Project Number: GFS MQP 0808

PROJECT RENOVATION OF

BOSTON LONG WHARF MARRIOTT

A Major Qualifying Project
Submitted to the faculty of
Worcester Polytechnic Institute
In partial fulfillment of the requirements for the
Degree of Bachelor of Science

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Sponsored By:

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Submitted To:

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Terms:

C08,D08,E08,A09,B09,C09,D09

Abstract

This study points out the renovation of guestrooms and corridor of Boston Long Wharf Marriott Hotel. Reviewing bid rates and evaluating the project manual; project sections were examined. The goal of the project was accomplished in collaboration with superintendents, engineers and accountants. An earned value analysis was performed to determine if the cost , schedule and work accomplished progressed according to the plan. A 5D visual representation of renovation project was created by combining 3DMax and schedule, cost values. One of the main goals of the project is to create 3D model of the entire project floor by floor showing the columns, elevator pits and stairs in order to show the change in cost and schedule. In conclusion, improvements for the close-out system have been proposed to TURNER Construction Company. Additionally an alternative approximate design process was designed in terms of manufacturability and economic.

Acknowledgments

Special thanks to Mrs. Danielle Clarke and the Turner Construction Company who was proposed by us and agreed to sponsored the main part of the project. I also thank to Abdullah Azhari for taking time out of his busy schedules and guiding us through the project. And finally special thanks to Professor Salazar for helping me whenever I need.

Capstone Design Experience

My capstone design focused on structural analysis. The renovation of existing space have minor structural implications as new materials are added to the building and the use of the space according to the architectural and functional requirements are different than the original.

An approximate design process including column and beam design was conducted in order to consider whether the column can carry the increasing live loads due to renovation. The selection of the beam and column sections was done by choosing a single column and beam selected for design analysis.The increasing live load implicated to column and beam. Capacity calculation of column was done by neglecting moment. This way, the column was designed for axial compression. The connection of beam with column was considered as pinned connection.

The following “realistic constraints” set forth by the ASCE Commentary: Economic, Manufacturability were satisfied in my capstone design of foundations by selecting the same section for beam and column.

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1.0 Introduction

The Long Wharf Marriot hotel is a leader in its own class of middle ranking hotels. It is located on Boston Harbor at the historic Long Wharf in downtown Boston. The Long Wharf Marriot is located in a place where it can easily attract especially business travelers throughout the year and families in the summer. The hotel went through an extensive renovation which finished in 18 weeks in 2008 by the Turner Construction Company. It is a commercial hotel built in 1981, renovated three times in 1996, 2002 and 2008. This study examines the renovation in 2008 that cost 16 million dollars when the hotel received a beautification treatment from top to bottom. The hotel was built by the same company who renovated it.

Before being bought by Sunset Investor Inc, a Southern California-based lodging real estate investment trust which operates under nationally recognized brands such as Marriott, Renaissance, Starwood and Fairmont, the Boston Long Wharf Marriott was one of the hotels of Marriott International. Hotel sector is one of the main interests of the Sunstone Hotel Investor INC. group which has more than 500 hotels worldwide, 350 of them being in the US. As the hotel refers rather to a middle class mass of customers, it is very important for them to balance a caring service with reasonable prices, and the aim of the renovation was basically to show with a concrete example that the hotel cares for the ever-increasing comfort of its customers.

The owner of the hotel is Sunstone Hotel Investor INC and it is managed by Marriot International INC. The organization chart of sunstone that dealt with the renovation project of Boston Long Wharf Marriot is given in Fig. 1.1.

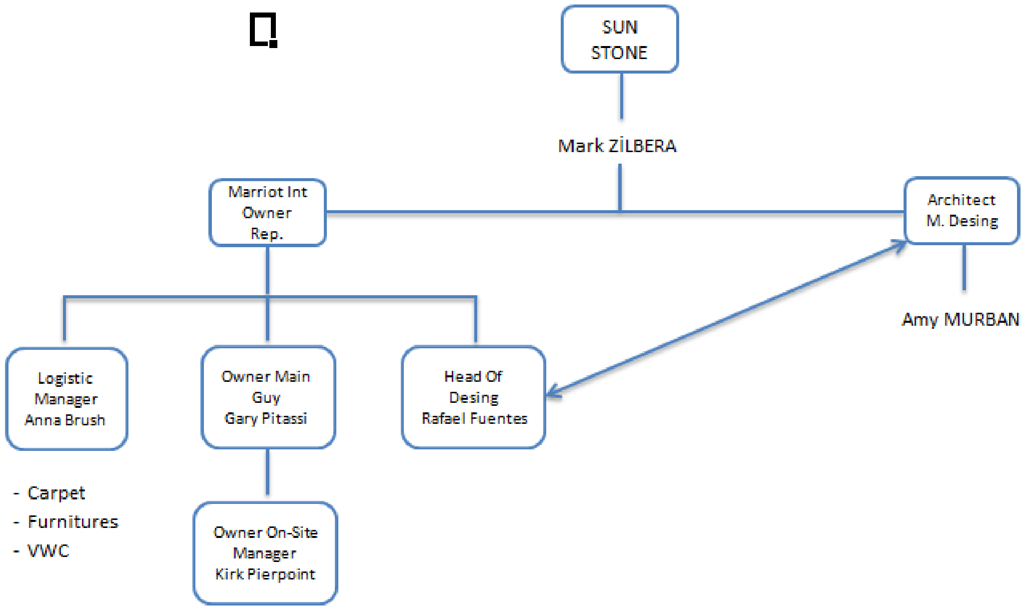

Figure 1.1: Organization Chart of Sun Stone

The hotel is one of the major chains in the hotels owned by Sunstone, and it was renovated as part of a renovation project with which Sunstone aimed to redress all its key hotels. The owner of the hotel only recently became Sunstone, and its investors decided it needed a good renovation. The total cost of the key hotels renovation project for Sunstone was 270$ million, 5.9 % of which was spent on the renovation of Long Wharf Marriot as it is one of its most profitable managements and also a generally well-known hotel in Boston as well. Though it was Turner who built the hotel in 1981, it was absent in the past renovations of the building. However, the 2008 renovation is the most comprehensive one the hotel is getting and therefore Turner and its subdivisions are involving themselves with full commitment.

The construction company of Turner was founded by Henry C. Turner in 1902. It is a leader in its industry and did the renovation of Boston Long Wharf Marriot in its 106th anniversary.

When it comes to Turner Construction Company, the first thing that must be mentioned is that it is one of the giants in the construction sector. The founder of the company Henry C. Turner is such a respected figure in the industry that the American National Building Museum holds a prize for him. Turner Construction is an international company that has a multitude of offices in a dozen countries and American states. The company’s market segments range from healthcare to industrial buildings. Ever since 2001, the value of total constructions completed by the company wavered between 1265$ million and 1565$ million annually.

Turner Special Project is the department at Turner which generally deals with projects of a 20$ million or less value. Their portfolio includes: tenant space fit-outs, rooms’ renovations, electrical and mechanical systems upgrades, office space fit outs, hospital spaces, lobby renovations, etc. These are projects that require special attention other than standard construction business conduct. In such projects, an operations manager oversees all the operations. The take-off begins right before the bidding with the order of the operations manager. A project senior executive manager is the actual person in charge on and off site. Then, there is the project engineer who is responsible for all the paper work, change orders, subcontractors, packages and payments, extra work orders, potential change order, project communication in owner, architect, and contractor (OAC) meetings. The organization chart of Turner Company is given in Fig. 1.2

The renovation of the Long Wharf Marriot was not done because of an ultimate necessity but for the aesthetical preferences of the new owner of the hotel. In the end, the renovation almost meant a total redressing of this key hotel in the Marriot hotel chain. During project, all of the public areas and guest rooms of the hotel were renovated. The improvements include a new collection of redressed suites, an enlarged lounge, and guestrooms with LCD TVs, wireless high speed internet and many other items above routine standards. In total, all the

410 rooms were renovated. All the existing furniture's were removed, carpets taken, ceilings blanked and repainted. All the tiles and WCs in the bathrooms, all the doors in the corridors were also to be replaced by new ones.

