", annualized	\$ 26.83	0.97	\$ 26.03	1.05	\$ 28.17	0.97	\$ 27.34	
1.000	D2025 270 0000	Valve, Sediment Strainer								
1.000	D2025 270 1950	Valve, sediment strainer, above 4", annualized	\$ 23.54	0.97	\$ 22.85	1.05	\$ 24.72	0.97	\$ 23.99	
1.000	D2025 310 0000	Valve, Automatic								
1.000	D2025 310 1950	Valve, automatic, above 4", annualized	\$ 24.09	0.97	\$ 23.38	1.05	\$ 25.29	0.97	\$ 24.55	
1.000	D2025 310 2950	Valve, auto diaphragm, above 4", annualized	\$ 23.00	0.97	\$ 22.32	1.05	\$ 24.14	0.97	\$ 23.43	
1.000	D2095 905 0000	Duplex Sump								
1.000	D2095 905 1950	Duplex sump, annualized	\$ 185.06	0.97	\$ 179.58	1.05	\$ 194.31	0.97	\$ 188.56	
1.000	D2095 910 0000	Pump, Submersible								
1.000	D2095 910 1950	Submersible, 1 H.P. and over, annualized	\$ 377.78	0.97	\$ 366.61	1.05	\$ 396.66	0.97	\$ 384.94	
1.000	D2095 930 0000	Oxygen Monitor								
1.000	D2095 930 1950	Oxygen monitor, annualized	\$ 646.05	0.97	\$ 626.95	1.05	\$ 678.35	0.97	\$ 658.30	
					\$ 3,099.00				\$ 3,253.95	
					Total Yearly Preventative Maintenance Cost			Total Yearly Preventative Maintenance Cost		
					Non-Green			Green		

PLUMBING PREVENTATIVE MAINTENANCE ¹											
Annualized Items-5% GF											
CostWorks 2010											
National Averages Adjusted to Reflect East Hall Location											
Escalation	6%										
De-Escalation to July 2009	1.03										
De-Escalation Factor to be Applied	0.97										
Green Factor	1.05	Assumed Value									
SUMMARY OF FINDINGS											
Qty	Assembly #	Description	Labor Hours	Bare Mat.	Bare Labor	Bare Equip.	Bare Total	Total In-House	Total Incl. O&P	Release	Location Adjustment
		Description	Cost	% Difference	Comments						
		Yearly Non-Green Preventative Maintenance Costs	\$ 3,099.00								
		Yearly Green Preventative Maintenance Costs	\$ 3,253.95	4.76%	Green Costs are 4.76% higher than Non-Green based on this analysis						
FOOTNOTES:											
1											
		RS Means CostWorks 2010 Operations and Maintenance									

Appendix C-SW11 5% GF Analysis of FMRRC

PLUMBING REPAIR AND REPLACEMENT MAINTENANCE COSTS¹

5% GF

CostWorks 2010

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.05	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2023 260 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/12 HP	0.5	1 Plum	Ea.	\$ 7.04	\$ 8.79	1.095	\$ 9.63	0.97
1.000	D2023 266 0020	Inspect/check pump/motor operation, lub. circulation pump, bronze 1 HP	0.5	1 Plum	Ea.	\$ 7.04	\$ 8.79	1.095	\$ 9.63	0.97
1.000	D2023 267 0020	Insp/chk pump/mtr oper, lub, chk align circulation pump, CI 1-1/2 HP	0.5	1 Plum	Ea.	\$ 10.48	\$ 13.09	1.095	\$ 14.33	0.97
1.000	D2013 810 0010	Check / minor repairs drinking fountain	1	1 Plum	Ea.	\$ 43.00	\$ 54.00	1.095	\$ 59.13	0.97
1.000	D2023 210 0020	Clean and service water heater, gas / oil, 30 gallon	1	1 Plum	Ea.	\$ 172.00	\$ 215.00	1.095	\$ 235.43	0.97
1.000	D2023 212 0020	Clean & service water heater, gas / oil, 70 gallon	1	1 Plum	Ea.	\$ 172.00	\$ 215.00	1.095	\$ 235.43	0.97
1.000	D2023 230 0020	Inspect for leaks steam converter, domestic hot water	1	1 Plum	Ea.	\$ 5.94	\$ 7.43	1.095	\$ 8.14	0.97
1.000	D2023 261 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/8 HP	1	1 Plum	Ea.	\$ 7.04	\$ 8.79	1.095	\$ 9.63	0.97
1.000	D2023 262 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/6 HP	1	1 Plum	Ea.	\$ 7.04	\$ 8.79	1.095	\$ 9.63	0.97
1.000	D2023 264 0020	Insp./chk. pump/mtr. oper., lub., chk. align. circulation pump, 1/2 HP	1	1 Plum	Ea.	\$ 10.48	\$ 13.09	1.095	\$ 14.33	0.97
1.000	D2043 110 1010	General maintenance & repair distribution: gutters, pipe	1	1 Plum	M.L.F.	\$ 264.70	\$ 333.40	1.095	\$ 365.07	0.97
1.000	D2043 210 1010	General maintenance & repair drain: roof, scupper, area	1	1 Plum	Ea.	\$ 32.70	\$ 40.90	1.095	\$ 44.79	0.97
1.000	D2043 310 1020	Insp./chk. pump/mtr. oper., lub., chk. align. rainwater sump pump	1	1 Plum	Ea.	\$ 10.48	\$ 13.09	1.095	\$ 14.33	0.97
1.000	D2093 946 1010	Check and adjust 2 H.P. compressor	1	1 Plum	Ea.	\$ 74.29	\$ 92.78	1.095	\$ 101.59	0.97
1.000	D2093 946 3010	Check and adjust 10 H.P. compressor	1	1 Plum	Ea.	\$ 74.29	\$ 92.78	1.095	\$ 101.59	0.97
1.000	D2093 946 4010	Check and adjust 25 H.P. compressor	1	1 Plum	Ea.	\$ 74.29	\$ 92.78	1.095	\$ 101.59	0.97
1.000	D2093 946 5030	Check operation compressed air systems	1	1 Stpi	Ea.	\$ 20.50	\$ 25.50	1.095	\$ 27.92	0.97
1.000	D2013 310 0020	Replace washer in faucet lavatory, iron, enamel	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 310 0050	Clean out strainer and P trap lavatory, iron, enamel	2	1 Plum	Ea.	\$ 30.60	\$ 38.65	1.095	\$ 42.32	0.97
1.000	D2013 330 0020	Replace washer in faucet lavatory, vitreous china	2	1 Plum	Ea.	\$ 11.22	\$ 13.97	1.095	\$ 15.30	0.97
1.000	D2013 330 0050	Clean out strainer and P trap lavatory, vitreous china	2	1 Plum	Ea.	\$ 30.60	\$ 38.65	1.095	\$ 42.32	0.97
1.000	D2013 350 0020	Replace washer in faucet lavatory, enameled steel	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97

PLUMBING REPAIR AND REPLACEMENT MAINTENANCE COSTS¹
5% GF
CostWorks 2010
Costs Reflect National Averages

Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value			GREEN		

Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2023 260 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/12 HP	\$ 9.34	1.05	\$ 10.11	0.97	\$ 9.81
1.000	D2023 266 0020	Inspect/check pump/motor operation, lub. circulation pump, bronze 1 HP	\$ 9.34	1.05	\$ 10.11	0.97	\$ 9.81
1.000	D2023 267 0020	Insp/chk pump/mtr oper, lub, chk align circulation pump, CI 1-1/2 HP	\$ 13.91	1.05	\$ 15.05	0.97	\$ 14.61
			\$ 32.59				\$ 34.22

			\$ 32.59	Assumed 100%		Assumed 100%	\$ 34.22
				PER 0.5 YR		PER 0.5 YR	

1.000	D2013 810 0010	Check / minor repairs drinking fountain	\$ 57.38	1.05	\$ 62.09	0.97	\$ 60.25
1.000	D2023 210 0020	Clean and service water heater, gas / oil, 30 gallon	\$ 228.47	1.05	\$ 247.20	0.97	\$ 239.89
1.000	D2023 212 0020	Clean & service water heater, gas / oil, 70 gallon	\$ 228.47	1.05	\$ 247.20	0.97	\$ 239.89
1.000	D2023 230 0020	Inspect for leaks steam converter, domestic hot water	\$ 7.90	1.05	\$ 8.54	0.97	\$ 8.29
1.000	D2023 261 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/8 HP	\$ 9.34	1.05	\$ 10.11	0.97	\$ 9.81
1.000	D2023 262 0020	Inspect / check pump / motor operation, lub. circulation pump, 1/6 HP	\$ 9.34	1.05	\$ 10.11	0.97	\$ 9.81
1.000	D2023 264 0020	Insp./chk. pump/mtr. oper., lub., chk. align. circulation pump, 1/2 HP	\$ 13.91	1.05	\$ 15.05	0.97	\$ 14.61
1.000	D2043 110 1010	General maintenance & repair distribution: gutters, pipe	\$ 354.28	1.05	\$ 383.33	0.97	\$ 371.99
1.000	D2043 210 1010	General maintenance & repair drain: roof, scupper, area	\$ 43.46	1.05	\$ 47.02	0.97	\$ 45.63
1.000	D2043 310 1020	Insp./chk. pump/mtr. oper., lub., chk. align. rainwater sump pump	\$ 13.91	1.05	\$ 15.05	0.97	\$ 14.61
1.000	D2093 946 1010	Check and adjust 2 H.P. compressor	\$ 98.59	1.05	\$ 106.67	0.97	\$ 103.52
1.000	D2093 946 3010	Check and adjust 10 H.P. compressor	\$ 98.59	1.05	\$ 106.67	0.97	\$ 103.52
1.000	D2093 946 4010	Check and adjust 25 H.P. compressor	\$ 98.59	1.05	\$ 106.67	0.97	\$ 103.52
1.000	D2093 946 5030	Check operation compressed air systems	\$ 27.10	1.05	\$ 29.32	0.97	\$ 28.45

			\$ 1,289.32				\$ 1,353.78
			\$ 1,289.32	Assumed 100%		Assumed 100%	\$ 1,353.78
				PER 1 YR		PER 1 YR	

1.000	D2013 310 0020	Replace washer in faucet lavatory, iron, enamel	\$ 14.75	1.05	\$ 15.96	0.97	\$ 15.49
1.000	D2013 310 0050	Clean out strainer and P trap lavatory, iron, enamel	\$ 41.07	1.05	\$ 44.44	0.97	\$ 43.12
1.000	D2013 330 0020	Replace washer in faucet lavatory, vitreous china	\$ 14.84	1.05	\$ 16.06	0.97	\$ 15.59
1.000	D2013 330 0050	Clean out strainer and P trap lavatory, vitreous china	\$ 41.07	1.05	\$ 44.44	0.97	\$ 43.12
1.000	D2013 350 0020	Replace washer in faucet lavatory, enameled steel	\$ 14.75	1.05	\$ 15.96	0.97	\$ 15.49

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.05	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2013 350 0050	Clean out strainer and P trap lavatory, enameled steel	2	1 Plum	Ea.	\$ 30.60	\$ 38.65	1.095	\$ 42.32	0.97
1.000	D2013 410 0010	Replace faucet washer sink, iron enamel	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 410 0040	Unstop sink sink, iron enamel	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 420 0010	Replace faucet washer sink, enameled steel	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 420 0040	Unstop sink enameled steel	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 430 0010	Replace faucet washer sink, stainless steel	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 430 0040	Unstop sink, stainless steel	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 440 0010	Replace faucet washer sink, plastic	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 440 0040	Unstop, sink, plastic	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 450 0020	Replace washer in faucet laundry sink, plastic	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 450 0050	Clean out strainer and P trap laundry sink, plastic	2	1 Plum	Ea.	\$ 30.60	\$ 38.65	1.095	\$ 42.32	0.97
1.000	D2013 460 0010	Replace faucet washer	2	1 Plum	Ea.	\$ 11.12	\$ 13.88	1.095	\$ 15.20	0.97
1.000	D2013 460 0040	Unstop sink	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 510 0020	Replace mixing valve barrel bathtub, cast iron enamel	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 530 0020	Replace mixing valve barrel bathtub, enameled steel	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 550 0020	Replace mixing valve barrel bathtub, fiberglass	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 710 0020	Replace mixing valve barrel shower, terrazzo	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 730 0020	Replace mixing valve barrel shower, enameled steel	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 750 0020	Replace mixing valve barrel shower, fiberglass	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 770 0020	Replace mixing valve barrel shower, misc.	2	1 Plum	Ea.	\$ 168.10	\$ 201.12	1.095	\$ 220.23	0.97
1.000	D2013 810 0030	Correct water pressure drinking fountain	2	1 Plum	Ea.	\$ 37.00	\$ 46.00	1.095	\$ 50.37	0.97
1.000	D2013 810 0040	Replace refrigerant drinking fountain	2	1 Plum	Ea.	\$ 22.50	\$ 26.50	1.095	\$ 29.02	0.97
1.000	D2023 214 0010	Minor repairs, adjustments water heater, gas / oil, 1150 GPH	2	2 Plum	Ea.	\$ 86.00	\$ 108.00	1.095	\$ 118.26	0.97
1.000	D2023 214 0020	Clean & service water heater, gas / oil, 1150 GPH	2	2 Plum	Ea.	\$ 515.00	\$ 645.00	1.095	\$ 706.28	0.97
1.000	D2093 910 1010	General maintenance pipe & fittings, industrial gas	2	1 Plum	M.L.F.	\$ 32.50	\$ 40.50	1.095	\$ 44.35	0.97
1.000	D2093 940 1010	General maintenance pipe & fittings, compressed air	2	1 Plum	M.L.F.	\$ 32.50	\$ 40.50	1.095	\$ 44.35	0.97
1.000	D2013 410 0020	Clean trap sink, iron enamel	3	1 Plum	Ea.	\$ 7.51	\$ 9.39	1.095	\$ 10.28	0.97
1.000	D2013 420 0020	Clean trap sink, enameled steel	3	1 Plum	Ea.	\$ 7.51	\$ 9.39	1.095	\$ 10.28	0.97
1.000	D2013 430 0020	Clean trap sink, stainless steel	3	1 Plum	Ea.	\$ 7.51	\$ 9.39	1.095	\$ 10.28	0.97
1.000	D2013 440 0020	Clean trap sink, plastic	3	1 Plum	Ea.	\$ 7.51	\$ 9.39	1.095	\$ 10.28	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2013 350 0050	Clean out strainer and P trap lavatory, enameled steel	\$ 41.07	1.05	\$ 44.44	0.97	\$ 43.12
1.000	D2013 410 0010	Replace faucet washer sink, iron enamel	\$ 14.75	1.05	\$ 15.96	0.97	\$ 15.49
1.000	D2013 410 0040	Unstop sink sink, iron enamel	\$ 48.88	1.05	\$ 52.89	0.97	\$ 51.32
1.000	D2013 420 0010	Replace faucet washer sink, enameled steel	\$ 14.75	1.05	\$ 15.96	0.97	\$ 15.49
1.000	D2013 420 0040	Unstop sink enameled steel	\$ 48.88	1.05	\$ 52.89	0.97	\$ 51.32
1.000	D2013 430 0010	Replace faucet washer sink, stainless steel	\$ 14.75	1.05	\$ 15.96	0.97	\$ 15.49
1.000	D2013 430 0040	Unstop sink, stainless steel	\$ 48.88	1.05	\$ 52.89	0.97	\$ 51.32
1.000	D2013 440 0010	Replace faucet washer sink, plastic	\$ 14.75	1.05	\$ 15.96	0.97	\$ 15.49
1.000	D2013 440 0040	Unstop, sink, plastic	\$ 48.88	1.05	\$ 52.89	0.97	\$ 51.32
1.000	D2013 450 0020	Replace washer in faucet laundry sink, plastic	\$ 14.75	1.05	\$ 15.96	0.97	\$ 15.49
1.000	D2013 450 0050	Clean out strainer and P trap laundry sink, plastic	\$ 41.07	1.05	\$ 44.44	0.97	\$ 43.12
1.000	D2013 460 0010	Replace faucet washer	\$ 14.75	1.05	\$ 15.96	0.97	\$ 15.49
1.000	D2013 460 0040	Unstop sink	\$ 48.88	1.05	\$ 52.89	0.97	\$ 51.32
1.000	D2013 510 0020	Replace mixing valve barrel bathtub, cast iron enamel	\$ 213.72	1.05	\$ 231.24	0.97	\$ 224.40
1.000	D2013 530 0020	Replace mixing valve barrel bathtub, enameled steel	\$ 213.72	1.05	\$ 231.24	0.97	\$ 224.40
1.000	D2013 550 0020	Replace mixing valve barrel bathtub, fiberglass	\$ 213.72	1.05	\$ 231.24	0.97	\$ 224.40
1.000	D2013 710 0020	Replace mixing valve barrel shower, terrazzo	\$ 213.72	1.05	\$ 231.24	0.97	\$ 224.40
1.000	D2013 730 0020	Replace mixing valve barrel shower, enameled steel	\$ 213.72	1.05	\$ 231.24	0.97	\$ 224.40
1.000	D2013 750 0020	Replace mixing valve barrel shower, fiberglass	\$ 213.72	1.05	\$ 231.24	0.97	\$ 224.40
1.000	D2013 770 0020	Replace mixing valve barrel shower, misc.	\$ 213.72	1.05	\$ 231.24	0.97	\$ 224.40
1.000	D2013 810 0030	Correct water pressure drinking fountain	\$ 48.88	1.05	\$ 52.89	0.97	\$ 51.32
1.000	D2013 810 0040	Replace refrigerant drinking fountain	\$ 28.16	1.05	\$ 30.47	0.97	\$ 29.57
1.000	D2023 214 0010	Minor repairs, adjustments water heater, gas / oil, 1150 GPH	\$ 114.76	1.05	\$ 124.17	0.97	\$ 120.50
1.000	D2023 214 0020	Clean & service water heater, gas / oil, 1150 GPH	\$ 685.40	1.05	\$ 741.59	0.97	\$ 719.67
1.000	D2093 910 1010	General maintenance pipe & fittings, industrial gas	\$ 43.04	1.05	\$ 46.56	0.97	\$ 45.19
1.000	D2093 940 1010	General maintenance pipe & fittings, compressed air	\$ 43.04	1.05	\$ 46.56	0.97	\$ 45.19
			\$ 3,000.81				\$ 3,150.85
			\$ 3,000.81	Assumed 100%		Assumed 100%	\$ 3,150.85
				PER 1 YR		PER 1 YR	
1.000	D2013 410 0020	Clean trap sink, iron enamel	\$ 9.98	1.05	\$ 10.80	0.97	\$ 10.48
1.000	D2013 420 0020	Clean trap sink, enameled steel	\$ 9.98	1.05	\$ 10.80	0.97	\$ 10.48
1.000	D2013 430 0020	Clean trap sink, stainless steel	\$ 9.98	1.05	\$ 10.80	0.97	\$ 10.48
1.000	D2013 440 0020	Clean trap sink, plastic	\$ 9.98	1.05	\$ 10.80	0.97	\$ 10.48

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.05	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2013 460 0020	Clean trap	3	1 Plum	Ea.	\$ 7.51	\$ 9.39	1.095	\$ 10.28	0.97
1.000	D2013 510 0010	Inspect / clean shower head bathtub, cast iron enamel	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 530 0010	Inspect / clean shower head bathtub, enameled steel	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 550 0010	Inspect / clean shower head bathtub, fiberglass	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 710 0010	Inspect / clean shower head shower, terrazzo	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 730 0010	Inspect / clean shower head shower, enameled steel	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 750 0010	Inspect / clean shower head fiberglass	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 770 0010	Inspect / clean shower head	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 910 0020	Inspect and clean shower head emergency shower station	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2013 920 0020	Inspect and clean spray heads, emergency eye wash	3	1 Plum	Ea.	\$ 43.26	\$ 54.02	1.095	\$ 59.15	0.97
1.000	D2023 220 0020	Check operation water heater, electric, 120 gallon	3	1 Plum	Ea.	\$ 2.27	\$ 2.83	1.095	\$ 3.10	0.97
1.000	D2023 222 0020	Check operation water heater, electric, 300 gallon	3	1 Plum	Ea.	\$ 2.27	\$ 2.83	1.095	\$ 3.10	0.97
1.000	D2023 224 0020	Check operation water heater, electric, 1000 gallon	3	1 Plum	Ea.	\$ 2.27	\$ 2.83	1.095	\$ 3.10	0.97
1.000	D2023 226 0020	Check operation water heater, electric, 2000 gallon	3	1 Plum	Ea.	\$ 2.27	\$ 2.83	1.095	\$ 3.10	0.97
1.000	D2013 810 0020	Repair internal leaks drinking fountain	4	1 Plum	Ea.	\$ 39.50	\$ 49.50	1.095	\$ 54.20	0.97
1.000	D2013 810 0050	Repair drain leak drinking fountain	4	1 Plum	Ea.	\$ 25.85	\$ 31.19	1.095	\$ 34.15	0.97
1.000	D2033 310 0010	Clean floor drain w/o bucket	4	1 Plum	Ea.	\$ 103.00	\$ 128.00	1.095	\$ 140.16	0.97
1.000	D2013 110 0020	Unplug clogged line tankless water closet	5	1 Plum	Ea.	\$ 191.32	\$ 239.44	1.095	\$ 262.19	0.97
1.000	D2013 110 0050	Replace wax ring gasket tankless water closet	5	1 Plum	Ea.	\$ 124.82	\$ 155.94	1.095	\$ 170.75	0.97
1.000	D2013 130 0010	Unplug clogged line flush-tank water closet	5	1 Plum	Ea.	\$ 191.32	\$ 239.44	1.095	\$ 262.19	0.97
1.000	D2013 130 0020	Replace washer / diaphragm in ball cock flush-tank water closet	5	1 Plum	Ea.	\$ 15.72	\$ 19.48	1.095	\$ 21.33	0.97
1.000	D2013 210 0020	Unplug line urinal	5	1 Plum	Ea.	\$ 127.32	\$ 159.44	1.095	\$ 174.59	0.97
1.000	D2023 210 0010	Overhaul water heater, gas / oil, 30 gallon	5	1 Plum	Ea.	\$ 102.58	\$ 128.45	1.095	\$ 140.65	0.97
1.000	D2023 212 0010	Overhaul water heater, gas / oil, 70 gallon	5	1 Plum	Ea.	\$ 143.80	\$ 180.22	1.095	\$ 197.34	0.97
1.000	D2023 250 0010	Refill expansion chamber	5	1 Plum	Ea.	\$ 2.52	\$ 3.15	1.095	\$ 3.45	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2013 460 0020	Clean trap	\$ 9.98	1.05	\$ 10.80	0.97	\$ 10.48
1.000	D2013 510 0010	Inspect / clean shower head bathtub, cast iron enamel	\$ 57.40	1.05	\$ 62.11	0.97	\$ 60.27
1.000	D2013 530 0010	Inspect / clean shower head bathtub, enameled steel	\$ 57.40	1.05	\$ 62.11	0.97	\$ 60.27
1.000	D2013 550 0010	Inspect / clean shower head bathtub, fiberglass	\$ 57.40	1.05	\$ 62.11	0.97	\$ 60.27
1.000	D2013 710 0010	Inspect / clean shower head shower, terrazzo	\$ 57.40	1.05	\$ 62.11	0.97	\$ 60.27
1.000	D2013 730 0010	Inspect / clean shower head shower, enameled steel	\$ 57.40	1.05	\$ 62.11	0.97	\$ 60.27
1.000	D2013 750 0010	Inspect / clean shower head fiberglass	\$ 57.40	1.05	\$ 62.11	0.97	\$ 60.27
1.000	D2013 770 0010	Inspect / clean shower head	\$ 57.40	1.05	\$ 62.11	0.97	\$ 60.27
1.000	D2013 910 0020	Inspect and clean shower head emergency shower station	\$ 57.40	1.05	\$ 62.11	0.97	\$ 60.27
1.000	D2013 920 0020	Inspect and clean spray heads, emergency eye wash	\$ 57.40	1.05	\$ 62.11	0.97	\$ 60.27
1.000	D2023 220 0020	Check operation water heater, electric, 120 gallon	\$ 3.01	1.05	\$ 3.25	0.97	\$ 3.16
1.000	D2023 222 0020	Check operation water heater, electric, 300 gallon	\$ 3.01	1.05	\$ 3.25	0.97	\$ 3.16
1.000	D2023 224 0020	Check operation water heater, electric, 1000 gallon	\$ 3.01	1.05	\$ 3.25	0.97	\$ 3.16
1.000	D2023 226 0020	Check operation water heater, electric, 2000 gallon	\$ 3.01	1.05	\$ 3.25	0.97	\$ 3.16
			\$ 578.55				\$ 607.48
			\$ 578.55	Assumed 100%		Assumed 100%	\$ 607.48
				PER 3 YR		PER 3 YR	
1.000	D2013 810 0020	Repair internal leaks drinking fountain	\$ 52.60	1.05	\$ 56.91	0.97	\$ 55.23
1.000	D2013 810 0050	Repair drain leak drinking fountain	\$ 33.14	1.05	\$ 35.86	0.97	\$ 34.80
1.000	D2033 310 0010	Clean floor drain w/o bucket	\$ 136.02	1.05	\$ 147.17	0.97	\$ 142.82
			\$ 221.76				\$ 232.85
			\$ 221.76	Assumed 100%		Assumed 100%	\$ 232.85
				PER 4 YR		PER 4 YR	
1.000	D2013 110 0020	Unplug clogged line tankless water closet	\$ 254.44	1.05	\$ 275.30	0.97	\$ 267.16
1.000	D2013 110 0050	Replace wax ring gasket tankless water closet	\$ 165.71	1.05	\$ 179.29	0.97	\$ 173.99
1.000	D2013 130 0010	Unplug clogged line flush-tank water closet	\$ 254.44	1.05	\$ 275.30	0.97	\$ 267.16
1.000	D2013 130 0020	Replace washer / diaphragm in ball cock flush-tank water closet	\$ 20.70	1.05	\$ 22.40	0.97	\$ 21.74
1.000	D2013 210 0020	Unplug line urinal	\$ 169.43	1.05	\$ 183.32	0.97	\$ 177.90
1.000	D2023 210 0010	Overhaul water heater, gas / oil, 30 gallon	\$ 136.49	1.05	\$ 147.69	0.97	\$ 143.32
1.000	D2023 212 0010	Overhaul water heater, gas / oil, 70 gallon	\$ 191.51	1.05	\$ 207.21	0.97	\$ 201.08
1.000	D2023 250 0010	Refill expansion chamber	\$ 3.35	1.05	\$ 3.62	0.97	\$ 3.51

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.05	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2033 330 0010	Clean out bucket floor drain with bucket	5	1 Plum	Ea.	\$ 258.00	\$ 325.00	1.095	\$ 355.88	0.97
1.000	D2013 210 0010	Replace flush valve diaphragm urinal	7	1 Plum	Ea.	\$ 34.51	\$ 41.39	1.095	\$ 45.32	0.97
1.000	D2013 310 0010	Replace washer in spud connection lavatory, iron, enamel	7	1 Plum	Ea.	\$ 21.74	\$ 25.46	1.095	\$ 27.88	0.97
1.000	D2013 330 0010	Replace washer in spud connection lavatory, vitreous china	7	1 Plum	Ea.	\$ 25.80	\$ 30.54	1.095	\$ 33.44	0.97
1.000	D2013 350 0010	Replace washer in spud connection lavatory, enameled steel	7	1 Plum	Ea.	\$ 26.01	\$ 30.80	1.095	\$ 33.73	0.97
1.000	D2023 220 0010	Drain and flush water heater, electric, 120 gallon	7	1 Plum	Ea.	\$ 258.00	\$ 325.00	1.095	\$ 355.88	0.97
1.000	D2023 222 0010	Drain and flush water heater, electric, 300 gallon	7	1 Plum	Ea.	\$ 258.00	\$ 325.00	1.095	\$ 355.88	0.97
1.000	D2023 224 0010	Drain and flush water heater, electric, 1000 gallon	7	1 Plum	Ea.	\$ 258.00	\$ 325.00	1.095	\$ 355.88	0.97
1.000	D2023 226 0010	Drain and flush water heater, electric, 2000 gallon	7	1 Plum	Ea.	\$ 258.00	\$ 325.00	1.095	\$ 355.88	0.97
1.000	D2013 110 0010	Replace flush valve diaphragm tankless water closet	10	1 Plum	Ea.	\$ 34.51	\$ 41.39	1.095	\$ 45.32	0.97
1.000	D2013 310 0040	Replace faucets lavatory, iron, enamel	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 330 0040	Replace faucets lavatory, vitreous china	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 350 0040	Replace faucets lavatory, enameled steel	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 410 0030	Replace faucets sink, iron enamel	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 420 0030	Replace faucets sink, enameled steel	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 430 0030	Replace faucets sink, stainless steel	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 440 0030	Replace faucets sink, plastic	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 450 0040	Replace faucets laundry sink, plastic	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 460 0030	Replace faucets	10	1 Plum	Ea.	\$ 142.60	\$ 173.12	1.095	\$ 189.57	0.97
1.000	D2013 510 0030	Replace mixing valve bathtub, cast iron enamel	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 530 0030	Replace mixing valve bathtub, enameled steel	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 550 0030	Replace mixing valve bathtub, fiberglass	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 710 0030	Replace mixing valve shower, terrazzo	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 730 0030	Replace mixing valve shower, enameled steel	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 750 0030	Replace mixing valve shower, fiberglass	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2033 330 0010	Clean out bucket floor drain with bucket	\$ 345.35	1.05	\$ 373.67	0.97	\$ 362.62
			\$ 1,541.41				\$ 1,618.48
			\$ 1,541.41	Assumed 100%		Assumed 100%	\$ 1,618.48
				PER 5 YR		PER 5 YR	
1.000	D2013 210 0010	Replace flush valve diaphragm urinal	\$ 43.98	1.05	\$ 47.59	0.97	\$ 46.18
1.000	D2013 310 0010	Replace washer in spud connection lavatory, iron, enamel	\$ 27.05	1.05	\$ 29.27	0.97	\$ 28.41
1.000	D2013 330 0010	Replace washer in spud connection lavatory, vitreous china	\$ 32.45	1.05	\$ 35.11	0.97	\$ 34.08
1.000	D2013 350 0010	Replace washer in spud connection lavatory, enameled steel	\$ 32.73	1.05	\$ 35.41	0.97	\$ 34.37
1.000	D2023 220 0010	Drain and flush water heater, electric, 120 gallon	\$ 345.35	1.05	\$ 373.67	0.97	\$ 362.62
1.000	D2023 222 0010	Drain and flush water heater, electric, 300 gallon	\$ 345.35	1.05	\$ 373.67	0.97	\$ 362.62
1.000	D2023 224 0010	Drain and flush water heater, electric, 1000 gallon	\$ 345.35	1.05	\$ 373.67	0.97	\$ 362.62
1.000	D2023 226 0010	Drain and flush water heater, electric, 2000 gallon	\$ 345.35	1.05	\$ 373.67	0.97	\$ 362.62
			\$ 1,517.64				\$ 1,593.52
			\$ 1,517.64	Assumed 100%		Assumed 100%	\$ 1,593.52
				PER 7 YR		PER 7 YR	
1.000	D2013 110 0010	Replace flush valve diaphragm tankless water closet	\$ 43.98	1.05	\$ 47.59	0.97	\$ 46.18
1.000	D2013 310 0040	Replace faucets lavatory, iron, enamel	\$ 183.96	1.05	\$ 199.04	0.97	\$ 193.16
1.000	D2013 330 0040	Replace faucets lavatory, vitreous china	\$ 183.96	1.05	\$ 199.04	0.97	\$ 193.16
1.000	D2013 350 0040	Replace faucets lavatory, enameled steel	\$ 183.96	1.05	\$ 199.04	0.97	\$ 193.16
1.000	D2013 410 0030	Replace faucets sink, iron enamel	\$ 183.96	1.05	\$ 199.04	0.97	\$ 193.16
1.000	D2013 420 0030	Replace faucets sink, enameled steel	\$ 183.96	1.05	\$ 199.04	0.97	\$ 193.16
1.000	D2013 430 0030	Replace faucets sink, stainless steel	\$ 183.96	1.05	\$ 199.04	0.97	\$ 193.16
1.000	D2013 440 0030	Replace faucets sink, plastic	\$ 183.96	1.05	\$ 199.04	0.97	\$ 193.16
1.000	D2013 450 0040	Replace faucets laundry sink, plastic	\$ 183.96	1.05	\$ 199.04	0.97	\$ 193.16
1.000	D2013 460 0030	Replace faucets	\$ 183.96	1.05	\$ 199.04	0.97	\$ 193.16
1.000	D2013 510 0030	Replace mixing valve bathtub, cast iron enamel	\$ 417.21	1.05	\$ 451.41	0.97	\$ 438.07
1.000	D2013 530 0030	Replace mixing valve bathtub, enameled steel	\$ 417.21	1.05	\$ 451.41	0.97	\$ 438.07
1.000	D2013 550 0030	Replace mixing valve bathtub, fiberglass	\$ 417.21	1.05	\$ 451.41	0.97	\$ 438.07
1.000	D2013 710 0030	Replace mixing valve shower, terrazzo	\$ 417.21	1.05	\$ 451.41	0.97	\$ 438.07
1.000	D2013 730 0030	Replace mixing valve shower, enameled steel	\$ 417.21	1.05	\$ 451.41	0.97	\$ 438.07
1.000	D2013 750 0030	Replace mixing valve shower, fiberglass	\$ 417.21	1.05	\$ 451.41	0.97	\$ 438.07