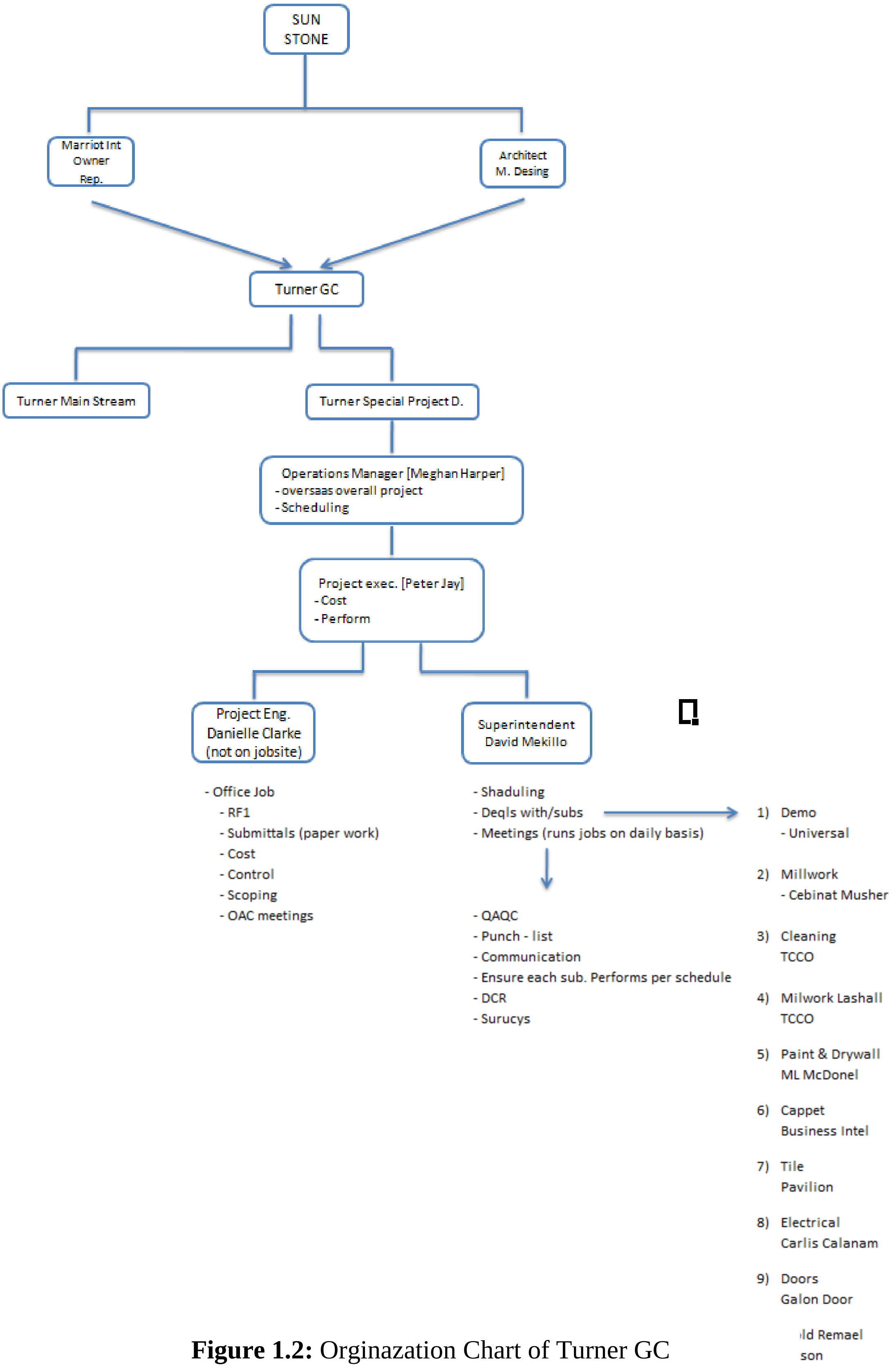

Figure 1.2: Orginazation Chart of Turner GC

The type of price arrangement between the hotel management and the Turner Construction Company's branch, located in Boston, is Lump-sum contract. During the bidding process, Turner Construction Company bid on a schedule with the price which included delivering the projects expectations within the time limit. The phase was important since it is the hotel that was going to lose money in the project, and Turner has to guarantee that the money will be spent with such an exactitude that there will be no delays in any of the project's segments because each extra work day costs the hotel an extra sum and cuts it from possible revenues earned. The work schedule is measured by floors and sections. Each 7 floor has a total of 27 sections. According to the contract, each section in the floors should be completed within the time limit given in the schedule.

With such an experience and institutionalization in the field, Turner managed to complete the renovation of the hotel within the specified time limit which included all guest rooms, suites and corridors, the lounge and grand ballroom. The guest rooms were completely renovated from floor to ceiling with success due to well-planned and well-managed business conduct on part of both of the contractors.

The aim of this project is to analyze how a renovation project is conducted in the particular example of the renovation of the Boston Long Wharf Marriot Hotel. The approach of the study to the subject is analytic in the sense of concentrating on the details of how the renovation project was carried out in terms of cost and schedule. An earned value analysis was performed to investigate if the cost, schedule, and work accomplished are progressing according to the plan. The visual representation was also done to demonstrate the process of renovation floor by floor. Overall, the study provide both qualitative and quantative data on how a certain kind of business project is carried out from beginning to the end.

2.0 Earned Value Analysis

Variations or deviations in a project are unavoidable. However depending on how late they appear, their correction will be equally difficult and expensive. If they are not under control, even small variations will affect project very negatively in the context of both time schedule as well as cost. These variations can be anticipated with a good planning and tracking system.

Project planning techniques attempts to identify and solve problems faced in the actual life by facilitating the ability to think ahead of them and making provision for their solution before they occur. These techniques substantially help project managers especially with their standpoints and the easiness they provide in structuring the problem. Due to alternatives provided thanks to time and cost values of these techniques project managers enable to complete their studies on time with the best low-cost. The Earned Value Management System (EVA) is an extremely powerful project management system among the project planning techniques and has the unique ability to combine measurements of scope, schedule, and cost in a single integrated system [4].

EVA compares the planned amount of work with what has actually been completed, to determine if the cost, schedule, and work accomplished are progressing according to the plan. It also provides and objective measure of accomplishments.

Before the Earned Value analysis, the tasks in a project are aligned after planning, relations and correlations between these tasks are determined and budget of the project is prepared. The actual costs are collected as the work progress in the same position with the targeted costs (budget). The purpose of the researcher is reporting of gained values and measured performances as well as performance deviations and the actions taken for compensating these deviations at each stage.

2.1 Earned Value System Method: Definitions

BCWS (Budgeted Cost Work Scheduled): The budgeted cost of the planned work.

POC (Percentage of Completion): Completion percentage. The completion percentage is 0 when actual starting date of a work is entered. And it is 100 when actual completion date is entered.

ACWP (Actual Cost Work Performed): The actual cost of the work performed.

BCWP (Budgeted Cost Work Performed): The budgeted cost of the performed work. It is also named as earned value as it represents the earned value in the project as per the realization state and date. As the whole work is indexed to the budged, you earn the corresponding portion of the budget upon the performed work. Thus, you ensure to complete the project within the budget when you proceed in accordance with that comparison.

BCWP = POC * BCWS

SV (Schedule Variance): Discrepancy in the plan. In earned value analysis, this is the variance between actual process and main plan. It indicates the deviation from time schedule.

SV = BCWP - BCWS

SPI (Schedule Performance Index)= BCWP/ BCWS

CV (Cost Variance): Discrepancy in the cost. In earned value analysis, this is the variance between actual cost and budgeted cost.

CV = BCWP – ACWP

CPI (Cost Performance Index): The index for cost performance.