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.05	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2013 770 0030	Replace mixing valve shower, misc.	10	1 Plum	Ea.	\$ 326.10	\$ 392.62	1.095	\$ 429.92	0.97
1.000	D2013 770 0070	Replace shower head with water conserving head	10	1 Plum	Ea.	\$ 127.67	\$ 149.29	1.095	\$ 163.47	0.97
1.000	D2013 810 0070	Replace fountain drinking fountain	10	2 Plum	Ea.	\$ 1,086.00	\$ 1,289.00	1.095	\$ 1,411.46	0.97
1.000	D2023 110 0010	Resolder joint pipe & fittings, copper	10	1 Plum	Ea.	\$ 37.94	\$ 47.30	1.095	\$ 51.79	0.97
1.000	D2023 130 0010	Reglue joint, install 1" tee solar piping: pipe & fittings, PVC	10	1 Plum	Ea.	\$ 65.15	\$ 81.65	1.095	\$ 89.41	0.97
1.000	D2023 130 0110	Reglue joint, install 1-1/4" tee solar piping: pipe & fittings, PVC	10	1 Plum	Ea.	\$ 71.15	\$ 88.65	1.095	\$ 97.07	0.97
1.000	D2023 130 0210	Reglue joint, install 1-1/2" tee solar piping: pipe & fittings, PVC	10	1 Plum	Ea.	\$ 77.65	\$ 96.65	1.095	\$ 105.83	0.97
1.000	D2023 130 0310	Reglue joint, install 2" tee solar piping: pipe & fittings, PVC	10	Q1	Ea.	\$ 82.65	\$ 103.15	1.095	\$ 112.95	0.97
1.000	D2023 150 0020	Replace old valve, non-drain, less than 1-1/2"	10	1 Plum	Ea.	\$ 322.00	\$ 372.50	1.095	\$ 407.89	0.97
1.000	D2023 152 0020	Replace old valve, non-drain, 2"	10	1 Plum	Ea.	\$ 1,396.50	\$ 1,608.00	1.095	\$ 1,760.76	0.97
1.000	D2023 154 0020	Replace old valve, non-drain, 3"	10	1 Plum	Ea.	\$ 1,396.50	\$ 1,608.00	1.095	\$ 1,760.76	0.97
1.000	D2023 156 0020	Replace old valve, non-drain, 4"	10	2 Plum	Ea.	\$ 1,690.00	\$ 1,990.00	1.095	\$ 2,179.05	0.97
1.000	D2023 156 0030	Replace old valve, non-drain, 6"	10	2 Plum	Ea.	\$ 2,528.00	\$ 2,970.00	1.095	\$ 3,252.15	0.97
1.000	D2023 156 0040	Replace old valve, non-drain, 8"	10	2 Plum	Ea.	\$ 3,758.00	\$ 4,366.00	1.095	\$ 4,780.77	0.97
1.000	D2023 156 0050	Replace old valve, non-drain, 10"	10	3 Plum	Ea.	\$ 5,953.00	\$ 6,904.00	1.095	\$ 7,559.88	0.97
1.000	D2023 210 0030	Replace water heater, gas / oil, 30 gallon	10	2 Plum	Ea.	\$ 1,506.95	\$ 1,777.45	1.095	\$ 1,946.31	0.97
1.000	D2023 250 0020	Remove old chamber, install new expansion chamber	10	1 Plum	Ea.	\$ 625.00	\$ 720.00	1.095	\$ 788.40	0.97
1.000	D2023 260 0030	Replace pump / motor assembly circulation pump, 1/12 HP	10	2 Plum	Ea.	\$ 846.00	\$ 996.00	1.095	\$ 1,090.62	0.97
1.000	D2023 310 0020	Replace old valve with new hose bibb	10	1 Plum	Ea.	\$ 51.00	\$ 62.45	1.095	\$ 68.38	0.97
1.000	D2033 110 0020	Unclog main drain pipe & fittings, cast iron	10	1 Plum	Ea.	\$ 40.50	\$ 51.00	1.095	\$ 55.85	0.97
1.000	D2033 130 0020	Unclog main drain pipe, PVC	10	1 Plum	M.L.F.	\$ 40.50	\$ 51.00	1.095	\$ 55.85	0.97
1.000	D2033 130 0040	Repair joint pipe and fittings, PVC	10	1 Plum	Ea.	\$ 131.55	\$ 164.15	1.095	\$ 179.74	0.97
1.000	D2033 305 3010	Unclog floor drain per M.L.F. pipe	10	1 Plum	Ea.	\$ 285.50	\$ 352.50	1.095	\$ 385.99	0.97
1.000	D2033 305 3020	Unclog main drain per M.L.F. pipe	10	1 Plum	Ea.	\$ 40.50	\$ 50.50	1.095	\$ 55.30	0.97
1.000	D2023 212 0030	Replace water heater, gas / oil, 70 gallon	12	2 Plum	Ea.	\$ 2,518.00	\$ 2,935.00	1.095	\$ 3,213.83	0.97
1.000	D2093 920 1010	Resolder joint pipe & fittings, anesthesia	12	1 Plum	Ea.	\$ 45.44	\$ 56.30	1.095	\$ 61.65	0.97
1.000	D2093 930 1010	Resolder joint pipe & fittings, oxygen	12	1 Plum	Ea.	\$ 60.65	\$ 75.50	1.095	\$ 82.67	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2013 770 0030	Replace mixing valve shower, misc.	\$ 417.21	1.05	\$ 451.41	0.97	\$ 438.07
1.000	D2013 770 0070	Replace shower head with water conserving head	\$ 158.64	1.05	\$ 171.65	0.97	\$ 166.57
1.000	D2013 810 0070	Replace fountain drinking fountain	\$ 1,369.73	1.05	\$ 1,482.03	0.97	\$ 1,438.21
1.000	D2023 110 0010	Resolder joint pipe & fittings, copper	\$ 50.26	1.05	\$ 54.38	0.97	\$ 52.78
1.000	D2023 130 0010	Reglue joint, install 1" tee solar piping: pipe & fittings, PVC	\$ 86.76	1.05	\$ 93.88	0.97	\$ 91.10
1.000	D2023 130 0110	Reglue joint, install 1-1/4" tee solar piping: pipe & fittings, PVC	\$ 94.20	1.05	\$ 101.93	0.97	\$ 98.91
1.000	D2023 130 0210	Reglue joint, install 1-1/2" tee solar piping: pipe & fittings, PVC	\$ 102.70	1.05	\$ 111.12	0.97	\$ 107.84
1.000	D2023 130 0310	Reglue joint, install 2" tee solar piping: pipe & fittings, PVC	\$ 109.61	1.05	\$ 118.60	0.97	\$ 115.09
1.000	D2023 150 0020	Replace old valve, non-drain, less than 1-1/2"	\$ 395.83	1.05	\$ 428.28	0.97	\$ 415.62
1.000	D2023 152 0020	Replace old valve, non-drain, 2"	\$ 1,708.71	1.05	\$ 1,848.80	0.97	\$ 1,794.14
1.000	D2023 154 0020	Replace old valve, non-drain, 3"	\$ 1,708.71	1.05	\$ 1,848.80	0.97	\$ 1,794.14
1.000	D2023 156 0020	Replace old valve, non-drain, 4"	\$ 2,114.63	1.05	\$ 2,288.00	0.97	\$ 2,220.36
1.000	D2023 156 0030	Replace old valve, non-drain, 6"	\$ 3,156.01	1.05	\$ 3,414.76	0.97	\$ 3,313.81
1.000	D2023 156 0040	Replace old valve, non-drain, 8"	\$ 4,639.44	1.05	\$ 5,019.81	0.97	\$ 4,871.41
1.000	D2023 156 0050	Replace old valve, non-drain, 10"	\$ 7,336.39	1.05	\$ 7,937.87	0.97	\$ 7,703.21
1.000	D2023 210 0030	Replace water heater, gas / oil, 30 gallon	\$ 1,888.77	1.05	\$ 2,043.62	0.97	\$ 1,983.21
1.000	D2023 250 0020	Remove old chamber, install new expansion chamber	\$ 765.09	1.05	\$ 827.82	0.97	\$ 803.35
1.000	D2023 260 0030	Replace pump / motor assembly circulation pump, 1/12 HP	\$ 1,058.38	1.05	\$ 1,145.15	0.97	\$ 1,111.30
1.000	D2023 310 0020	Replace old valve with new hose bibb	\$ 66.36	1.05	\$ 71.80	0.97	\$ 69.68
1.000	D2033 110 0020	Unclog main drain pipe & fittings, cast iron	\$ 54.19	1.05	\$ 58.64	0.97	\$ 56.90
1.000	D2033 130 0020	Unclog main drain pipe, PVC	\$ 54.19	1.05	\$ 58.64	0.97	\$ 56.90
1.000	D2033 130 0040	Repair joint pipe and fittings, PVC	\$ 174.43	1.05	\$ 188.73	0.97	\$ 183.15
1.000	D2033 305 3010	Unclog floor drain per M.L.F. pipe	\$ 374.58	1.05	\$ 405.29	0.97	\$ 393.31
1.000	D2033 305 3020	Unclog main drain per M.L.F. pipe	\$ 53.66	1.05	\$ 58.06	0.97	\$ 56.35
			\$ 32,141.38				\$ 33,748.45
			\$ 32,141.38	Assumed 100%		Assumed 100%	\$ 33,748.45
				PER 10 YR		PER 10 YR	
1.000	D2023 212 0030	Replace water heater, gas / oil, 70 gallon	\$ 3,118.81	1.05	\$ 3,374.52	0.97	\$ 3,274.76
1.000	D2093 920 1010	Resolder joint pipe & fittings, anesthesia	\$ 59.83	1.05	\$ 64.73	0.97	\$ 62.82
1.000	D2093 930 1010	Resolder joint pipe & fittings, oxygen	\$ 80.23	1.05	\$ 86.81	0.97	\$ 84.24
			\$ 3,258.87				\$ 3,421.81
			\$ 3,258.87	Assumed 100%		Assumed 100%	\$ 3,421.81

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.05	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2023 320 0010	Overhaul water meter	13	1 Plum	Ea.	\$ 33.00	\$ 39.50	1.095	\$ 43.25	0.97
1.000	D2013 130 0030	Replace valve and ball cock assembly flush-tank water closet	15	1 Plum	Ea.	\$ 83.77	\$ 102.79	1.095	\$ 112.56	0.97
1.000	D2013 440 0060	Replace sink and fittings, polyethylene sink, plastic	15	2 Plum	Ea.	\$ 1,951.00	\$ 2,277.00	1.095	\$ 2,493.32	0.97
1.000	D2023 160 0020	Remove old insulation & replace with new, pipe 1/2", wall 1"	15	1 Plum	L.F.	\$ 7.25	\$ 8.90	1.095	\$ 9.75	0.97
1.000	D2023 160 0030	Remove old insulation & replace with new, pipe 3/4", wall 1"	15	1 Plum	L.F.	\$ 7.55	\$ 9.25	1.095	\$ 10.13	0.97
1.000	D2023 160 0040	Remove old insulation & replace with new, pipe 1-1/2", wall 1"	15	1 Plum	L.F.	\$ 8.30	\$ 10.15	1.095	\$ 11.11	0.97
1.000	D2023 160 0050	Remove old insulation & replace with new, pipe 1/2", wall 3/4"	15	1 Plum	L.F.	\$ 9.60	\$ 11.80	1.095	\$ 12.92	0.97
1.000	D2023 160 0060	Remove old insulation & replace with new, pipe 3/4", wall 3/4"	15	1 Plum	L.F.	\$ 9.85	\$ 12.10	1.095	\$ 13.25	0.97
1.000	D2023 160 0070	Remove old insulation & replace with new, pipe 1-1/2", wall 3/4"	15	1 Plum	L.F.	\$ 11.00	\$ 13.45	1.095	\$ 14.73	0.97
1.000	D2023 220 0030	Replace water heater, electric, 120 gallon	15	2 Plum	Ea.	\$ 9,305.00	\$ 10,650.00	1.095	\$ 11,661.75	0.97
1.000	D2023 222 0030	Replace water heater, electric, 300 gallon	15	2 Plum	Ea.	\$ 38,365.00	\$ 43,780.00	1.095	\$ 47,939.10	0.97
1.000	D2023 224 0030	Replace water heater, electric, 1000 gallon	15	2 Plum	Ea.	\$ 85,850.00	\$ 98,175.00	1.095	\$ 107,501.63	0.97
1.000	D2023 226 0030	Replace water heater, electric, 2000 gallon	15	2 Plum	Ea.	\$ 123,875.00	\$ 141,350.00	1.095	\$ 154,778.25	0.97
1.000	D2023 370 0030	Replace water softener	15	2 Plum	Ea.	\$ 1,318.00	\$ 1,560.00	1.095	\$ 1,708.20	0.97
1.000	D2013 110 0015	Rebuild flush valve tankless water closet	20	1 Plum	Ea.	\$ 155.17	\$ 186.83	1.095	\$ 204.58	0.97
1.000	D2013 130 0040	Install gasket between tank and bowl flush-tank water closet	20	1 Plum	Ea.	\$ 34.66	\$ 43.22	1.095	\$ 47.33	0.97
1.000	D2013 210 0015	Rebuild flush valve urinal	20	1 Plum	Ea.	\$ 155.17	\$ 186.83	1.095	\$ 204.58	0.97
1.000	D2013 450 0060	Replace laundry sink ,plastic	20	2 Plum	Ea.	\$ 550.43	\$ 667.78	1.095	\$ 731.22	0.97
1.000	D2013 550 0070	Replace bathtub, fiberglass	20	2 Plum	Ea.	\$ 1,276.00	\$ 1,514.00	1.095	\$ 1,657.83	0.97
1.000	D2013 750 0060	Replace shower and fittings, fiberglass	20	2 Plum	Ea.	\$ 1,027.00	\$ 1,220.00	1.095	\$ 1,335.90	0.97
1.000	D2013 770 0120	Replace shower, C.M.U.	20	D8	Ea.	\$ 878.00	\$ 1,061.00	1.095	\$ 1,161.80	0.97
1.000	D2023 110 0020	Replace pipe and fittings, copper 3/4"	20	2 Plum	L.F.	\$ 20.23	\$ 24.60	1.095	\$ 26.94	0.97
1.000	D2023 130 1020	Install 10' section PVC 1" diameter solar piping	20	1 Plum	Ea.	\$ 299.40	\$ 370.75	1.095	\$ 405.97	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor PER 12 YR	TOTAL with Green Factor	De-Escalation Factor PER 12 YR	Total Green with All Adjustments
1.000	D2023 320 0010	Overhaul water meter	\$ 41.97	1.05	\$ 45.42	0.97	\$ 44.07
			\$ 41.97				\$ 44.07
			\$ 41.97	Assumed 100%		Assumed 100%	\$ 44.07
				PER 12 YR		PER 12 YR	
1.000	D2013 130 0030	Replace valve and ball cock assembly flush-tank water closet	\$ 109.23	1.05	\$ 118.18	0.97	\$ 114.69
1.000	D2013 440 0060	Replace sink and fittings, polyethylene sink, plastic	\$ 2,419.61	1.05	\$ 2,617.98	0.97	\$ 2,540.59
1.000	D2023 160 0020	Remove old insulation & replace with new, pipe 1/2", wall 1"	\$ 9.46	1.05	\$ 10.23	0.97	\$ 9.93
1.000	D2023 160 0030	Remove old insulation & replace with new, pipe 3/4", wall 1"	\$ 9.83	1.05	\$ 10.64	0.97	\$ 10.32
1.000	D2023 160 0040	Remove old insulation & replace with new, pipe 1-1/2", wall 1"	\$ 10.79	1.05	\$ 11.67	0.97	\$ 11.32
1.000	D2023 160 0050	Remove old insulation & replace with new, pipe 1/2", wall 3/4"	\$ 12.54	1.05	\$ 13.57	0.97	\$ 13.17
1.000	D2023 160 0060	Remove old insulation & replace with new, pipe 3/4", wall 3/4"	\$ 12.86	1.05	\$ 13.91	0.97	\$ 13.50
1.000	D2023 160 0070	Remove old insulation & replace with new, pipe 1-1/2", wall 3/4"	\$ 14.29	1.05	\$ 15.46	0.97	\$ 15.01
1.000	D2023 220 0030	Replace water heater, electric, 120 gallon	\$ 11,316.99	1.05	\$ 12,244.84	0.97	\$ 11,882.84
1.000	D2023 222 0030	Replace water heater, electric, 300 gallon	\$ 46,521.88	1.05	\$ 50,336.06	0.97	\$ 48,847.97
1.000	D2023 224 0030	Replace water heater, electric, 1000 gallon	\$ 104,323.55	1.05	\$ 112,876.71	0.97	\$ 109,539.73
1.000	D2023 226 0030	Replace water heater, electric, 2000 gallon	\$ 150,202.54	1.05	\$ 162,517.16	0.97	\$ 157,712.67
1.000	D2023 370 0030	Replace water softener	\$ 1,657.70	1.05	\$ 1,793.61	0.97	\$ 1,740.59
			\$ 316,621.26				\$ 332,452.32
			\$ 316,621.26	Assumed 100%		Assumed 100%	\$ 332,452.32
				PER 15 YR		PER 15 YR	
1.000	D2013 110 0015	Rebuild flush valve tankless water closet	\$ 198.53	1.05	\$ 214.81	0.97	\$ 208.46
1.000	D2013 130 0040	Install gasket between tank and bowl flush-tank water closet	\$ 45.93	1.05	\$ 49.69	0.97	\$ 48.22
1.000	D2013 210 0015	Rebuild flush valve urinal	\$ 198.53	1.05	\$ 214.81	0.97	\$ 208.46
1.000	D2013 450 0060	Replace laundry sink ,plastic	\$ 709.60	1.05	\$ 767.78	0.97	\$ 745.08
1.000	D2013 550 0070	Replace bathtub, fiberglass	\$ 1,608.82	1.05	\$ 1,740.72	0.97	\$ 1,689.26
1.000	D2013 750 0060	Replace shower and fittings, fiberglass	\$ 1,296.41	1.05	\$ 1,402.70	0.97	\$ 1,361.23
1.000	D2013 770 0120	Replace shower, C.M.U.	\$ 1,127.45	1.05	\$ 1,219.88	0.97	\$ 1,183.82
1.000	D2023 110 0020	Replace pipe and fittings, copper 3/4"	\$ 26.14	1.05	\$ 28.28	0.97	\$ 27.45
1.000	D2023 130 1020	Install 10' section PVC 1" diameter solar piping	\$ 393.97	1.05	\$ 426.27	0.97	\$ 413.67

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.05	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2023 130 1120	Install 10' PVC 1-1/4" diameter solar piping	20	1 Plum	Ea.	\$ 331.40	\$ 411.75	1.095	\$ 450.87	0.97
1.000	D2023 130 1220	Install 10' PVC 1-1/2" diameter solar piping	20	1 Plum	Ea.	\$ 384.40	\$ 478.75	1.095	\$ 524.23	0.97
1.000	D2023 130 1320	Install 10' section PVC 2" diameter solar piping	20	Q1	Ea.	\$ 428.40	\$ 524.75	1.095	\$ 574.60	0.97
1.000	D2023 214 0030	Replace water heater, gas / oil, 1150 GPH	20	2 Plum	Ea.	\$ 31,800.00	\$ 36,700.00	1.095	\$ 40,186.50	0.97
1.000	D2023 230 0030	Replace steam converter	20	2 Plum	Ea.	\$ 2,212.00	\$ 2,540.00	1.095	\$ 2,781.30	0.97
1.000	D2023 245 0010	Replace 1000 gallon solar storage tank	20	Q9	Ea.	\$ 6,895.00	\$ 7,980.00	1.095	\$ 8,738.10	0.97
1.000	D2023 261 0030	Replace pump / motor assembly circulation pump, 1/8 HP	20	2 Plum	Ea.	\$ 1,251.00	\$ 1,451.00	1.095	\$ 1,588.85	0.97
1.000	D2023 262 0030	Replace pump / motor assembly circulation pump, 1/6 HP	20	2 Plum	Ea.	\$ 1,509.00	\$ 1,743.00	1.095	\$ 1,908.59	0.97
1.000	D2023 264 0030	Replace pump / motor assembly, partial circulation pump, 1/2 HP	20	2 Plum	Ea.	\$ 2,651.00	\$ 3,064.00	1.095	\$ 3,355.08	0.97
1.000	D2023 266 0040	Replace pump / motor assembly circulation pump, bronze 1 HP	20	2 Plum	Ea.	\$ 4,351.00	\$ 5,014.00	1.095	\$ 5,490.33	0.97
1.000	D2023 267 0040	Replace pump / motor assembly circulation pump, CI 1-1/2 HP	20	2 Plum	Ea.	\$ 2,251.00	\$ 2,589.00	1.095	\$ 2,834.96	0.97
1.000	D2033 130 0010	Unclog floor drain, PVC	20	1 Plum	Ea.	\$ 42.00	\$ 52.50	1.095	\$ 57.49	0.97
1.000	D2043 110 1020	Replace pipe or gutter distribution	20	1 Plum	L.F.	\$ 53.10	\$ 64.75	1.095	\$ 70.90	0.97
1.000	D2043 310 1030	Replace rainwater sump pump / motor assembly	20	2 Plum	Ea.	\$ 479.00	\$ 570.00	1.095	\$ 624.15	0.97

1.000	D2013 110 0040	Replace tankless flush valve	25	1 Plum	Ea.	\$ 262.67	\$ 306.83	1.095	\$ 335.98	0.97
1.000	D2013 770 0060	Replace shower and fittings, aluminum	25	2 Plum	Ea.	\$ 1,027.00	\$ 1,220.00	1.095	\$ 1,335.90	0.97
1.000	D2013 770 0200	Replace shower, glazed C.M.U.	25	D8	Ea.	\$ 1,398.00	\$ 1,673.00	1.095	\$ 1,831.94	0.97
1.000	D2013 910 0030	Replace shower emergency shower station	25	2 Plum	Ea.	\$ 826.00	\$ 989.00	1.095	\$ 1,082.96	0.97
1.000	D2013 920 0030	Replace eye wash station, emergency eye wash	25	2 Plum	Ea.	\$ 871.00	\$ 1,039.00	1.095	\$ 1,137.71	0.97
1.000	D2023 110 0030	Replace pipe and fittings, copper 1"	25	2 Plum	L.F.	\$ 23.58	\$ 28.35	1.095	\$ 31.04	0.97
1.000	D2023 110 0050	Replace pipe and fittings, copper 1-1/2"	25	2 Plum	L.F.	\$ 34.20	\$ 41.40	1.095	\$ 45.33	0.97
1.000	D2023 110 0060	Replace pipe and fittings, copper 2"	25	2 Plum	L.F.	\$ 47.40	\$ 56.50	1.095	\$ 61.87	0.97
1.000	D2023 110 0070	Replace pipe and fittings, copper 4"	25	2 Plum	L.F.	\$ 127.90	\$ 150.90	1.095	\$ 165.24	0.97
1.000	D2023 110 0080	Replace pipe and fittings, copper 8"	25	2 Plum	L.F.	\$ 657.00	\$ 757.00	1.095	\$ 828.92	0.97
1.000	D2023 120 0010	Install new gasket, 4" pipe size, steel/iron	25	1 Plum	Ea.	\$ 169.50	\$ 210.50	1.095	\$ 230.50	0.97
1.000	D2023 320 0020	Remove old meter, install new water meter 5/8"	25	1 Plum	Ea.	\$ 109.00	\$ 131.00	1.095	\$ 143.45	0.97
1.000	D2023 320 0025	Remove old meter, install new water meter 3/4"	25	1 Plum	Ea.	\$ 156.00	\$ 186.00	1.095	\$ 203.67	0.97
1.000	D2023 320 0030	Remove old meter, install new water meter 1"	25	1 Plum	Ea.	\$ 212.00	\$ 250.00	1.095	\$ 273.75	0.97
1.000	D2023 320 0035	Remove old meter, install new water meter 1-1/2"	25	1 Plum	Ea.	\$ 437.00	\$ 512.50	1.095	\$ 561.19	0.97
1.000	D2023 320 0040	Remove old meter, install new water meter 2"	25	1 Plum	Ea.	\$ 591.00	\$ 690.00	1.095	\$ 755.55	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2023 130 1120	Install 10' PVC 1-1/4" diameter solar piping	\$ 437.54	1.05	\$ 473.41	0.97	\$ 459.41
1.000	D2023 130 1220	Install 10' PVC 1-1/2" diameter solar piping	\$ 508.73	1.05	\$ 550.44	0.97	\$ 534.17
1.000	D2023 130 1320	Install 10' section PVC 2" diameter solar piping	\$ 557.61	1.05	\$ 603.33	0.97	\$ 585.50
1.000	D2023 214 0030	Replace water heater, gas / oil, 1150 GPH	\$ 38,998.47	1.05	\$ 42,195.83	0.97	\$ 40,948.39
1.000	D2023 230 0030	Replace steam converter	\$ 2,699.08	1.05	\$ 2,920.37	0.97	\$ 2,834.03
1.000	D2023 245 0010	Replace 1000 gallon solar storage tank	\$ 8,479.78	1.05	\$ 9,175.01	0.97	\$ 8,903.76
1.000	D2023 261 0030	Replace pump / motor assembly circulation pump, 1/8 HP	\$ 1,541.87	1.05	\$ 1,668.29	0.97	\$ 1,618.97
1.000	D2023 262 0030	Replace pump / motor assembly circulation pump, 1/6 HP	\$ 1,852.16	1.05	\$ 2,004.01	0.97	\$ 1,944.77
1.000	D2023 264 0030	Replace pump / motor assembly, partial circulation pump, 1/2 HP	\$ 3,255.89	1.05	\$ 3,522.83	0.97	\$ 3,418.69
1.000	D2023 266 0040	Replace pump / motor assembly circulation pump, bronze 1 HP	\$ 5,328.02	1.05	\$ 5,764.85	0.97	\$ 5,594.42
1.000	D2023 267 0040	Replace pump / motor assembly circulation pump, CI 1-1/2 HP	\$ 2,751.15	1.05	\$ 2,976.70	0.97	\$ 2,888.70
1.000	D2033 130 0010	Unclog floor drain, PVC	\$ 55.79	1.05	\$ 60.36	0.97	\$ 58.58
1.000	D2043 110 1020	Replace pipe or gutter distribution	\$ 68.81	1.05	\$ 74.45	0.97	\$ 72.25
1.000	D2043 310 1030	Replace rainwater sump pump / motor assembly	\$ 605.70	1.05	\$ 655.36	0.97	\$ 635.98
			\$ 72,745.96				\$ 76,383.26
			\$ 72,745.96	Assumed 100%		Assumed 100%	\$ 76,383.26
				PER 20 YR		PER 20 YR	
1.000	D2013 110 0040	Replace tankless flush valve	\$ 326.05	1.05	\$ 352.78	0.97	\$ 342.35
1.000	D2013 770 0060	Replace shower and fittings, aluminum	\$ 1,296.41	1.05	\$ 1,402.70	0.97	\$ 1,361.23
1.000	D2013 770 0200	Replace shower, glazed C.M.U.	\$ 1,777.78	1.05	\$ 1,923.53	0.97	\$ 1,866.67
1.000	D2013 910 0030	Replace shower emergency shower station	\$ 1,050.94	1.05	\$ 1,137.10	0.97	\$ 1,103.49
1.000	D2013 920 0030	Replace eye wash station, emergency eye wash	\$ 1,104.07	1.05	\$ 1,194.59	0.97	\$ 1,159.27
1.000	D2023 110 0030	Replace pipe and fittings, copper 1"	\$ 30.13	1.05	\$ 32.60	0.97	\$ 31.63
1.000	D2023 110 0050	Replace pipe and fittings, copper 1-1/2"	\$ 43.99	1.05	\$ 47.60	0.97	\$ 46.19
1.000	D2023 110 0060	Replace pipe and fittings, copper 2"	\$ 60.04	1.05	\$ 64.96	0.97	\$ 63.04
1.000	D2023 110 0070	Replace pipe and fittings, copper 4"	\$ 160.35	1.05	\$ 173.50	0.97	\$ 168.37
1.000	D2023 110 0080	Replace pipe and fittings, copper 8"	\$ 804.41	1.05	\$ 870.36	0.97	\$ 844.63
1.000	D2023 120 0010	Install new gasket, 4" pipe size, steel/iron	\$ 223.68	1.05	\$ 242.02	0.97	\$ 234.87
1.000	D2023 320 0020	Remove old meter, install new water meter 5/8"	\$ 139.20	1.05	\$ 150.62	0.97	\$ 146.16
1.000	D2023 320 0025	Remove old meter, install new water meter 3/4"	\$ 197.65	1.05	\$ 213.85	0.97	\$ 207.53
1.000	D2023 320 0030	Remove old meter, install new water meter 1"	\$ 265.66	1.05	\$ 287.44	0.97	\$ 278.94
1.000	D2023 320 0035	Remove old meter, install new water meter 1-1/2"	\$ 544.60	1.05	\$ 589.25	0.97	\$ 571.83
1.000	D2023 320 0040	Remove old meter, install new water meter 2"	\$ 733.21	1.05	\$ 793.33	0.97	\$ 769.87