CPI = BCWP / ACWP

2.2 Earned Value Analysis: Project

The work schedule is measured by floors and sections. Each floor has sections. According to the contract, each section in the floors should be completed within the time limit given in the schedules (appendix I- appendix II). The budget percentage of work in one day is listed in Table 2.1. The daily work is calculated as this formula :

(Per floor / total rooms) / Days per section = the budget percentage of work in one day

The cumulative daily work can be considered as 2.95% of total work.

Table 2.1: The budget percentage of work in one day

Floor/section	Room number per section	Total rooms	Percent for section	days per section	Percent for daily work	Cumulative percent for daily work
F/7 S1	18	402	0,0448	38	0,0012	0,0012
F/7 S2	18	402	0,0448	39	0,0011	0,0023
F/7 S3	18	402	0,0448	39	0,0011	0,0035
F/6 S1	34	402	0,0846	37	0,0023	0,0058
F/6 S2	23	402	0,0572	40	0,0014	0,0072
F/5 S1	25	402	0,0622	40	0,0016	0,0087
F/5 S2	22	402	0,0547	38	0,0014	0,0102
F/5 S3	22	402	0,0547	38	0,0014	0,0116
F/4 S1	24	402	0,0597	33	0,0018	0,0134
F/4 S2	22	402	0,0547	32	0,0017	0,0151
F/4 S3	22	402	0,0547	32	0,0017	0,0169
F/3 S1	24	402	0,0597	32	0,0019	0,0187
F/3 S2	24	402	0,0597	32	0,0019	0,0206
F/3 S3	24	402	0,0597	32	0,0019	0,0225
F/2 S1	24	402	0,0597	30	0,0020	0,0244
F/2 S2	26	402	0,0647	30	0,0022	0,0266
F/1 S1	16	402	0,0398	29	0,0014	0,0280
F/1 S2	16	402	0,0398	26	0,0015	0,0295

The percentage of each week for the performed work is shown in the column of week's percent (appendix I- appendix II).

The budgeted total cost was estimated to be USD 3,962,822. The actual cost after completion of the study was calculated as USD 5,975,139. The detailed distribution of the costs and the percent of work (as measured by completed rooms) are calculated in the table 2.2. Earned value analysis is applied by taking percentage of work performed each week.

Table 2.2 : Earned value analysis calculations

	weeks percent(total is 1)	budget	BCWS	actual cost	ACWP	BCWP	CV
1st week	0,007	$ 27,740	$ 27,740	$ 40,566	$ 40,566	$ 194	-$ 12,826
2nd week	0,02	$ 79,256	$ 106,996	$ 115,903	$ 156,469	$ 2,889	-$ 49,473
3rd week	0,031	$ 122,847	$ 229,844	$ 179,649	$ 336,118	$ 13,331	-$ 106,274
4th week	0,055	$ 217,955	$ 447,799	$ 318,733	$ 654,851	$ 50,601	-$ 207,052
5th week	0,065	$ 257,583	$ 705,382	$ 376,684	$ 1,031.535	$ 125,558	-$ 326,152
6th week	0,075	$ 297,212	$ 1,002.594	$ 434,635	$ 1,466.170	$ 263,656	-$ 463,576
7th week	0,07	$ 277,398	$ 1,279.992	$ 405,660	$ 1,871.830	$ 413,437	-$ 591,838
8th week	0,07	$ 277,398	$ 1,557.389	$ 405,660	$ 2,277.490	$ 612,054	-$ 720,101
9th week	0,066	$ 261,546	$ 1,818.935	$ 382,479	$ 2,659.969	$ 834,891	-$ 841,034
10th week	0,076	$ 301,174	$ 2,120.110	$ 440,431	$ 3,100.399	$ 1,134.259	-$ 980,290
11th week	0,073	$ 289,286	$ 2,409.396	$ 423,045	$ 3,523.445	$ 1,464.913	-$ 1,114.049
12th week	0,076	$ 301,174	$ 2,710.570	$ 440,431	$3,963.875	$ 1,854.030	-$ 1,253.305
13th week	0,078	$ 309,100	$ 3,019.670	$ 452,021	$ 4,415.896	$ 2,300.989	-$ 1,396.226
14th week	0,077	$ 305,137	$ 3,324.808	$ 446,226	$ 4,862.122	$ 2,789.514	-$ 1,537.314
15th week	0,069	$ 273,435	$ 3,598.242	$ 399,865	$ 5,261.986	$ 3,267.204	-$ 1,663.744
16th week	0,053	$ 210,030	$ 3,808.272	$ 307,142	$ 5,569.129	$ 3,559.749	-$ 1,760.857
17th week	0,031	$ 122,847	$ 3,931.119	$ 179,649	$5,748.778	$ 3,899.670	-$ 1,817.658
18th week	0,008	$ 31,703	$ 3,962.822	$ 46,361	$5,795.139	$ 3,962.822	-$ 3,832.317

CPI value is an indication that tasks are performed as they have been planned. If the CPI value is bigger than 1, this means project is ahead of the schedule. When it is below 1, this appoints a trouble in the performance. So, the necessary actions can be taken. The ACWP and BCWP values are calculated for each week and listed in table 2.1.

The 100% of the whole project is completed. The budgeted cost at this stage was USD 3, 962,822 while the actual expenses reached up to USD 5,795,139 as painted 6th and 7th columns in table 2.2. CPI value is determined as $ 3,962.822 / $5,795.139 = 0,68 for project which commented as there are some faults in the project. CPI value indicates us that we performed 0,68 work against each USD 1 that we had spend.

The CV values are also listed in table 2.2. A negative CV value shows that more money is spent than the estimated value in the budget. Cost of the work did not go as planned and, it is understood that more money spent than the expected. The cost of the performed work has exceeded the budget. Even the works are finished on time, when it came to budget the expectation has not been realized. If we take these values from the table then it means that the works are completed as a whole by spending USD 5,795,139 instead of USD 3,962,822 our cost is increased in an amount of USD 1.832.317. The cost variance is USD -1.832.317.

Due the fact that the project has completed, BCWS and ACWP values are compared in order to calculate cost deviations and shown in Fig. 2.1.

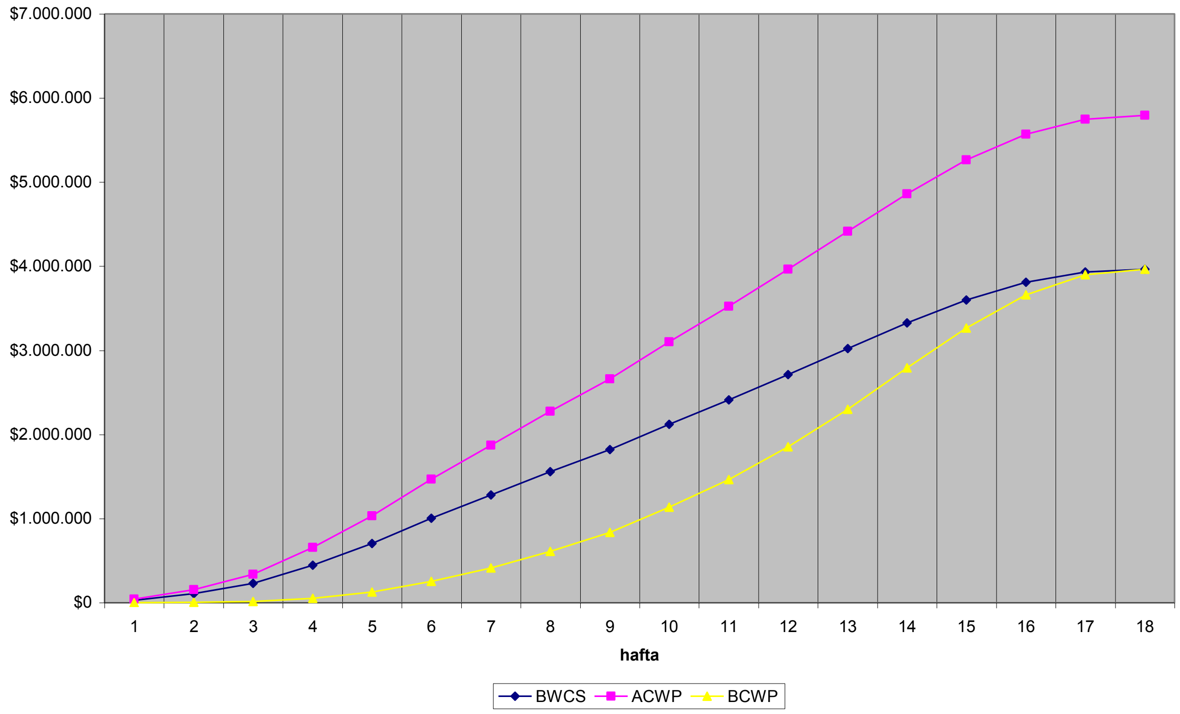

Figure 2.1: The distribution of BWCS, ACWP and BCWP

Budgeted cost of the programmed work for the 1st week was planned as USD 27.740 while actual cost realized as USD 40.566. The budgeted cost of the performed work is determined as USD194.