Costs Reflect National Averages										
Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.05	Assumed Value								NON GREEN
Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2023 320 0045	Remove old meter, install new water meter 3"	25	Q1	Ea.	\$ 3,501.00	\$ 4,027.00	1.095	\$ 4,409.57	0.97
1.000	D2023 320 0050	Remove old meter, install new water meter 4"	25	Q1	Ea.	\$ 5,825.00	\$ 6,755.00	1.095	\$ 7,396.73	0.97
1.000	D2023 320 0055	Remove old meter, install new water meter 6"	25	Q1	Ea.	\$ 9,155.00	\$ 10,605.00	1.095	\$ 11,612.48	0.97
1.000	D2023 320 0060	Remove old meter, install new water meter 8"	25	Q1	Ea.	\$ 13,855.00	\$ 15,945.00	1.095	\$ 17,459.78	0.97
1.000	D2093 920 1030	Replace pipe and fittings, anesthesia	25	2 Plum	L.F.	\$ 20.12	\$ 24.45	1.095	\$ 26.77	0.97
1.000	D2093 930 1030	Replace pipe and fittings, oxygen	25	2 Plum	L.F.	\$ 20.12	\$ 24.45	1.095	\$ 26.77	0.97
1.000	D2093 946 1030	Replace 2 H.P. compressor	25	2 Plum	Ea.	\$ 4,567.00	\$ 5,285.00	1.095	\$ 5,787.08	0.97
1.000	D2093 946 3030	Replace 10 H.P. compressor	25	2 Plum	Ea.	\$ 9,525.00	\$ 11,150.00	1.095	\$ 12,209.25	0.97
1.000	D2093 946 4030	Replace 25 H.P. compressor	25	2 Plum	Ea.	\$ 18,150.00	\$ 21,250.00	1.095	\$ 23,268.75	0.97
1.000	D2013 710 0060	Replace terrazzo shower surface	30	2 Plum	Ea.	\$ 1,102.00	\$ 1,322.00	1.095	\$ 1,447.59	0.97
1.000	D2013 770 0280	Replace shower surface, ceramic tile	30	D7	Ea.	\$ 757.00	\$ 923.00	1.095	\$ 1,010.69	0.97
1.000	D2023 130 2030	Replace 1000' PVC pipe 1" diameter solar piping	30	1 Plum	M.L.F.	\$ 24,840.00	\$ 30,775.00	1.095	\$ 33,698.63	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2023 320 0045	Remove old meter, install new water meter 3"	\$ 4,279.20	1.05	\$ 4,630.04	0.97	\$ 4,493.17
1.000	D2023 320 0050	Remove old meter, install new water meter 4"	\$ 7,178.06	1.05	\$ 7,766.56	0.97	\$ 7,536.96
1.000	D2023 320 0055	Remove old meter, install new water meter 6"	\$ 11,269.18	1.05	\$ 12,193.10	0.97	\$ 11,832.63
1.000	D2023 320 0060	Remove old meter, install new water meter 8"	\$ 16,943.61	1.05	\$ 18,332.76	0.97	\$ 17,790.79
1.000	D2093 920 1030	Replace pipe and fittings, anesthesia	\$ 25.98	1.05	\$ 28.11	0.97	\$ 27.28
1.000	D2093 930 1030	Replace pipe and fittings, oxygen	\$ 25.98	1.05	\$ 28.11	0.97	\$ 27.28
1.000	D2093 946 1030	Replace 2 H.P. compressor	\$ 5,615.99	1.05	\$ 6,076.43	0.97	\$ 5,896.79
1.000	D2093 946 3030	Replace 10 H.P. compressor	\$ 11,848.31	1.05	\$ 12,819.71	0.97	\$ 12,440.72
1.000	D2093 946 4030	Replace 25 H.P. compressor	\$ 22,580.86	1.05	\$ 24,432.19	0.97	\$ 23,709.90
			\$ 88,525.33				\$ 92,951.59
			\$ 88,525.33	Assumed 100%		Assumed 100%	\$ 92,951.59
				PER 25 YR		PER 25 YR	
1.000	D2013 710 0060	Replace terrazzo shower surface	\$ 1,404.79	1.05	\$ 1,519.97	0.97	\$ 1,475.03
1.000	D2013 770 0280	Replace shower surface, ceramic tile	\$ 980.81	1.05	\$ 1,061.22	0.97	\$ 1,029.85
1.000	D2023 130 2030	Replace 1000' PVC pipe 1" diameter solar piping	\$ 32,702.39	1.05	\$ 35,383.56	0.97	\$ 34,337.51

Costs Reflect National Averages

Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.05	Assumed Value								NON GREEN

Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2023 130 2130	Replace 1000' PVC pipe 1-1/4" diameter solar piping	30	1 Plum	M.L.F.	\$ 27,540.00	\$ 34,075.00	1.095	\$ 37,312.13	0.97
1.000	D2023 130 2230	Replace 1000' PVC pipe 1-1/2" diameter solar piping	30	1 Plum	M.L.F.	\$ 31,840.00	\$ 39,575.00	1.095	\$ 43,334.63	0.97
1.000	D2023 130 2330	Replace 1000' PVC pipe 2" diameter solar piping	30	Q1	M.L.F.	\$ 35,340.00	\$ 43,375.00	1.095	\$ 47,495.63	0.97
1.000	D2033 130 0060	Replace pipe, 1-1/2" pipe and fittings, PVC	30	2 Plum	L.F.	\$ 51.75	\$ 64.40	1.095	\$ 70.52	0.97
1.000	D2033 130 0080	Replace pipe, 2" pipe and fittings, PVC	30	2 Plum	L.F.	\$ 55.75	\$ 69.30	1.095	\$ 75.88	0.97
1.000	D2033 130 0100	Replace pipe, 4" pipe and fittings, PVC	30	2 Plum	L.F.	\$ 69.10	\$ 85.75	1.095	\$ 93.90	0.97
1.000	D2033 130 0120	Replace pipe, 6" pipe and fittings, PVC	30	2 Plum	L.F.	\$ 90.00	\$ 110.85	1.095	\$ 121.38	0.97
1.000	D2033 130 0140	Replace pipe, 8" pipe and fittings, PVC	30	2 Plum	L.F.	\$ 108.05	\$ 132.50	1.095	\$ 145.09	0.97
1.000	D2013 110 0030	Replace tankless water closet	35	2 Plum	Ea.	\$ 541.32	\$ 637.99	1.095	\$ 698.60	0.97
1.000	D2013 130 0050	Replace two piece water closet flush-tank	35	2 Plum	Ea.	\$ 526.01	\$ 622.39	1.095	\$ 681.52	0.97
1.000	D2013 130 0060	Replace one piece water closet flush-tank	35	2 Plum	Ea.	\$ 866.01	\$ 1,012.39	1.095	\$ 1,108.57	0.97
1.000	D2013 210 0030	Replace wall-hung urinal	35	2 Plum	Ea.	\$ 843.02	\$ 1,016.39	1.095	\$ 1,112.95	0.97
1.000	D2013 330 0060	Replace lavatory, vitreous china	35	2 Plum	Ea.	\$ 613.43	\$ 731.78	1.095	\$ 801.30	0.97
1.000	D2013 350 0060	Replace lavatory lavatory, enameled steel	35	2 Plum	Ea.	\$ 593.43	\$ 721.78	1.095	\$ 790.35	0.97
1.000	D2013 410 0060	Replace sink, P.E.C.I. sink, iron enamel	35	2 Plum	Ea.	\$ 759.50	\$ 893.00	1.095	\$ 977.84	0.97
1.000	D2013 420 0060	Replace sink, enameled steel	35	2 Plum	Ea.	\$ 519.00	\$ 625.00	1.095	\$ 684.38	0.97
1.000	D2013 460 0060	Replace sink, P.E.C.I.	35	1 Plum	Ea.	\$ 1,094.50	\$ 1,293.00	1.095	\$ 1,415.84	0.97
1.000	D2013 530 0070	Replace tub bathtub, enameled steel	35	2 Plum	Ea.	\$ 755.00	\$ 892.00	1.095	\$ 976.74	0.97
1.000	D2013 730 0060	Replace shower, enameled steel	35	2 Plum	Ea.	\$ 1,525.00	\$ 1,800.00	1.095	\$ 1,971.00	0.97
1.000	D2013 310 0060	Replace lavatory, iron, enamel	40	2 Plum	Ea.	\$ 657.93	\$ 771.28	1.095	\$ 844.55	0.97
1.000	D2013 430 0060	Replace sink, stainless steel	40	2 Plum	Ea.	\$ 984.50	\$ 1,168.00	1.095	\$ 1,278.96	0.97
1.000	D2013 510 0070	Replace tub bathtub, cast iron enamel	40	2 Plum	Ea.	\$ 1,360.00	\$ 1,587.00	1.095	\$ 1,737.77	0.97
1.000	D2033 110 0030	Replace pipe & fittings, cast iron	40	2 Plum	L.F.	\$ 47.45	\$ 57.70	1.095	\$ 63.18	0.97
1.000	D2033 310 0030	Replace floor drain w/o bucket	40	1 Plum	Ea.	\$ 1,027.00	\$ 1,184.00	1.095	\$ 1,296.48	0.97
1.000	D2033 330 0030	Replace floor drain with bucket	40	1 Plum	Ea.	\$ 1,027.00	\$ 1,184.00	1.095	\$ 1,296.48	0.97

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2023 130 2130	Replace 1000' PVC pipe 1-1/4" diameter solar piping	\$ 36,209.07	1.05	\$ 39,177.73	0.97	\$ 38,019.52
1.000	D2023 130 2230	Replace 1000' PVC pipe 1-1/2" diameter solar piping	\$ 42,053.52	1.05	\$ 45,501.36	0.97	\$ 44,156.20
1.000	D2023 130 2330	Replace 1000' PVC pipe 2" diameter solar piping	\$ 46,091.51	1.05	\$ 49,870.41	0.97	\$ 48,396.09
1.000	D2033 130 0060	Replace pipe, 1-1/2" pipe and fittings, PVC	\$ 68.43	1.05	\$ 74.04	0.97	\$ 71.85
1.000	D2033 130 0080	Replace pipe, 2" pipe and fittings, PVC	\$ 73.64	1.05	\$ 79.68	0.97	\$ 77.32
1.000	D2033 130 0100	Replace pipe, 4" pipe and fittings, PVC	\$ 91.12	1.05	\$ 98.59	0.97	\$ 95.68
1.000	D2033 130 0120	Replace pipe, 6" pipe and fittings, PVC	\$ 117.79	1.05	\$ 127.45	0.97	\$ 123.68
1.000	D2033 130 0140	Replace pipe, 8" pipe and fittings, PVC	\$ 140.80	1.05	\$ 152.34	0.97	\$ 147.84
			\$ 159,933.88				\$ 167,930.57
			\$ 159,933.88	Assumed 100%		Assumed 100%	\$ 167,930.57
				PER 25 YR		PER 25 YR	
1.000	D2013 110 0030	Replace tankless water closet	\$ 677.95	1.05	\$ 733.53	0.97	\$ 711.84
1.000	D2013 130 0050	Replace two piece water closet flush-tank	\$ 661.37	1.05	\$ 715.59	0.97	\$ 694.44
1.000	D2013 130 0060	Replace one piece water closet flush-tank	\$ 1,075.79	1.05	\$ 1,164.00	0.97	\$ 1,129.58
1.000	D2013 210 0030	Replace wall-hung urinal	\$ 1,080.04	1.05	\$ 1,168.59	0.97	\$ 1,134.05
1.000	D2013 330 0060	Replace lavatory, vitreous china	\$ 777.61	1.05	\$ 841.36	0.97	\$ 816.49
1.000	D2013 350 0060	Replace lavatory lavatory, enameled steel	\$ 766.98	1.05	\$ 829.87	0.97	\$ 805.33
1.000	D2013 410 0060	Replace sink, P.E.C.I. sink, iron enamel	\$ 948.93	1.05	\$ 1,026.73	0.97	\$ 996.37
1.000	D2013 420 0060	Replace sink, enameled steel	\$ 664.14	1.05	\$ 718.59	0.97	\$ 697.35
1.000	D2013 460 0060	Replace sink, P.E.C.I.	\$ 1,373.98	1.05	\$ 1,486.63	0.97	\$ 1,442.68
1.000	D2013 530 0070	Replace tub bathtub, enameled steel	\$ 947.86	1.05	\$ 1,025.58	0.97	\$ 995.26
1.000	D2013 730 0060	Replace shower, enameled steel	\$ 1,912.73	1.05	\$ 2,069.55	0.97	\$ 2,008.37
			\$ 10,887.39				\$ 11,431.76
			\$ 10,887.39	Assumed 100%		Assumed 100%	\$ 11,431.76
				PER 25 YR		PER 25 YR	
1.000	D2013 310 0060	Replace lavatory, iron, enamel	\$ 819.58	1.05	\$ 886.78	0.97	\$ 860.56
1.000	D2013 430 0060	Replace sink, stainless steel	\$ 1,241.15	1.05	\$ 1,342.91	0.97	\$ 1,303.21
1.000	D2013 510 0070	Replace tub bathtub, cast iron enamel	\$ 1,686.39	1.05	\$ 1,824.65	0.97	\$ 1,770.71
1.000	D2033 110 0030	Replace pipe & fittings, cast iron	\$ 61.31	1.05	\$ 66.34	0.97	\$ 64.38
1.000	D2033 310 0030	Replace floor drain w/o bucket	\$ 1,258.15	1.05	\$ 1,361.30	0.97	\$ 1,321.06
1.000	D2033 330 0030	Replace floor drain with bucket	\$ 1,258.15	1.05	\$ 1,361.30	0.97	\$ 1,321.06

Costs Reflect National Averages										
Escalation	6%									
De-Escalation to July 2009	1.03									
De-Escalation Factor to be Applied	0.97									
Green Factor	1.05	Assumed Value								NON GREEN
Qty	Assembly Number	Description	Frequency	Crew	Unit	Total In-House	Total Incl. O&P	Location Adjustment	Total Adjusted w/OH&P	De-Escalation Factor
1.000	D2043 210 1020	Replace drain: roof, scupper, area	40	1 Plum	Ea.	\$ 481.50	\$ 563.00	1.095	\$ 616.49	0.97
1.000	D2023 240 0020	Replace storage tank, glass lined, P.E., 80 gal.	50	2 Plum	Ea.	\$ 2,962.50	\$ 3,396.50	1.095	\$ 3,719.17	0.97
FOOTNOTES:										
1										
RS Means CostWorks 2010 Operations and Maintenance										

Costs Reflect National Averages							
Escalation	6%						
De-Escalation to July 2009	1.03						
De-Escalation Factor to be Applied	0.97						
Green Factor	1.05	Assumed Value			GREEN		
Qty	Assembly Number	Description	Total Non-Green with All Adjustments	Green Factor	TOTAL with Green Factor	De-Escalation Factor	Total Green with All Adjustments
1.000	D2043 210 1020	Replace drain: roof, scupper, area	\$ 598.26	1.05	\$ 647.31	0.97	\$ 628.17
			\$ 6,923.00				\$ 7,269.15
			\$ 6,923.00	Assumed 100%		Assumed 100%	\$ 7,269.15
				PER 40 YR		PER 40 YR	
1.000	D2023 240 0020	Replace storage tank, glass lined, P.E., 80 gal.	\$ 3,609.22	1.05	\$ 3,905.13	0.97	\$ 3,789.68
			\$ 3,609.22				\$ 3,789.68
			\$ 3,609.22	Assumed 100%		Assumed 100%	\$ 3,789.68
				PER 50 YR		PER 50 YR	
FOOTNOTES:							
1							
RS Means CostWorks 2010 Operations and Maintenance							

Appendix C-SW12 5% GF Summary of FMRRC

Summary of Green versus Non-Green Major Repair and Replacement Costs based on Frequency (Plumbing) 5% GF			
Type of Construction	Description	TOTAL COST	COMMENTS
Non-Green	Up to 10 Years	\$ 40,323.45	
Non-Green	10 th yr on till 25 th Year	\$ 652,014.66	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
Non-Green	25 th yr on till 50 th Year	\$ 10,532.22	
Green	Up to 10 Years	\$ 42,339.62	
Green	10 th yr on till 25 th Year	\$ 684,615.39	MAJORITY OF MAJOR REPAIR AND REPLACEMENT OCCURS IN THIS TIMEFRAME
Green	25 th yr on till 50 th Year	\$ 11,058.83	
SUMMARY OF FINDINGS			
Green v. Non-Green	4.76%	Green Major Repair and Replacement is 4.76% higher in cost than that of a traditional building	

LCCA and Sensitivity Data

Appendix F-L1 LCCA Green v. Non-Green Case 1 Scenario 1

LIFE CYCLE COST (Present Worth Method)							
LCC - Construction Costs, Consumption Costs, O&M (20% GF)				Green		Non-Green	
Actual Case Compared to Proposed Design Case				Not East Hall Specific		RS Means CostWorks	
PROJECT LIFE CYCLE (YEARS)		25					
DISCOUNT RATE (% in decimals)		7.00%					
				Est.	PW	Est.	PW
Base Cost					\$ -		\$ -
A) Base Construction Costs				\$ 37,469,713.06	\$ 37,469,713.06	\$ 35,248,164.16	\$ 35,248,164.16
B)					\$ -		\$ -
Total Initial Cost Impact (IC)					\$ 37,469,713.06		\$ 35,248,164.16
Initial Cost PW Savings							\$ 2,221,548.90
		Year	Factor				
FMRRC Mechanical Items		0.5	0.9667	\$ 328.99	\$ 318.00	\$ 274.16	\$ 265.00
		1	0.9346	\$ 3,976.50	\$ 3,716.00	\$ 3,313.75	\$ 3,096.00
		2	0.8734	\$ 234.51	\$ 204.00	\$ 195.43	\$ 170.00
		3	0.8163	\$ 17.53	\$ 14.00	\$ 14.61	\$ 11.00
		5	0.7130	\$ 60,802.80	\$ 43,351.00	\$ 50,669.00	\$ 36,126.00
		6	0.6663	\$ 9,102.05	\$ 6,065.00	\$ 7,585.04	\$ 5,054.00
		7	0.6227	\$ 34,687.06	\$ 21,601.00	\$ 28,905.89	\$ 18,001.00
		8	0.5820	\$ 163.87	\$ 95.00	\$ 136.56	\$ 79.00
		10	0.5083	\$ 789,342.47	\$ 401,261.00	\$ 657,785.39	\$ 334,384.00
		12	0.4440	\$ 22,101.58	\$ 9,813.00	\$ 18,417.99	\$ 8,177.00
		14	0.3878	\$ 1,200.33	\$ 465.00	\$ 1,000.28	\$ 387.00
		15	0.3624	\$ 1,478,129.18	\$ 535,742.00	\$ 1,231,774.32	\$ 446,451.00
		20	0.2584	\$ 1,855,074.93	\$ 479,386.00	\$ 1,545,895.77	\$ 399,488.00
		25	0.1842	\$ 41,744.98	\$ 7,691.00	\$ 34,787.48	\$ 6,409.00
	FMRRC Electrical Items		0.5	0.9667	\$ 95.64	\$ 92.00	\$ 79.70
		1	0.9346	\$ 76.51	\$ 71.00	\$ 63.76	\$ 59.00
		3	0.8163	\$ 47.82	\$ 39.00	\$ 39.85	\$ 32.00
		5	0.7130	\$ 2,490.38	\$ 1,775.00	\$ 2,075.31	\$ 1,479.00
		10	0.5083	\$ 4,918.08	\$ 2,500.00	\$ 4,098.40	\$ 2,083.00
		15	0.3624	\$ 270.33	\$ 97.00	\$ 225.28	\$ 81.00
		20	0.2584	\$ 6,185.77	\$ 1,598.00	\$ 5,154.81	\$ 1,332.00
	25	0.1842	\$ 562.79	\$ 103.00	\$ 468.99	\$ 86.00	
	30	0.1314		\$ -		\$ -	

Appendix F-L2 LCCA Green v. Non-Green Case 1 Scenario 2

LIFE CYCLE COST (Present Worth Method)							
LCC -Construction Costs, Consumption Costs, O&M (20% GF)				Green		Non-Green	
Actual Case Compared to Proposed Design Case				Not East Hall Specific		RS Means CostWorks	
PROJECT LIFE CYCLE (YEARS)		25					
DISCOUNT RATE (% in decimals)		4.00%					
				Est.	PW	Est.	PW
Base Cost					\$ -		\$ -
A)	Base Construction Costs			\$ 37,469,713.06	\$ 37,469,713.06	\$ 35,248,164.16	\$ 35,248,164.16
B)					\$ -		\$ -
Total Initial Cost Impact (IC)					\$ 37,469,713.06		\$ 35,248,164.16
Initial Cost PW Savings							\$ 2,221,548.90
		Year	Factor				
	FMRRC Mechanical Items	0.5	0.9806	\$ 328.99	\$ 318.00	\$ 274.16	\$ 265.00
		1	0.9615	\$ 3,976.50	\$ 3,716.00	\$ 3,313.75	\$ 3,096.00
		2	0.9246	\$ 234.51	\$ 204.00	\$ 195.43	\$ 170.00
		3	0.8890	\$ 17.53	\$ 14.00	\$ 14.61	\$ 11.00
		5	0.8219	\$ 60,802.80	\$ 43,351.00	\$ 50,669.00	\$ 36,126.00
		6	0.7903	\$ 9,102.05	\$ 6,065.00	\$ 7,585.04	\$ 5,054.00
		7	0.7599	\$ 34,687.06	\$ 21,601.00	\$ 28,905.89	\$ 18,001.00
		8	0.7307	\$ 163.87	\$ 95.00	\$ 136.56	\$ 79.00
		10	0.6756	\$ 789,342.47	\$ 401,261.00	\$ 657,785.39	\$ 334,384.00
		12	0.6246	\$ 22,101.58	\$ 9,813.00	\$ 18,417.99	\$ 8,177.00
		14	0.5775	\$ 1,200.33	\$ 465.00	\$ 1,000.28	\$ 387.00
		15	0.5553	\$ 1,478,129.18	\$ 535,742.00	\$ 1,231,774.32	\$ 446,451.00
		20	0.4564	\$ 1,855,074.93	\$ 479,386.00	\$ 1,545,895.77	\$ 399,488.00
		25	0.3751	\$ 41,744.98	\$ 7,691.00	\$ 34,787.48	\$ 6,409.00
		FMRRC Electrical Items	0.5	0.9806	\$ 95.64	\$ 93.00	\$ 79.70
	1		0.9615	\$ 76.51	\$ 73.00	\$ 63.76	\$ 61.00
	3		0.8890	\$ 47.82	\$ 42.00	\$ 39.85	\$ 35.00
	5		0.8219	\$ 2,490.38	\$ 2,046.00	\$ 2,075.31	\$ 1,705.00
	10		0.6756	\$ 4,918.08	\$ 3,322.00	\$ 4,098.40	\$ 2,768.00
	15		0.5553	\$ 270.33	\$ 150.00	\$ 225.28	\$ 125.00
	20		0.4564	\$ 6,185.77	\$ 2,823.00	\$ 5,154.81	\$ 2,352.00
	25	0.3751	\$ 562.79	\$ 211.00	\$ 468.99	\$ 175.00	
		30	0.3083		\$ -		\$ -

Appendix F-L3 LCCA Green v. Non-Green Case 1 Scenario 3

LIFE CYCLE COST (Present Worth Method)							
LCC -Construction Costs, Consumption Costs, O&M (20% GF)				Green		Non-Green	
Actual Case Compared to Proposed Design Case				Not East Hall Specific		RS Means CostWorks	
PROJECT LIFE CYCLE (YEARS)		25					
DISCOUNT RATE (% in decimals)		6.00%					
				Est.	PW	Est.	PW
Base Cost					\$ -		\$ -
A)	Base Construction Costs			\$ 37,469,713.06	\$ 37,469,713.06	\$ 35,248,164.16	\$ 35,248,164.16
B)					\$ -		\$ -
Total Initial Cost Impact (IC)				\$ 37,469,713.06		\$ 35,248,164.16	
Initial Cost PW Savings						\$ 2,221,548.90	
		Year	Factor				
	FMRRC Mechanical Items	0.5	0.9713	\$ 328.99	\$ 318.00	\$ 274.16	\$ 265.00
		1	0.9434	\$ 3,976.50	\$ 3,716.00	\$ 3,313.75	\$ 3,096.00
		2	0.8900	\$ 234.51	\$ 204.00	\$ 195.43	\$ 170.00
		3	0.8396	\$ 17.53	\$ 14.00	\$ 14.61	\$ 11.00
		5	0.7473	\$ 60,802.80	\$ 43,351.00	\$ 50,669.00	\$ 36,126.00
		6	0.7050	\$ 9,102.05	\$ 6,065.00	\$ 7,585.04	\$ 5,054.00
		7	0.6651	\$ 34,687.06	\$ 21,601.00	\$ 28,905.89	\$ 18,001.00
		8	0.6274	\$ 163.87	\$ 95.00	\$ 136.56	\$ 79.00
		10	0.5584	\$ 789,342.47	\$ 401,261.00	\$ 657,785.39	\$ 334,384.00
		12	0.4970	\$ 22,101.58	\$ 9,813.00	\$ 18,417.99	\$ 8,177.00
		14	0.4423	\$ 1,200.33	\$ 465.00	\$ 1,000.28	\$ 387.00
		15	0.4173	\$ 1,478,129.18	\$ 535,742.00	\$ 1,231,774.32	\$ 446,451.00
		20	0.3118	\$ 1,855,074.93	\$ 479,386.00	\$ 1,545,895.77	\$ 399,488.00
		25	0.2330	\$ 41,744.98	\$ 7,691.00	\$ 34,787.48	\$ 6,409.00
		FMRRC Electrical Items	0.5	0.9713	\$ 95.64	\$ 92.00	\$ 79.70
	1		0.9434	\$ 76.51	\$ 72.00	\$ 63.76	\$ 60.00
	3		0.8396	\$ 47.82	\$ 40.00	\$ 39.85	\$ 33.00
	5		0.7473	\$ 2,490.38	\$ 1,860.00	\$ 2,075.31	\$ 1,550.00
	10		0.5584	\$ 4,918.08	\$ 2,746.00	\$ 4,098.40	\$ 2,288.00
	15		0.4173	\$ 270.33	\$ 112.00	\$ 225.28	\$ 94.00
	20		0.3118	\$ 6,185.77	\$ 1,928.00	\$ 5,154.81	\$ 1,607.00
	25	0.2330	\$ 562.79	\$ 131.00	\$ 468.99	\$ 109.00	
		30	0.1741		\$ -		\$ -

Appendix F-L4 LCCA Green v. Non-Green Case 1 Scenario 4

LIFE CYCLE COST (Present Worth Method)							
LCC - Construction Costs, Consumption Costs, O&M (20% GF)				Green		Non-Green	
Actual Case Compared to Proposed Design Case				Not East Hall Specific		RS Means CostWorks	
PROJECT LIFE CYCLE (YEARS)	25						
DISCOUNT RATE (% in decimals)	3.00%						
				Est.	PW	Est.	PW
Base Cost					\$ -		\$ -
A) Base Construction Costs				\$ 37,469,713.06	\$ 37,469,713.06	\$ 35,248,164.16	\$ 35,248,164.16
B)					\$ -		\$ -
Total Initial Cost Impact (IC)					\$ 37,469,713.06		\$ 35,248,164.16
Initial Cost PW Savings							\$ 2,221,548.90
		Year	Factor				
FMRRC Mechanical Items		0.5	0.9853	\$ 328.99	\$ 318.00	\$ 274.16	\$ 265.00
		1	0.9709	\$ 3,976.50	\$ 3,716.00	\$ 3,313.75	\$ 3,096.00
		2	0.9426	\$ 234.51	\$ 204.00	\$ 195.43	\$ 170.00
		3	0.9151	\$ 17.53	\$ 14.00	\$ 14.61	\$ 11.00
		5	0.8626	\$ 60,802.80	\$ 43,351.00	\$ 50,669.00	\$ 36,126.00
		6	0.8375	\$ 9,102.05	\$ 6,065.00	\$ 7,585.04	\$ 5,054.00
		7	0.8131	\$ 34,687.06	\$ 21,601.00	\$ 28,905.89	\$ 18,001.00
		8	0.7894	\$ 163.87	\$ 95.00	\$ 136.56	\$ 79.00
		10	0.7441	\$ 789,342.47	\$ 401,261.00	\$ 657,785.39	\$ 334,384.00
		12	0.7014	\$ 22,101.58	\$ 9,813.00	\$ 18,417.99	\$ 8,177.00
		14	0.6611	\$ 1,200.33	\$ 465.00	\$ 1,000.28	\$ 387.00
		15	0.6419	\$ 1,478,129.18	\$ 535,742.00	\$ 1,231,774.32	\$ 446,451.00
		20	0.5537	\$ 1,855,074.93	\$ 479,386.00	\$ 1,545,895.77	\$ 399,488.00
		25	0.4776	\$ 41,744.98	\$ 7,691.00	\$ 34,787.48	\$ 6,409.00
	FMRRC Electrical Items		0.5	0.9853	\$ 95.64	\$ 94.00	\$ 79.70
		1	0.9709	\$ 76.51	\$ 74.00	\$ 63.76	\$ 61.00
		3	0.9151	\$ 47.82	\$ 43.00	\$ 39.85	\$ 36.00
		5	0.8626	\$ 2,490.38	\$ 2,148.00	\$ 2,075.31	\$ 1,790.00
		10	0.7441	\$ 4,918.08	\$ 3,659.00	\$ 4,098.40	\$ 3,049.00
		15	0.6419	\$ 270.33	\$ 173.00	\$ 225.28	\$ 144.00
		20	0.5537	\$ 6,185.77	\$ 3,424.00	\$ 5,154.81	\$ 2,854.00
	25	0.4776	\$ 562.79	\$ 268.00	\$ 468.99	\$ 223.00	
	30	0.4120		\$ -		\$ -	

Appendix F-L5 LCCA Green v. Non-Green Case 1 Scenario 5

LIFE CYCLE COST (Present Worth Method)							
LCC -Construction Costs, Consumption Costs, O&M (20% GF)				Green		Non-Green	
Actual Case Compared to Proposed Design Case				Not East Hall Specific		RS Means CostWorks	
PROJECT LIFE CYCLE (YEARS)		25					
DISCOUNT RATE (% in decimals)		4.00%					
				Est.	PW	Est.	PW
Base Cost					\$ -		\$ -
A)	Base Construction Costs			\$ 37,469,713.06	\$ 37,469,713.06	\$ 35,248,164.16	\$ 35,248,164.16
B)					\$ -		\$ -
Total Initial Cost Impact (IC)					\$ 37,469,713.06		\$ 35,248,164.16
Initial Cost PW Savings							\$ 2,221,548.90
		Year	Factor				
	FMRRC Mechanical Items	0.5	0.9806	\$ 328.99	\$ 318.00	\$ 274.16	\$ 265.00
		1	0.9615	\$ 3,976.50	\$ 3,716.00	\$ 3,313.75	\$ 3,096.00
		2	0.9246	\$ 234.51	\$ 204.00	\$ 195.43	\$ 170.00
		3	0.8890	\$ 17.53	\$ 14.00	\$ 14.61	\$ 11.00
		5	0.8219	\$ 60,802.80	\$ 43,351.00	\$ 50,669.00	\$ 36,126.00
		6	0.7903	\$ 9,102.05	\$ 6,065.00	\$ 7,585.04	\$ 5,054.00
		7	0.7599	\$ 34,687.06	\$ 21,601.00	\$ 28,905.89	\$ 18,001.00
		8	0.7307	\$ 163.87	\$ 95.00	\$ 136.56	\$ 79.00
		10	0.6756	\$ 789,342.47	\$ 401,261.00	\$ 657,785.39	\$ 334,384.00
		12	0.6246	\$ 22,101.58	\$ 9,813.00	\$ 18,417.99	\$ 8,177.00
		14	0.5775	\$ 1,200.33	\$ 465.00	\$ 1,000.28	\$ 387.00
		15	0.5553	\$ 1,478,129.18	\$ 535,742.00	\$ 1,231,774.32	\$ 446,451.00
		20	0.4564	\$ 1,855,074.93	\$ 479,386.00	\$ 1,545,895.77	\$ 399,488.00
		25	0.3751	\$ 41,744.98	\$ 7,691.00	\$ 34,787.48	\$ 6,409.00
		FMRRC Electrical Items	0.5	0.9806	\$ 95.64	\$ 93.00	\$ 79.70
	1		0.9615	\$ 76.51	\$ 73.00	\$ 63.76	\$ 61.00
	3		0.8890	\$ 47.82	\$ 42.00	\$ 39.85	\$ 35.00
	5		0.8219	\$ 2,490.38	\$ 2,046.00	\$ 2,075.31	\$ 1,705.00
	10		0.6756	\$ 4,918.08	\$ 3,322.00	\$ 4,098.40	\$ 2,768.00
	15		0.5553	\$ 270.33	\$ 150.00	\$ 225.28	\$ 125.00
	20		0.4564	\$ 6,185.77	\$ 2,823.00	\$ 5,154.81	\$ 2,352.00
	25	0.3751	\$ 562.79	\$ 211.00	\$ 468.99	\$ 175.00	
		30	0.3083		\$ -		\$ -