Budgeted cost of the programmed work for the 18th week was planned as USD 3.962.822 while actual cost realized as USD 5.795.139. Budgeted cost of the performed work is determined as USD 3.962.822.

SPI is calculated for each week and listed in table 2.3.

Table 2.3 : SPI values

	BCWS	BCWP	SPI
1st week	$ 27,740	$ 194	0.007
2nd week	$ 106,996	$ 2,889	0.027
3rd week	$ 229,844	$ 13,331	0.058
4th week	$ 447,799	$ 50,601	0.113
5th week	$ 705,382	$ 125,558	0.178
6th week	$ 1,002,594	$ 263,656	0.263
7th week	$ 1,279,992	$ 413,437	0.323
8th week	$ 1,557,389	$ 612,054	0.393
9th week	$ 1,818,935	$ 834,891	0.459
10th week	$ 2,120,110	$ 1,134,259	0.535
11th week	$ 2,409,396	$ 1,464,913	0.608
12th week	$ 2,710,570	$ 1,854,030	0.684
13th week	$ 3,019,670	$ 2,300,989	0.762
14th week	$ 3,324,808	$ 2,789,514	0.839
15th week	$ 3,598,242	$ 3,267,204	0.908
16th week	$ 3,808,272	$ 3,559,749	0.935
17th week	$ 3,931,119	$ 3,899,670	0.992
18th week	$ 3,962,822	$ 3,962,822	1.000

Project, on 14.11.2007, was started as the sub-contractor company had got into the hotel and it was completed by the sub-contractor as a result of its work based on seven days and regular working hours. The total completion time was 123 days and the completed work handed over to hotel management on 15/03/2008.

During execution of the project, a certain number of rooms were out of service due to alterations in these rooms. The hotel has total 402 rooms. 3 rooms were constantly reserved for project staff during the whole project period. 1% of the rooms were out of service in the first day.

The project was started with the alteration of 18 rooms in the 7th floor; totally 18+3=21 rooms were out of service during the first week of the project. And, percentage was 5%. The number of rooms out of service due to alteration in the second week was 39 and this figure later increased to 57. The number of rooms that were out of service had increased during whole project except in the last days. In the last days of the project, the number of these rooms had decreased and many of them brought into service after alteration. The number of out of service rooms was 19 and percentage of them was 5%. The process has completed by starting alterations in other floors within a plan after handing over of the rooms of which the alterations were completed.

The out of service room number was 183 in the 6th and 7th weeks. These are the weeks in which maximum number of rooms was out of service. The profile representing number of out of service rooms had increased regularly during working weeks and it had decreased in the last weeks as a result of intensive work. And, the process was completed at the end.

The graphic is demonstrating out of service rooms between dates of project execution. It shows the labor value from starting of the project until completion of it.

3.0 5D Model for the Project (3DMax)

The 3D model of building was drawn by the program 3DMax. The perspective of the building is shown in the figure.

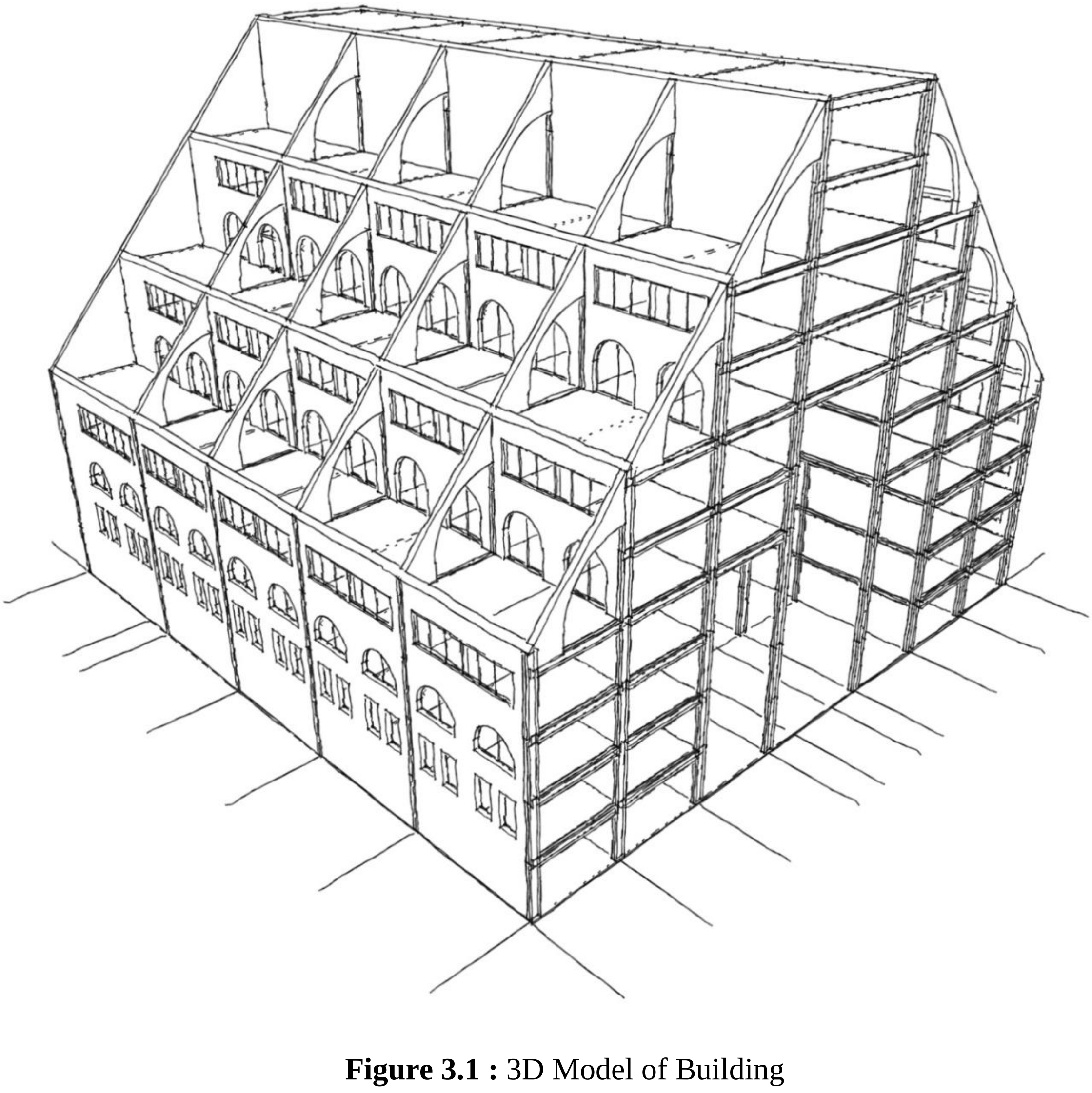

Figure 3.1 : 3D Model of Building

The renovation activity level complexity makes the whole construction process quite complicated and difficult for planners and builders. 4D (3D+Time) construction planning makes the virtual models easy to analyze and plan for the sequence of activities. Using 4D visualization we can learn time-space relationship in construction schedule more effectively. The objective of this research was to create 5D (3D+time+cost) model by adding the cost of project with reference to the time line so we can be able to obtain the cost control measures with the Schedule.