Appendix F-L6 LCCA Green v. Non-Green Case 1 Scenario 6

LIFE CYCLE COST (Present Worth Method)							
LCC -Construction Costs, Consumption Costs, O&M (20% GF)				Green		Non-Green	
Actual Case Compared to Proposed Design Case				Not East Hall Specific		RS Means CostWorks	
PROJECT LIFE CYCLE (YEARS)		25					
DISCOUNT RATE (% in decimals)		7.00%					
				Est.	PW	Est.	PW
Base Cost					\$ -		\$ -
A)	Base Construction Costs			\$ 37,469,713.06	\$ 37,469,713.06	\$ 35,248,164.16	\$ 35,248,164.16
B)					\$ -		\$ -
Total Initial Cost Impact (IC)					\$ 37,469,713.06		\$ 35,248,164.16
Initial Cost PW Savings							\$ 2,221,548.90
		Year	Factor				
	FMRRC Mechanical Items	0.5	0.9667	\$ 328.99	\$ 318.00	\$ 274.16	\$ 265.00
		1	0.9346	\$ 3,976.50	\$ 3,716.00	\$ 3,313.75	\$ 3,096.00
		2	0.8734	\$ 234.51	\$ 204.00	\$ 195.43	\$ 170.00
		3	0.8163	\$ 17.53	\$ 14.00	\$ 14.61	\$ 11.00
		5	0.7130	\$ 60,802.80	\$ 43,351.00	\$ 50,669.00	\$ 36,126.00
		6	0.6663	\$ 9,102.05	\$ 6,065.00	\$ 7,585.04	\$ 5,054.00
		7	0.6227	\$ 34,687.06	\$ 21,601.00	\$ 28,905.89	\$ 18,001.00
		8	0.5820	\$ 163.87	\$ 95.00	\$ 136.56	\$ 79.00
		10	0.5083	\$ 789,342.47	\$ 401,261.00	\$ 657,785.39	\$ 334,384.00
		12	0.4440	\$ 22,101.58	\$ 9,813.00	\$ 18,417.99	\$ 8,177.00
		14	0.3878	\$ 1,200.33	\$ 465.00	\$ 1,000.28	\$ 387.00
		15	0.3624	\$ 1,478,129.18	\$ 535,742.00	\$ 1,231,774.32	\$ 446,451.00
		20	0.2584	\$ 1,855,074.93	\$ 479,386.00	\$ 1,545,895.77	\$ 399,488.00
		25	0.1842	\$ 41,744.98	\$ 7,691.00	\$ 34,787.48	\$ 6,409.00
		FMRRC Electrical Items	0.5	0.9667	\$ 95.64	\$ 92.00	\$ 79.70
	1		0.9346	\$ 76.51	\$ 71.00	\$ 63.76	\$ 59.00
	3		0.8163	\$ 47.82	\$ 39.00	\$ 39.85	\$ 32.00
	5		0.7130	\$ 2,490.38	\$ 1,775.00	\$ 2,075.31	\$ 1,479.00
	10		0.5083	\$ 4,918.08	\$ 2,500.00	\$ 4,098.40	\$ 2,083.00
	15		0.3624	\$ 270.33	\$ 97.00	\$ 225.28	\$ 81.00
	20		0.2584	\$ 6,185.77	\$ 1,598.00	\$ 5,154.81	\$ 1,332.00
		25	0.1842	\$ 562.79	\$ 103.00	\$ 468.99	\$ 86.00
		30	0.1314		\$ -		\$ -

Appendix F-L7 LCCA Green v. Non-Green Case 2 Scenario 1

Appendix F-L8 LCCA Green v. Non-Green Case 2 Scenario 2

LIFE CYCLE COST (Present Worth Method)									
LCC -Construction Costs, Consumption Costs, O&M (10% GF)				Green		Non-Green			
O&M 70% Reduction to Fall into Typical 5% Cost Distribution									
Actual Case Compared to Proposed Design Case				Not East Hall Specific		RS Means CostWorks			
PROJECT LIFE CYCLE (YEARS)		25							
DISCOUNT RATE (% in decimals)		6.00%							
				Est.		PW		Est.	
Base Cost						\$ -		\$ -	
A) Base Construction Costs				\$ 37,469,713.06		\$ 37,469,713.06		\$ 35,248,164.16	
B)						\$ -		\$ -	
Total Initial Cost Impact (IC)						\$ 37,469,713.06		\$ 35,248,164.16	
Initial Cost PW Savings								\$ 2,221,548.90	
				Year		Factor			
				0.5		0.9713		\$ 265.00	
				1		0.9434		\$ 3,096.00	
				2		0.8900		\$ 170.00	
				3		0.8396		\$ 11.00	
				5		0.7473		\$ 36,126.00	
				6		0.7050		\$ 5,054.00	
				7		0.6651		\$ 18,001.00	
				8		0.6274		\$ 79.00	
				10		0.5584		\$ 334,384.00	
				12		0.4970		\$ 8,177.00	
				14		0.4423		\$ 387.00	
				15		0.4173		\$ 446,451.00	
				20		0.3118		\$ 399,488.00	
				25		0.2330		\$ 6,409.00	
				0.5		0.9713		\$ 23.00	
				1		0.9434		\$ 18.00	
				3		0.8396		\$ 10.00	
				5		0.7473		\$ 465.00	
				10		0.5584		\$ 686.00	
				15		0.4173		\$ 28.00	
				20		0.3118		\$ 482.00	
				25		0.2330		\$ 32.00	
				30		0.1741		\$ -	
FMRRC Mechanical Items				0.5		0.9713		\$ 82.25	
				1		0.9434		\$ 994.13	
				2		0.8900		\$ 58.63	
				3		0.8396		\$ 4.38	
				5		0.7473		\$ 15,200.70	
				6		0.7050		\$ 2,275.51	
				7		0.6651		\$ 8,671.77	
				8		0.6274		\$ 40.97	
				10		0.5584		\$ 197,335.62	
				12		0.4970		\$ 5,525.40	
				14		0.4423		\$ 300.08	
				15		0.4173		\$ 369,532.30	
				20		0.3118		\$ 463,768.73	
				25		0.2330		\$ 10,436.24	
				FMRRC Electrical Items				0.5	
1		0.9434						\$ 19.13	
3		0.8396						\$ 11.95	
5		0.7473						\$ 622.59	
10		0.5584						\$ 1,229.52	
15		0.4173						\$ 67.58	
20		0.3118						\$ 1,546.44	
25		0.2330						\$ 140.70	
30		0.1741						\$ -	

Appendix F-L9 LCCA Green v. Non-Green Case 2 Scenario 3

Appendix F-L10 LCCA Green v. Non-Green Case 2 Scenario 4

LIFE CYCLE COST (Present Worth Method)								
LCC -Construction Costs, Consumption Costs, O&M (10% GF)				Green		Non-Green		
O&M 70% Reduction to Fall into Typical 5% Cost Distribution								
Actual Case Compared to Proposed Design Case				Not East Hall Specific		RS Means CostWorks		
PROJECT LIFE CYCLE (YEARS)		25						
DISCOUNT RATE (% in decimals)		3.00%						
				Est.		PW		Est.
								PW
Base Cost						\$ -		\$ -
A) Base Construction Costs				\$ 37,469,713.06		\$ 37,469,713.06		\$ 35,248,164.16
B)						\$ -		\$ -
Total Initial Cost Impact (IC)						\$ 37,469,713.06		\$ 35,248,164.16
Initial Cost PW Savings								\$ 2,221,548.90
				Year		Factor		
FMRRC Mechanical Items				0.5		0.9853		\$ 90.47
				1		0.9709		\$ 3,716.00
				2		0.9426		\$ 204.00
				3		0.9151		\$ 14.00
				5		0.8626		\$ 43,351.00
				6		0.8375		\$ 6,065.00
				7		0.8131		\$ 21,601.00
				8		0.7894		\$ 95.00
				10		0.7441		\$ 401,261.00
				12		0.7014		\$ 9,813.00
				14		0.6611		\$ 465.00
				15		0.6419		\$ 535,742.00
				20		0.5537		\$ 479,386.00
				25		0.4776		\$ 7,691.00
				FMRRC Electrical Items				0.5
1		0.9709						\$ 21.04
3		0.9151						\$ 13.15
5		0.8626						\$ 590.00
10		0.7441						\$ 1,006.00
15		0.6419						\$ 47.00
20		0.5537						\$ 941.00
25		0.4776						\$ 73.00
30		0.4120		\$ -				

			0.5	0.9853	\$	10.75	\$	37.00	\$	9.78	\$	31.00		
			1	0.9709	\$	1,415.74	\$	4,811.00	\$	1,287.04	\$	4,009.00		
			3	0.9151	\$	190.92	\$	566.00	\$	173.56	\$	472.00		
			4	0.8885	\$	73.18	\$	203.00	\$	66.53	\$	169.00		
			5	0.8626	\$	508.66	\$	1,318.00	\$	462.42	\$	1,099.00		
			7	0.8131	\$	500.82	\$	1,134.00	\$	455.29	\$	945.00		
			10	0.7441	\$	10,606.65	\$	19,606.00	\$	9,642.41	\$	16,339.00		
			12	0.7014	\$	1,089.28	\$	1,758.00	\$	990.25	\$	18.00		
			15	0.6419	\$	104,485.01	\$	137,709.00	\$	94,986.38	\$	114,758.00		
			20	0.5537	\$	24,006.17	\$	22,558.00	\$	21,823.79	\$	18,798.00		
			25	0.4776	\$	85,584.38	\$	57,341.00	\$	77,803.98	\$	47,784.00		
			0.5	0.9853	\$	849.91	\$	821.00	\$	849.91	\$	821.00		
			1	0.9709	\$	2,569.29	\$	2,401.00	\$	2,467.83	\$	2,306.00		
			5	0.8626	\$	3,430.16	\$	2,445.00	\$	3,294.69	\$	2,349.00		
			15	0.6419	\$	54,406.26	\$	19,719.00	\$	52,257.62	\$	18,940.00		
			20	0.5537	\$	127,772.28	\$	33,018.00	\$	122,726.24	\$	31,714.00		
Total Replacement/Salvage PW Costs											\$	1,817,881.00	\$	1,521,118.00
		Type of Annual Expense	Escl..00 %	PWA										
A		YPM-Electrical	6.00%	37.094	\$	6,360.70	\$	235,941.95	\$	5,782.46	\$	214,492.68		
A		Operations-Electrical	6.00%	37.094	\$	100,000.00	\$	3,709,368.80	\$	100,000.00	\$	3,709,368.80		
A		YPM-Mechanical	6.00%	37.094	\$	6,163.86	\$	497,098.05	\$	5,603.51	\$	414,248.37		
A		Operations-Mechanical	6.00%	37.094	\$	100,000.00	\$	2,217,799.31	\$	100,000.00	\$	2,217,799.31		
A		YPM-Plumbing	6.00%	37.094	\$	1,022.67	\$	82,475.43	\$	929.70	\$	68,729.53		
A		Operations-Plumbing	6.00%	37.094	\$	50,000.00	\$	1,108,899.65	\$	50,000.00	\$	1,108,899.65		
A		YPM-Roof	6.00%	37.094	\$	7,766.83	\$	172,252.70	\$	6,229.92	\$	138,167.16		
A		Roof-Operations-1/4 Employee1	6.00%	37.094	\$	12,500.00	\$	277,224.91	\$	12,500.00	\$	277,224.91		
A		Electrical Consumption	6.00%	37.094	\$	148,872.91	\$	5,522,245.27	\$	280,355.93	\$	10,399,435.39		
A		Mechanical Consumption	6.00%	37.094	\$	7,769.22	\$	288,189.02	\$	9,878.30	\$	366,422.58		
A		Water Consumption-25 % Reduction	6.00%	37.094	\$	23,173.57	\$	859,593.18	\$	15,672.49	\$	581,350.45		
Total Operation/Maintenance (PW) Costs											\$	14,971,088.27	\$	19,496,138.84
Total Present Worth Life Cycle Costs											\$	54,258,682.33	\$	56,265,421.00
Life Cycle (PW) Savings													\$	(2,006,738.67)
PW - Present Worth PWA - Present Worth of Annuity														
Summary-All Costs per SF														
												East Hall SF	162,404.00	
												Total Non Green Costs per SF	\$ 346.45	
												Total Green Costs per SF	\$ 334.10	
												Savings per SF	\$ 12.36	
												Percent Savings	3.57%	

Appendix F-L11 LCCA Green v. Non-Green Case 2 Scenario 5

LIFE CYCLE COST (Present Worth Method)									
LCC -Construction Costs, Consumption Costs, O&M (10% GF)				Green		Non-Green			
O&M 70% Reduction to Fall into Typical 5% Cost Distribution									
Actual Case Compared to Proposed Design Case				Not East Hall Specific		RS Means CostWorks			
PROJECT LIFE CYCLE (YEARS)		25							
DISCOUNT RATE (% in decimals)		4.00%							
				Est.		PW			
Base Cost						\$ -		\$ -	
A) Base Construction Costs				\$ 37,469,713.06		\$ 37,469,713.06		\$ 35,248,164.16	
B)						\$ -		\$ -	
Total Initial Cost Impact (IC)						\$ 37,469,713.06		\$ 35,248,164.16	
Initial Cost PW Savings								\$ 2,221,548.90	
				Year	Factor				
FMRRC Mechanical Items				0.5	0.9806	\$ 90.47	\$ 318.00	\$ 82.25	\$ 265.00
				1	0.9615	\$ 1,093.54	\$ 3,716.00	\$ 994.13	\$ 3,096.00
				2	0.9246	\$ 64.49	\$ 204.00	\$ 58.63	\$ 170.00
				3	0.8890	\$ 4.82	\$ 14.00	\$ 4.38	\$ 11.00
				5	0.8219	\$ 16,720.77	\$ 43,351.00	\$ 15,200.70	\$ 36,126.00
				6	0.7903	\$ 2,503.06	\$ 6,065.00	\$ 2,275.51	\$ 5,054.00
				7	0.7599	\$ 9,538.94	\$ 21,601.00	\$ 8,671.77	\$ 18,001.00
				8	0.7307	\$ 45.06	\$ 95.00	\$ 40.97	\$ 79.00
				10	0.6756	\$ 217,069.18	\$ 401,261.00	\$ 197,335.62	\$ 334,384.00
				12	0.6246	\$ 6,077.94	\$ 9,813.00	\$ 5,525.40	\$ 8,177.00
				14	0.5775	\$ 330.09	\$ 465.00	\$ 300.08	\$ 387.00
				15	0.5553	\$ 406,485.53	\$ 535,742.00	\$ 369,532.30	\$ 446,451.00
				20	0.4564	\$ 510,145.60	\$ 479,386.00	\$ 463,768.73	\$ 399,488.00
				25	0.3751	\$ 11,479.87	\$ 7,691.00	\$ 10,436.24	\$ 6,409.00
				FMRRC Electrical Items				0.5	0.9806
1	0.9615	\$ 21.04	\$ 20.00					\$ 19.13	\$ 18.00
3	0.8890	\$ 13.15	\$ 11.00					\$ 11.95	\$ 10.00
5	0.8219	\$ 684.85	\$ 562.00					\$ 622.59	\$ 511.00
10	0.6756	\$ 1,352.47	\$ 913.00					\$ 1,229.52	\$ 830.00
15	0.5553	\$ 74.34	\$ 41.00					\$ 67.58	\$ 37.00
20	0.4564	\$ 1,701.09	\$ 776.00					\$ 1,546.44	\$ 705.00
25	0.3751	\$ 154.77	\$ 58.00	\$ 140.70	\$ 52.00				
30	0.3083		\$ -	\$ -	\$ -				