The aim of presenting visual representation is to improve decision making in the planning and scheduling phase of a Project and analysis of performance to date during the execution and control phase of Project. A 5D visualization model will make it easier to develop a more realistic approach to the whole process.

My 3D model represents the entire project floor by floor showing the columns, elevator pits, stairs, and interior walls. The procedure of 5D Model here was consisted of combining 3D model, ACWP values and schedules showing the phases of the model floor by floor extracted from MS Project. The renovation schedule was prepared based on floors. Calculated actual cost (ACWP) values are given by week periods. So, ACWP values for each floor renovation were determined and listed in Table 3.1. All the ACWP values shown in the table below was calculated according to the completion time of each floor.

Based on these values a 5D model was created by integrating schedule, 3D model and ACWP values. This process was done not only for entire building but also for each floor. 5D Model representation of each floor is shown in Appendix III .

Table 3.1 : ACWP Values for Each Floor Renovation

<table>
<tr><th rowspan="2">Week Number</th><th rowspan="2">Date</th><th colspan="8">ACWP</th></tr>
<tr><th>ACWP week by week</th><th>1th floor</th><th>2nd floor</th><th>3rd floor</th><th>4th floor</th><th>5th floor</th><th>6th floor</th><th>7th floor</th></tr>
<tr><td>1st week</td><td>14th November-
21th November</td><td>$ 40,566</td><td rowspan="3">21 days</td><td rowspan="5">31 days</td><td rowspan="7">43 days</td><td rowspan="9">62 days</td><td rowspan="12">79 days</td><td rowspan="14">97 days</td><td rowspan="16">111 days</td></tr>
<tr><td>2nd week</td><td>21th November
28th November</td><td>$ 156,469</td></tr>
<tr><td>3rd week</td><td>28th November
5th December</td><td>$ 336,118</td></tr>
<tr><td>4th week</td><td>5th December
12th December</td><td>$ 654,851</td><td rowspan="15">$ 336.118</td></tr>
<tr><td>5th week</td><td>12th December
19th December</td><td>$ 1,031.535</td></tr>
<tr><td>6th week</td><td>19th December
26th December</td><td>$ 1,466.170</td><td rowspan="13">$ 816.448</td></tr>
<tr><td>7th week</td><td>26th December
2nd January</td><td>$ 1,871.830</td></tr>
<tr><td>8th week</td><td>2nd January
9thJanuary</td><td>$ 2,277.490</td><td rowspan="11">$ 1.524.179</td></tr>
<tr><td>9th week</td><td>9th January
16thJanuary</td><td>$ 2,659.969</td></tr>
<tr><td>10th week</td><td>16h January
23thJanuary</td><td>$ 3,100.399</td><td rowspan="9">$ 2.595.097</td></tr>
<tr><td>11th week</td><td>23th January
30thJanuary</td><td>$ 3,523.445</td></tr>
<tr><td>12th week</td><td>30th January
6th February</td><td>$3,963.875</td></tr>
<tr><td>13th week</td><td>6th February
13th February</td><td>$ 4,415.896</td><td rowspan="6">$ 3.649.408</td></tr>
<tr><td>14th week</td><td>13th February
20th February</td><td>$ 4,862.122</td></tr>
<tr><td>15th week</td><td>20th February
27th February</td><td>$ 5,261.986</td><td rowspan="4">$ 4.798.312</td></tr>
<tr><td>16th week</td><td>27th February
5th March</td><td>$ 5,569.129</td></tr>
<tr><td>17th week</td><td>5th March
12th March</td><td>$5,748.778</td><td rowspan="2">$ 5.525.208</td></tr>
<tr><td>18th week</td><td>12th March
17th March</td><td>$5,795.139</td></tr>
</table>

4.0 Engineering Consideration in Renovation Project

Since this project was conducted for solely functional and operational purposes, it didn't have any structural elements to it. However, any renovation of existing space may have structural implications as new materials are added to the building and the use of the space according to the architectural and functional requirements may be different than the original. In this actual renovation of the building, there were no structural engineering or design performed nor any structural work done. Any structural reinforcements were not necessary for this job. The scope of the work consisted of removal of carpet and wallpaper, as well as of removal of existing furniture, installation of new carpet and wallpaper as well as wall preparation, mold remediation and finally installation of new furniture. Turner CO didn't have any information as far as the steel or concrete design of this building or the load information as this was not necessary for their project. An approximate design process including column and beam design was conducted in order to consider the increasing live loads due to renovation.

During renovation process, there were minor challenges that affected planned schedule. However construction managers overcame the problem in least amount of time possible.

4.1 Structural Analysis

The structural system consists of steel columns and beams with composite deck. In addition, this project was only an interior fit out of existing space so TURNER CO did not have any structural plans of the existing shell structure as this building was built over 30 years ago. Architecture drawings which have no dimensional information as shown in figure 4.1(second floor plan) were taken from Turner Construction Company representatives. In order to discover the plan dimensions, hotel representatives were called and only the regular guest room dimensions was accessible . The other unknown room dimensions which are king guest room, executive suit etc were determined by measuring with AutoCAD. The regular room dimensions (19ftx12ft) are taken as a reference to find the other dimensions..

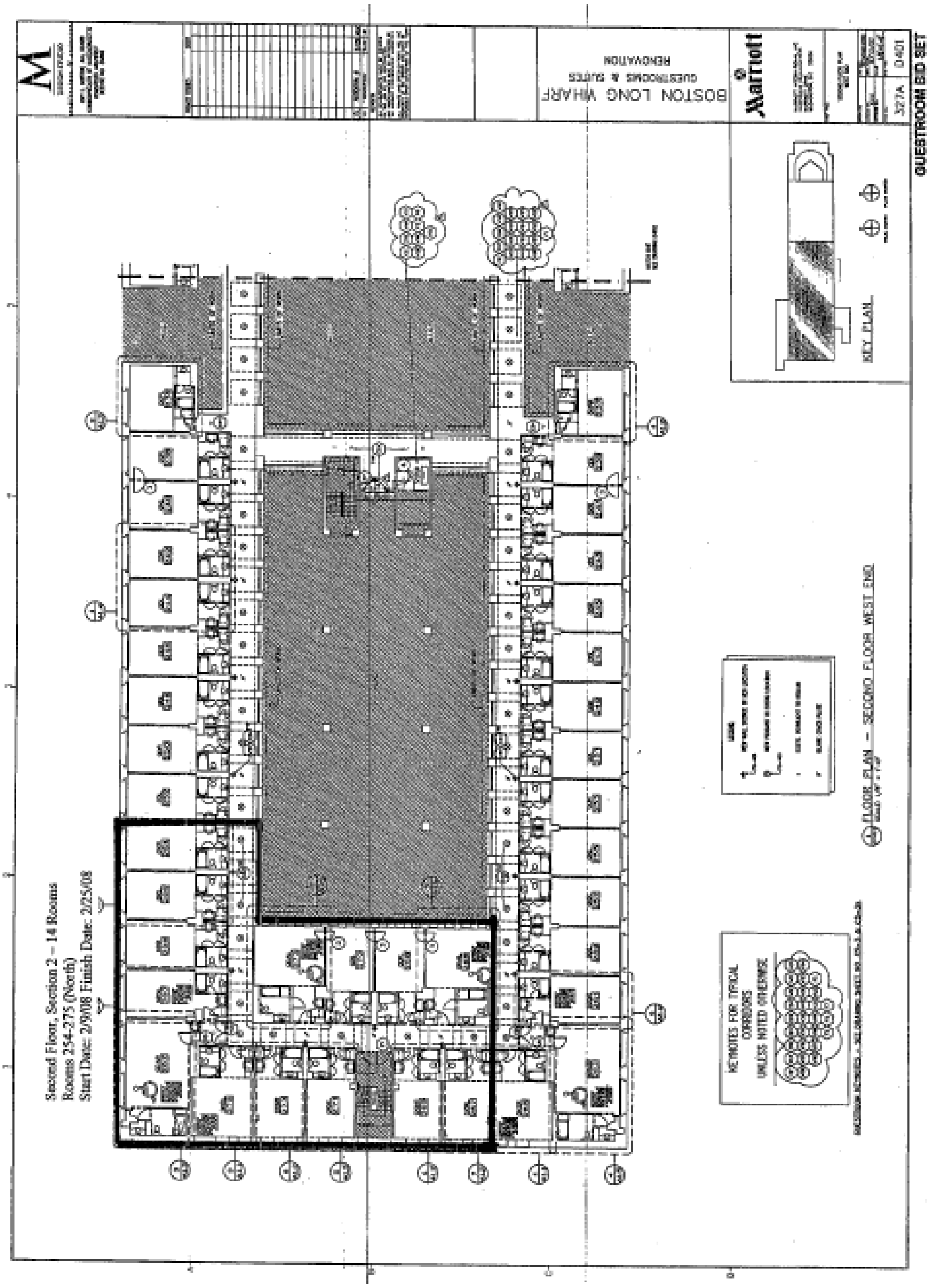

Figure 4.1: Second Floor Plan

Figure 4.2 demonstrates the enlarged view of the second floor plan.

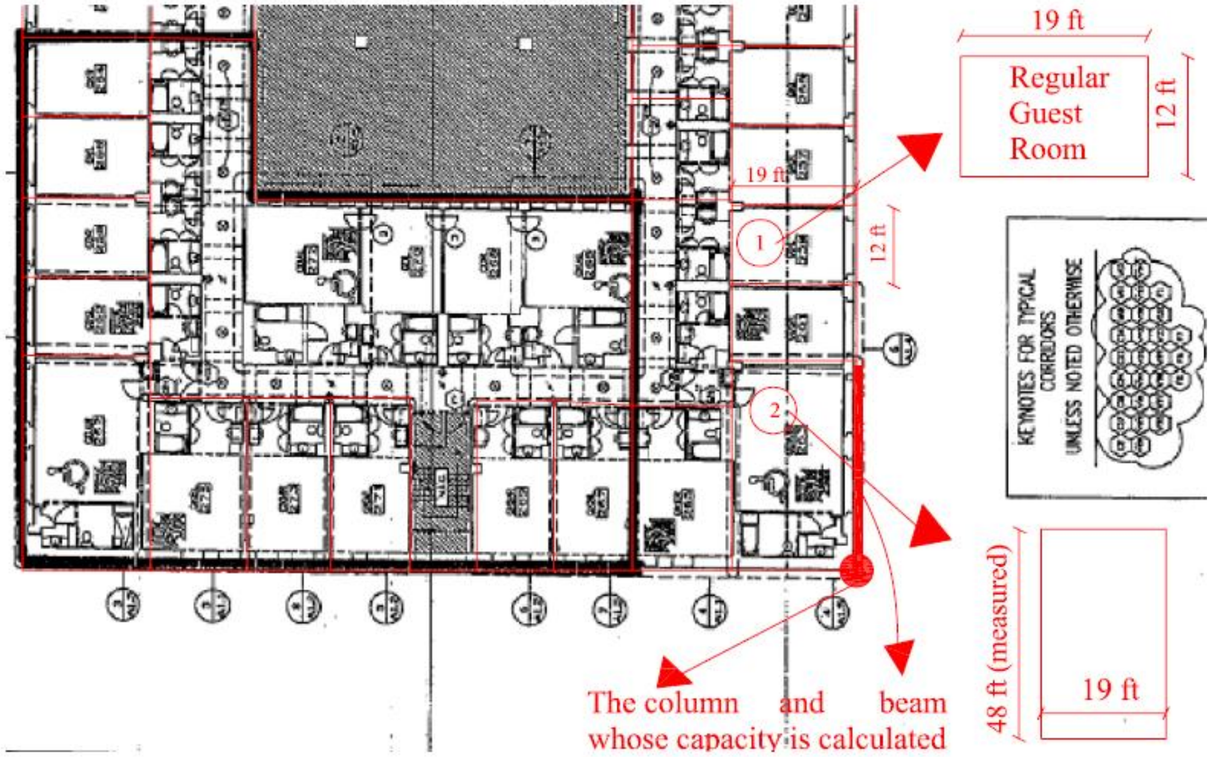

Figure 4.2: The enlarged plan of second floor

Column Design

Since we did not have enough information about the structural frame of the building, a reasonable approximate calculation was done to perform a structural review of the required capabilities of the frame instead of complex static analysis. The practical procedure applied here is based on the following assumptions:

1- Having moments neglected, the columns are considered to be carrying only axial force. The formulation is given in ASD-E2 (Allowable Stress Design) [1,3] as :

$$f_a \leq F_a$$

Where, f_a is service load compression stress $= P / A_g$; P is service load axial force, A_g is gross cross-sectional area of column and F_a is allowable stress at service load.

Columns are designed for bucking load. Slender columns can buckled easily compared to short columns. Therefore slenderness is taken into consideration of design criteria for columns. According to ASD-E2, F_a can be calculated in two formulas which account for slender ratio (KL/r):

a) For $\frac{KL}{r} < C_c$,

$$F_a = \frac{\left[1 - \frac{(KL/r)^2}{2C_c^2}\right] F_y}{\frac{5}{3} + \frac{3(KL/r)}{8C_c} - \frac{(KL/r)^3}{8C_c^3}}$$

b) For $\frac{KL}{r} > C_c$,

$$F_a = \frac{12\pi^2 E}{23(KL/r)^2}$$

where

$$C_c = \sqrt{\frac{2\pi^2 E}{F_y}}$$

Where, k is effective length factor, L is length of member, r is radius of gyration, E is Elasticity modulus, F_y is yield stress. The type of structural steel used in design process is A570 Grade 50 (F_y=50 ksi).

In Figure for a selected column marked on red, the capacity calculation was done. Due to lack of data in structural system, the column is redesigned in order to carry increasing live loads after the renovation. The considered loads are given below

1) Dead loads: 5.25 kN/m^2

2) Live Loads : 1.92 kN/m^2 + 0.48 kN/m^2 + 0.60 kN/m^2 = 3 kN/m^2

- 1.92 kN/m^2 → The live loads for Hotels given in ASCE/SEI 7-05 [II]
- 0.48 kN/m^2 → The live loads for partition weight given in ASCE/SEI 7-05 [II]
- 0.60 kN/m^2 → The increasing live loads during the renovation process (bed, matress, lounge chair, ottoman, tv, dresser with stone tabs etc…)

The load area for selected column is 21.17 m^2 (2.9m*7.30m). The axial force for one story is calculated as (5.25+3)*21.17 = 174.7 kN and the axial force for column at the base is 174.7*7 =1223 kN

The selected column section is W16x36, the characteristics of this section is given as:

r_y(radius of gyration in y direction)=0.0386 m; Area=0.006839 m^2 and the quality of steel A570 Grade 50 (F_y=50 ksi).