		0.5	0.9806	\$	10.75	\$	37.00	\$	9.78	\$	31.00	
		1	0.9615	\$	1,415.74	\$	4,811.00	\$	1,287.04	\$	4,009.00	
		3	0.8890	\$	190.92	\$	566.00	\$	173.56	\$	472.00	
		4	0.8548	\$	73.18	\$	203.00	\$	66.53	\$	169.00	
		5	0.8219	\$	508.66	\$	1,318.00	\$	462.42	\$	1,099.00	
		7	0.7599	\$	500.82	\$	1,134.00	\$	455.29	\$	945.00	
		10	0.6756	\$	10,606.65	\$	19,606.00	\$	9,642.41	\$	16,339.00	
		12	0.6246	\$	1,089.28	\$	1,758.00	\$	990.25	\$	18.00	
		15	0.5553	\$	104,485.01	\$	137,709.00	\$	94,986.38	\$	114,758.00	
		20	0.4564	\$	24,006.17	\$	22,558.00	\$	21,823.79	\$	18,798.00	
		25	0.3751	\$	85,584.38	\$	57,341.00	\$	77,803.98	\$	47,784.00	
		0.5	0.9806	\$	849.91	\$	821.00	\$	849.91	\$	821.00	
		1	0.9615	\$	2,569.29	\$	2,401.00	\$	2,467.83	\$	2,306.00	
		5	0.8219	\$	3,430.16	\$	2,445.00	\$	3,294.69	\$	2,349.00	
		15	0.5553	\$	54,406.26	\$	19,719.00	\$	52,257.62	\$	18,940.00	
		20	0.4564	\$	127,772.28	\$	33,018.00	\$	122,726.24	\$	31,714.00	
Total Replacement/Salvage PW Costs						\$	1,817,573.00			\$	1,520,836.00	
		Type of Annual Expense	Escl..00 %	PWA								
A		YPM-Electrical	3.00%	22.103	\$	6,360.70	\$	140,588.33	\$	5,782.46	\$	127,807.57
A		Operations-Electrical	3.00%	22.103	\$	100,000.00	\$	2,210,263.80	\$	100,000.00	\$	2,210,263.80
A		YPM-Mechanical	3.00%	22.103	\$	6,163.86	\$	497,098.05	\$	5,603.51	\$	414,248.37
A		Operations-Mechanical	3.00%	22.103	\$	100,000.00	\$	2,217,799.31	\$	100,000.00	\$	2,217,799.31
A		YPM-Plumbing	3.00%	22.103	\$	1,022.67	\$	82,475.43	\$	929.70	\$	68,729.53
A		Operations-Plumbing	3.00%	22.103	\$	50,000.00	\$	1,108,899.65	\$	50,000.00	\$	1,108,899.65
A		YPM-Roof	3.00%	22.103	\$	7,766.83	\$	172,252.70	\$	6,229.92	\$	138,167.16
A		Roof-Operations-1/4 Employee1	3.00%	22.103	\$	12,500.00	\$	277,224.91	\$	12,500.00	\$	277,224.91
A		Electrical Consumption	3.00%	22.103	\$	148,872.91	\$	3,290,484.04	\$	280,355.93	\$	6,196,605.63
A		Mechanical Consumption	3.00%	22.103	\$	7,769.22	\$	171,720.26	\$	9,878.30	\$	218,336.49
A		Water Consumption-25 % Reduction	3.00%	22.103	\$	23,173.57	\$	512,197.03	\$	15,672.49	\$	346,403.37
Total Operation/Maintenance (PW) Costs						\$	10,681,003.50			\$	13,324,485.80	
Total Present Worth Life Cycle Costs						\$	49,968,289.56			\$	50,093,485.96	
Life Cycle (PW) Savings										\$	(125,196.40)	
PW - Present Worth PWA - Present Worth of Annuity												
Summary-All Costs per SF												
											East Hall SF	162,404.00
											Total Non Green Costs per SF	\$ 308.45
											Total Green Costs per SF	\$ 307.68
											Savings per SF	\$ 0.77
											Percent Savings	0.25%

Appendix F-L12 LCCA Green v. Non-Green Case 2 Scenario 6

LIFE CYCLE COST (Present Worth Method)									
LCC -Construction Costs, Consumption Costs, O&M (10% GF)				Green		Non-Green			
O&M 70% Reduction to Fall into Typical 5% Cost Distribution									
Actual Case Compared to Proposed Design Case				Not East Hall Specific		RS Means CostWorks			
PROJECT LIFE CYCLE (YEARS)		25							
DISCOUNT RATE (% in decimals)		7.00%							
				Est.		PW		Est.	
Base Cost						\$ -		\$ -	
A) Base Construction Costs				\$ 37,469,713.06		\$ 37,469,713.06		\$ 35,248,164.16	
B)						\$ -		\$ -	
Total Initial Cost Impact (IC)						\$ 37,469,713.06		\$ 35,248,164.16	
Initial Cost PW Savings								\$ 2,221,548.90	
				Year		Factor			
				0.5		0.9667		\$ 265.00	
				1		0.9346		\$ 3,096.00	
				2		0.8734		\$ 170.00	
				3		0.8163		\$ 11.00	
				5		0.7130		\$ 36,126.00	
				6		0.6663		\$ 5,054.00	
				7		0.6227		\$ 18,001.00	
				8		0.5820		\$ 79.00	
				10		0.5083		\$ 334,384.00	
				12		0.4440		\$ 8,177.00	
				14		0.3878		\$ 387.00	
				15		0.3624		\$ 446,451.00	
				20		0.2584		\$ 399,488.00	
				25		0.1842		\$ 6,409.00	
				0.5		0.9667		\$ 23.00	
				1		0.9346		\$ 17.00	
				3		0.8163		\$ 9.00	
				5		0.7130		\$ 443.00	
				10		0.5083		\$ 625.00	
				15		0.3624		\$ 24.00	
				20		0.2584		\$ 399.00	
				25		0.1842		\$ 25.00	
				30		0.1314		\$ -	
FMRRC Mechanical Items						\$ 90.47	\$ 318.00	\$ 82.25	\$ 265.00
						\$ 1,093.54	\$ 3,716.00	\$ 994.13	\$ 3,096.00
						\$ 64.49	\$ 204.00	\$ 58.63	\$ 170.00
						\$ 4.82	\$ 14.00	\$ 4.38	\$ 11.00
						\$ 16,720.77	\$ 43,351.00	\$ 15,200.70	\$ 36,126.00
						\$ 2,503.06	\$ 6,065.00	\$ 2,275.51	\$ 5,054.00
						\$ 9,538.94	\$ 21,601.00	\$ 8,671.77	\$ 18,001.00
						\$ 45.06	\$ 95.00	\$ 40.97	\$ 79.00
						\$ 217,069.18	\$ 401,261.00	\$ 197,335.62	\$ 334,384.00
						\$ 6,077.94	\$ 9,813.00	\$ 5,525.40	\$ 8,177.00
						\$ 330.09	\$ 465.00	\$ 300.08	\$ 387.00
						\$ 406,485.53	\$ 535,742.00	\$ 369,532.30	\$ 446,451.00
						\$ 510,145.60	\$ 479,386.00	\$ 463,768.73	\$ 399,488.00
						\$ 11,479.87	\$ 7,691.00	\$ 10,436.24	\$ 6,409.00
				FMRRC Electrical Items					
		\$ 21.04	\$ 19.00					\$ 19.13	\$ 17.00
		\$ 13.15	\$ 10.00					\$ 11.95	\$ 9.00
		\$ 684.85	\$ 488.00					\$ 622.59	\$ 443.00
		\$ 1,352.47	\$ 687.00					\$ 1,229.52	\$ 625.00
		\$ 74.34	\$ 26.00					\$ 67.58	\$ 24.00
		\$ 1,701.09	\$ 439.00					\$ 1,546.44	\$ 399.00
		\$ 154.77	\$ 28.00	\$ 140.70	\$ 25.00				
		\$ -	\$ -	\$ -	\$ -				

			0.5	0.9667	\$	10.75	\$	37.00	\$	9.78	\$	31.00		
			1	0.9346	\$	1,415.74	\$	4,811.00	\$	1,287.04	\$	4,009.00		
			3	0.8163	\$	190.92	\$	566.00	\$	173.56	\$	472.00		
			4	0.7629	\$	73.18	\$	203.00	\$	66.53	\$	169.00		
			5	0.7130	\$	508.66	\$	1,318.00	\$	462.42	\$	1,099.00		
			7	0.6227	\$	500.82	\$	1,134.00	\$	455.29	\$	945.00		
			10	0.5083	\$	10,606.65	\$	19,606.00	\$	9,642.41	\$	16,339.00		
			12	0.4440	\$	1,089.28	\$	1,758.00	\$	990.25	\$	18.00		
			15	0.3624	\$	104,485.01	\$	137,709.00	\$	94,986.38	\$	114,758.00		
			20	0.2584	\$	24,006.17	\$	22,558.00	\$	21,823.79	\$	18,798.00		
			25	0.1842	\$	85,584.38	\$	57,341.00	\$	77,803.98	\$	47,784.00		
			0.5	0.9667	\$	849.91	\$	821.00	\$	849.91	\$	821.00		
			1	0.9346	\$	2,569.29	\$	2,401.00	\$	2,467.83	\$	2,306.00		
			5	0.7130	\$	3,430.16	\$	2,445.00	\$	3,294.69	\$	2,349.00		
			15	0.3624	\$	54,406.26	\$	19,719.00	\$	52,257.62	\$	18,940.00		
			20	0.2584	\$	127,772.28	\$	33,018.00	\$	122,726.24	\$	31,714.00		
Total Replacement/Salvage PW Costs											\$	1,816,889.00	\$	1,520,215.00
			Type of Annual Expense	Escl..00 %	PWA									
A			YPM-Electrical	3.00%	15.816	\$	6,360.70	\$	100,602.45	\$	5,782.46	\$	91,456.77	
A			Operations-Electrical	3.00%	15.816	\$	100,000.00	\$	1,581,624.58	\$	100,000.00	\$	1,581,624.58	
A			YPM-Mechanical	3.00%	15.816	\$	6,163.86	\$	497,098.05	\$	5,603.51	\$	414,248.37	
A			Operations-Mechanical	3.00%	15.816	\$	100,000.00	\$	2,217,799.31	\$	100,000.00	\$	2,217,799.31	
A			YPM-Plumbing	3.00%	15.816	\$	1,022.67	\$	82,475.43	\$	929.70	\$	68,729.53	
A			Operations-Plumbing	3.00%	15.816	\$	50,000.00	\$	1,108,899.65	\$	50,000.00	\$	1,108,899.65	
A			YPM-Roof	3.00%	15.816	\$	7,766.83	\$	172,252.70	\$	6,229.92	\$	138,167.16	
A			Roof-Operations-1/4 Employee1	3.00%	15.816	\$	12,500.00	\$	277,224.91	\$	12,500.00	\$	277,224.91	
A			Electrical Consumption	3.00%	15.816	\$	148,872.91	\$	2,354,610.54	\$	280,355.93	\$	4,434,178.31	
A			Mechanical Consumption	3.00%	15.816	\$	7,769.22	\$	122,879.89	\$	9,878.30	\$	156,237.62	
A			Water Consumption-25 % Reduction	3.00%	15.816	\$	23,173.57	\$	366,518.88	\$	15,672.49	\$	247,879.95	
Total Operation/Maintenance (PW) Costs											\$	8,881,986.40	\$	10,736,446.17
Total Present Worth Life Cycle Costs											\$	48,168,588.46	\$	47,504,825.33
Life Cycle (PW) Savings													\$	663,763.13
PW - Present Worth PWA - Present Worth of Annuity														
Summary-All Costs per SF														
												East Hall SF	162,404.00	
												Total Non Green Costs per SF	\$ 292.51	
												Total Green Costs per SF	\$ 296.60	
												Savings per SF	\$ (4.09)	
												Percent Savings	-1.40%	

Glossary

Baseline Design Case (BDC): The BDC is the non-green case which is evaluated in the LEED template and used as a baseline to calculate the energy savings of the particular component of interest to the Proposed Design Case.

Building: A shelter comprising a partially or totally enclosed space, erected by means of a planned process of forming and combining materials. (2) The act or process of building.

Building Information Modeling (BIM): BIM refers to constructing and managing a building information model over time. The complete vision for BIM is for designers, construction firms, and owners to collaborate and use drawing and database tools throughout the design, construction, commissioning, and maintenance cycles of a building's life. The ultimate goal of BIM is to not only to provide large savings throughout the design and construction phases of a building by actually assembling a virtual model of the facility in a computer, in which the assembly of building systems can be tested and evaluated prior to actual physical construction, but also provide to the owner at the end of construction a complete model that can be used and updated over time while dealing with maintenance and renovation work⁴⁰.

Construction Specifications Institute's (CSI) MasterFormat sections are a master list of numbers and titles classified by work types. It is used to organize project manuals and detailed cost information, and to relate drawing notations to specifications. MasterFormat provides a standard filing and retrieval method that can be used throughout the construction industry. It lists titles and section numbers for organizing data about construction requirements, products, and activities. By standardizing such information, MasterFormat facilitates communication among architects, specifiers,

⁴⁰ <http://www.cfta.org/mc/page.do?sitePageId=75364>

contractors and suppliers, helping them meet building owners' requirements, timelines and budgets.⁴¹

Current Amount (CA): Is the actual contractor's costs as indicated in Gilbane Building Company's Construction Cost Estimate.

Energy Input: All forms of energy necessary for the accomplishment of the particular building life cycle process under consideration.

Environmental Releases: All air, water, and solid emissions, which are given off by the building life cycle process under the consideration that they return to the natural environment.

Facilities Management (FM): Facility management is an interdisciplinary profession with the aim to ensure functionality of the built environment by integrating people, place, process and technology⁴².

Forest Stewardship Council (FSC) certified wood: A non-profit organization that sets high standards to ensure forestry is practiced in an environmentally responsible and socially beneficial manner. When products are labeled as "FSC Certified", it means the wood used in the piece and the manufacturer met the requirements of the Forest Stewardship Council.

Frequency of Maintenance Repair and Replacement (FMRR): Is the maintenance that is needed at a given frequency for example in one year or two years of system installation or operation. The FMRR is required to ensure that they systems are functioning at their design efficiencies.

⁴¹ <http://www.csinet.org/masterformat>

⁴² http://www.ifma.org/what_is_fm/index.cfm

Furnishing and Outfitting: The complete series of activities and actions that begins with a building structure and results in a complete building.

Green Building: a building that provides the specified building performance requirements while minimizing disturbance to and improving the functioning of local, regional, and global ecosystems both during and after its construction and specified service life.

GBC: Gilbane Building Company

Green: Indicates that the type of construction and design referred to includes sustainability features.

Green Factor (GF): Green Factor is a factor applied to reflect the potential increase in cost due to new technology adoption and the learning curve associated with its implementation.

Guaranteed Maximum Price (GMP): Is a cost contract to construct a project where the contractor is compensated only the fixed price it bid. The contractor is responsible for cost overruns, unless the GMP amount has been increased by a formal change order (only as a result of additional scope from the client, not due to price overruns, errors, or omissions). Savings resulting from cost under-runs are returned to the owner.

HVAC: Heating Ventilation Air Conditioning Systems

Interior Furnishings: Those temporary and semi-permanent systems and components, which generally are required for the normal utilization of the building for its intended purpose including decorative components.

LEED template: refers to the documents that are filed with the USGBC in the process of LEED certification.

Life-Cycle: (1) In economic impact management, the length of time over which an investment is analyzed. (2) In environmental impact management, consecutive and

interlinked stages of a product system, from raw material acquisition or generation from natural resources to final disposal

Life-Cycle Assessment, LCA: A method of evaluating a product by reviewing the ecological impact over the life of the product. At each stage the product and its components are evaluated based upon materials and energy consumed, and the pollution and waste produced. Life stages include extraction of raw materials, processing and fabrication, transportation, installation, use and maintenance, and reuse/recycling/disposal. Based on ISO 14040, LCA is compilation and evaluation of the inputs, outputs, and the potential environmental impacts of a product system throughout its life cycle.

Life-Cycle Cost Analysis (LCCA) Method: A technique of economic evaluation that sums over a given study period the costs of initial investment (less resale value), replacements, operations (including energy use), and maintenance and repair of an investment decision (expressed in present or annual value terms).

MEP: Mechanical Electrical Plumbing Systems

Non-Green: Indicates that the type of construction and design referred to does not include sustainability features.

Obsolete Building: A building that has reached the end of its useful life.

Proposed Design Case (PDC): The PDC is the green case where the energy saving features have been included and this design case is compared to the baseline design case in the LEED Template to generate the percent savings in energy consumption to be evaluated by the USGBC for certification purposes.

Sustainability: the maintenance of ecosystem components and functions for future generations.

Sustainable Development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Square Foot (SF): square foot unit of measure used in buildings.

United States Green Building Council (USGBC): The USGBC is a non-profit organization, which developed a sustainable building rating system called Leadership in Energy and Environmental Design (LEED).

Work Breakdown Structure (WBS): Work Breakdown Structure is a method of work division and data collection that allows the organization of complex projects by subdividing them into progressively smaller portions into a collection of defined "work packages" that can include a variety of tasks. The Work Breakdown Structure (WBS) is used to provide the framework for organizing and managing the work.

Yearly Preventative Maintenance (YPM): Is the required yearly maintenance deemed to prevent system breakdown and ensures systems in question function efficiently per their design criterion intended efficiencies.