The capacity calculation:

$$\frac{KL}{r} = \frac{1 \times 3.6576}{0.0386} = 94.76$$

K is taken as 1 in order to get the effect of composite slab involved

L is taken as 12 ft

All the calculations were done in terms of kN and m.

$$C_c = \sqrt{\frac{2\pi^2 E}{f_y}} = \sqrt{\frac{2 \times 3.14^2 \times 2 \times 10^8}{345000}} = 107$$

$$\frac{KL}{r} < 107 \text{ so,}$$

$$F_a = \frac{\left[1 - \frac{(94.76)^2}{2 \times 107^2}\right] \times 345000}{\frac{5}{3} + \frac{3(94.76)}{8 \times 107} - \frac{(94.76)^3}{8 \times 107^3}} = 109700 \text{ kN/m}^2 = 15.91 \text{ ksi}$$

$$f_a = \frac{1222}{0.006839} = 178764 \text{ kN/m}^2 = 25.9275 \text{ ksi}$$

$f_a > F_a$ Section is overstressed

A greater section is selected. The corresponding section W18x88, the required properties of this section is:

$r_y = 0.0668$ m; Area=0.0163 m^2

$\frac{KL}{r} = \frac{1\times 3.6576}{0.0668}$ =54.64 $\qquad\qquad$ $\frac{KL}{r} < 107$ so,

$$F_a = \frac{\left[1 - \frac{(54.64)^2}{2\times 107^2}\right]\times 345000}{\frac{5}{3} + \frac{3(54.64)}{8\times 107} - \frac{(54.64)^3}{8\times 107^3}} = 162918 \text{ kN/m}^2 = 23.63\ ksi$$

$f_a = \frac{1222}{0.0163}$ =74969 kN/m^2=10.87 *ksi*

$f_a < F_a$ section is sufficient

<u>Beam Design</u>

The beams are considered as laterally supported because of existing composite deck. The connection of column and beam is considered as pinned. The formulation of beam capacity is given in ASD-E2 (Allowable Stress Design) as:

$$\frac{MN}{FS} \geq \text{M}$$

M_n = nominal moment strength

FS=1.67 nominal safety factor,

M= service load bending moment

$$\left(f_b = \frac{M}{S}\right) \leq \left(F_b = \frac{M_n}{(FS)S}\right)$$

S = Section modulus

For compact I sections bending about x-x axis

$F_b = 0.66F_y$

The selected beam is connected to corner column whose capacity evaluation was done earlier. Beam is located in a one bay slab so the distributed load for beam is calculated as 2.9m*7.5kN/m^2=21.75 kN/m. The beam moment is calculated conservatively with this formula:

$$M = \frac{ql^2}{8} = \frac{21.75 \times 14.63^2}{8} = 582 \text{ kNm}$$

Like column, beam section is selected as W18x88 (S=0.00272m^3) and capacity:

$$\left(f_b = \frac{582}{0.00272} \right) \leq F_b = 0.66 \times 345000$$

$$f_b = 213970\, kN/m^2 = 31.02 \text{ ksi} < F_b = 227700\, kN/m^2 = 33.02 \text{ ksi}$$

The selected section for beam can carry loads.

4.2 Major Challenges Encountered during the Renovation Process

There was only one major challenge that the contractor faced during construction; Part of the Contractor's scope of the project was to remove the existing wall covering (wall paper) from all the rooms and corridors, once they started the project and started taking the wall coverings down, they discovered a great extent of mold damage on the walls. Dealing with mold requires special attention and procedures as it considered hazardous. The observed mold is shown in figure 4.3.

Figure 4.3: The observed mold

4.3 Solution to the challenge

The contractor Turner proceeded with removing all mold damage off the walls by cutting the gypsum board walls and removing insulation behind it using a special mold remediation contractor. An industrial hygienist was also hired to verify that all damage was removed and all mold remediated. Due to the challenging schedule that Turner CO committed to for completion of the project and turning back rooms to the busy hotel, they were eager to rebuild the walls back to continue with the original scope of new wall covering install. There was a problem that hindered their progress however. Since the building was built in the 80's, the fire rating requirements were different to what they are now in the building code. The existing condition at the floor slab edge off the curtain wall system allowed for smoke to escape from one floor to another in case of a fire since the gap between the slab edge and the curtain wall was not sealed. The contractor Turner requested the architect and owner to address this issue at these conditions as they could not rebuild the walls to proceed with their scope without direction on this potentially costly situation. After doing some research, it was decided that the most cost effective solution would be to use dense deck to close the gap and to spray a smoke seal spray to seal it. The problem here was that they did not get this detail until two weeks had passed which slowed their progress down and put them behind schedule and also caused the cost of the job increased. This resulted in immense and complicated conversations and negotiations with the owner to extend the project schedule duration. They got two weeks extension. Therefore the project was not completed according to the original schedule.

5.0 Conclusions

At the first glance, even though EVA seems have no difference from other methods, profitability stands out in the earned value analysis as values are dependent on the budget. The weak point of this method is operating upon budget values. In case of any error in the costs it will directly affect the plan.

During whole project a value of USD 5.975.139 is obtained (earned) by spending an amount of USD 5.975.139. The cost deviation is USD 1.832.317. Since the deviations in CV value are negative, it is understood that more money was spent than the determined value in the budget. The cost of the performed work has exceeded the budget the result of authorized scope changes.

The actual cost is paid as USD 5.795.139 after completion while cost of the programmed work was planned as USD 3.962.822.

A cost variance of USD 1.182.317 has occurred in the project other than the planned figure and there are negative deviations in all stages of the project. The actual payment made by hotel is higher than the planned figure. Still, there is an earned value due to completion of the work.

BIBLIOGRAPHY

[1] Steel Structures Design and behavior Third Addition Charles G.Salmon John E. Johnson, Harper Collins Publishers

[2] ASCE SEI/7-05 Minimum Design Loads for Buildings and other Structures

[3] ASD-E2 Allowable Stress Design

[4] Integrated Cost and Schedule Control in Project Management, Kuehn, U., Management Concept Press

Appendix I: Rooms of market (Count)

Rooms of market	Per floor	Days per section	14.11.2007	15.11.2007	16.11.2007	17.11.2007	18.11.2007	19.11.2007	20.11.2007	21.11.2007	22.11.2007	23.11.2007	24.11.2007	25.11.2007
F/7 S1	18	38		18	18	18	18	18	18	18	18	18	18	18
F/7 S2	18	39									18	18	18	18
F/7 S3	18	39										18	18	18
F/6 S1	34	37												
F/6 S2	23	40												
F/5 S1	25	40												
F/5 S2	22	38												
F/5 S3	22	38												
F/4 S1	24	33												
F/4 S2	22	32												
F/4 S3	22	32												
F/3 S1	24	32												
F/3 S2	24	32												
F/3 S3	24	32												
F/2 S1	24	30												
F/2 S2	26	30												
F/1 S1	16	29												
F/1 S2	16	26												
contractor room			3	3	3	3	3	3	3	3	3	3	3	3
rooms out of renovation			3	21	21	21	21	21	21	21	39	57	57	57
Rooms available to renovate			402	402	402	402	402	402	402	402	402	402	402	402
% Rooms out			1%	5%	5%	5%	5%	5%	5%	5%	10%	14%	14%	14%

26.11.2007	27.11.2007	28.11.2007	29.11.2007	30.11.2007	01.12.2007	02.12.2007	03.12.2007	04.12.2007	05.12.2007	06.12.2007	07.12.2007	08.12.2007	09.12.2007	10.12.2007
18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
						34	34	34	34	34	34	34	34	34
								23	23	23	23	23	23	23
													25	25
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
57	57	57	57	57	57	91	91	114	114	114	114	114	139	139
402	402	402	402	402	402	402	402	402	402	402	402	402	402	402
14%	14%	14%	14%	14%	14%	23%	23%	28%	28%	28%	28%	28%	35%	35%

11.12.2007	12.12.2007	13.12.2007	14.12.2007	15.12.2007	16.12.2007	17.12.2007	18.12.2007	19.12.2007	20.12.2007	21.12.2007	22.12.2007	23.12.2007	24.12.2007	25.12.2007
18	18	18	18	18	18	18	18	18	18	18	18			
18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
					22	22	22	22	22	22	22	22	22	22
										22	22	22	22	22
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
139	139	139	139	139	161	161	161	161	161	183	183	165	165	165
402	402	402	402	402	402	402	402	402	402	402	402	402	402	402
35%	35%	35%	35%	35%	40%	40%	40%	40%	40%	46%	46%	41%	41%	41%

26.12.2007	27.12.2007	28.12.2007	29.12.2007	30.12.2007	31.12.2007	01.01.2008	02.01.2008	03.01.2008	04.01.2008	05.01.2008	06.01.2008	07.01.2008	08.01.2008	09.01.2008
18	18	18	18	18										
18	18	18	18	18	18									
34	34	34	34	34	34	34	34	34	34	34	34	34		
23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
							24	24	24	24	24	24	24	24
													22	22
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
165	165	165	165	165	147	129	153	153	153	153	153	153	141	141
402	402	402	402	402	402	402	402	402	402	402	402	402	402	402
41%	41%	41%	41%	41%	37%	32%	38%	38%	38%	38%	38%	38%	35%	35%

10.01.2008	11.01.2008	12.01.2008	13.01.2008	14.01.2008	15.01.2008	16.01.2008	17.01.2008	18.01.2008	19.01.2008	20.01.2008	21.01.2008	22.01.2008	23.01.2008	24.01.2008
23	23	23												
25	25	25	25	25	25	25	25							
22	22	22	22	22	22	22	22	22	22	22	22	22		
22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
			22	22	22	22	22	22	22	22	22	22	22	22
								24	24	24	24	24	24	24
													24	24
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
141	141	141	140	140	140	140	140	139	139	139	139	139	141	141
402	402	402	402	402	402	402	402	402	402	402	402	402	402	402
35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%

25.01.2008	26.01.2008	27.01.2008	28.01.2008	29.01.2008	30.01.2008	31.01.2008	01.02.2008	02.02.2008	03.02.2008	04.02.2008	05.02.2008	06.02.2008	07.02.2008	08.02.2008
22	22	22												
24	24	24	24	24	24	24	24	24	24					
22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
			24	24	24	24	24	24	24	24	24	24	24	24
										24	24	24	24	24
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
141	141	141	143	143	143	143	143	143	143	143	143	143	143	143
402	402	402	402	402	402	402	402	402	402	402	402	402	402	402
35%	35%	35%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%

09.02.2008	10.02.2008	11.02.2008	12.02.2008	13.02.2008	14.02.2008	15.02.2008	16.02.2008	17.02.2008	18.02.2008	19.02.2008	20.02.2008	21.02.2008	22.02.2008	23.02.2008
22	22	22	22	22										
24	24	24	24	24	24	24	24	24	24					
24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
					16	16	16	16	16	16	16	16	16	16
										16	16	16	16	16
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
147	147	147	147	147	141	141	141	141	141	133	133	133	133	133
402	402	402	402	402	402	402	402	402	402	402	402	402	402	402
37%	37%	37%	37%	37%	35%	35%	35%	35%	35%	33%	33%	33%	33%	33%

24.02.2008	25.02.2008	26.02.2008	27.02.2008	28.02.2008	29.02.2008	01.03.2008	02.03.2008	03.03.2008	04.03.2008	05.03.2008	06.03.2008	07.03.2008	08.03.2008	09.03.2008
24	24	24	24	24										
24	24	24	24	24	24	24	24	24	24					
26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
109	109	109	109	109	85	85	85	85	85	61	61	61	61	61
402	402	402	402	402	402	402	402	402	402	402	402	402	402	402
27%	27%	27%	27%	27%	21%	21%	21%	21%	21%	15%	15%	15%	15%	15%

10.03.2008	11.03.2008	12.03.2008	13.03.2008	14.03.2008	15.03.2008
16	16	16	16		
16	16	16	16	16	16
3	3	3	3	3	3
35	35	35	35	19	19
402	402	402	402	402	402
9%	9%	9%	9%	5%	5%

Appendix II: Rooms of market (percent)

Rooms of market	Per floor	Days per section	14.11.2007	15.11.2007	16.11.2007	17.11.2007	18.11.2007	19.11.2007	20.11.2007	21.11.2007	22.11.2007	23.11.2007	24.11.2007	25.11.2007	26.11.2007	27.11.2007
Budget percent																
F/7 S1	18	38		0,0012	0,0012	0,0012	0,0012	0,0012	0,0012	0,0012	0,0012	0,0012	0,0012	0,0012	0,0012	0,0012
F/7 S2	18	39									0,0011	0,0011	0,0011	0,0011	0,0011	0,0011
F/7 S3	18	39										0,0011	0,0011	0,0011	0,0011	0,0011
F/6 S1	34	37														
F/6 S2	23	40														
F/5 S1	25	40														
F/5 S2	22	38														
F/5 S3	22	38														
F/4 S1	24	33														
F/4 S2	22	32														
F/4 S3	22	32														
F/3 S1	24	32														
F/3 S2	24	32														
F/3 S3	24	32														
F/2 S1	24	30														
F/2 S2	26	30														
F/1 S1	16	29														
F/1 S2	16	26														
				0,0071						0,0209						

28.11.2007	29.11.2007	30.11.2007	01.12.2007	02.12.2007	03.12.2007	04.12.2007	05.12.2007	06.12.2007	07.12.2007	08.12.2007	09.12.2007	10.12.2007	11.12.2007
0,0012	0,0012	0,0012	0,0012	0,0012	0,0012	0,0012	0,0012	0,0012	0,0012	0,0012	0,0012	0,0012	0,0012
0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011
0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011
				0,0023	0,0023	0,0023	0,0023	0,0023	0,0023	0,0023	0,0023	0,0023	0,0023
						0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014
											0,0016	0,0016	0,0016
0,0326							0,0550						

12.12.2007	13.12.2007	14.12.2007	15.12.2007	16.12.2007	17.12.2007	18.12.2007	19.12.2007	20.12.2007	21.12.2007	22.12.2007	23.12.2007	24.12.2007	25.12.2007
0,0012	0,0012	0,0012	0,0012	0,0012	0,0012	0,0012	0,0012	0,0012	0,0012	0,0012			
0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011
0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011	0,0011
0,0023	0,0023	0,0023	0,0023	0,0023	0,0023	0,0023	0,0023	0,0023	0,0023	0,0023	0,0023	0,0023	0,0023
0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014
0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016
				0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014
									0,0014	0,0014	0,0014	0,0014	0,0014
0,0655							0,0750						

26.12.2007	27.12.2007	28.12.2007	29.12.2007	30.12.2007	31.12.2007	01.01.2008	02.01.2008	03.01.2008	04.01.2008	05.01.2008	06.01.2008	07.01.2008	08.01.2008
0,0011	0,0011	0,0011	0,0011	0,0011									
0,0011	0,0011	0,0011	0,0011	0,0011	0,0011								
0,0023	0,0023	0,0023	0,0023	0,0023	0,0023	0,0023	0,0023	0,0023	0,0023	0,0023	0,0023	0,0023	
0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014
0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016
0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014
0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014
							0,0018	0,0018	0,0018	0,0018	0,0018	0,0018	0,0018
													0,0017
0,0697							0,0691						

09.01.2008	10.01.2008	11.01.2008	12.01.2008	13.01.2008	14.01.2008	15.01.2008	16.01.2008	17.01.2008	18.01.2008	19.01.2008	20.01.2008	21.01.2008	22.01.2008
0,0014	0,0014	0,0014	0,0014										
0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016	0,0016
0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014
0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014
0,0018	0,0018	0,0018	0,0018	0,0018	0,0018	0,0018	0,0018	0,0018	0,0018	0,0018	0,0018	0,0018	0,0018
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				0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017
									0,0019	0,0019	0,0019	0,0019	0,0019
0,0665							0,0770						

23.01.2008	24.01.2008	25.01.2008	26.01.2008	27.01.2008	28.01.2008	29.01.2008	30.01.2008	31.01.2008	01.02.2008	02.02.2008	03.02.2008	04.02.2008	05.02.2008
0,0014	0,0014	0,0014	0,0014	0,0014									
0,0018	0,0018	0,0018	0,0018	0,0018	0,0018	0,0018	0,0018	0,0018	0,0018	0,0018	0,0018		
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												0,0020	0,0020
0,0737							0,0761						

06.02.2008	07.02.2008	08.02.2008	09.02.2008	10.02.2008	11.02.2008	12.02.2008	13.02.2008	14.02.2008	15.02.2008	16.02.2008	17.02.2008	18.02.2008	19.02.2008
0,0017	0,0017	0,0017											
0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017	0,0017						
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			0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022	0,0022
								0,0014	0,0014	0,0014	0,0014	0,0014	0,0014
													0,0015
0,0788							0,0778						

20.02.2008	21.02.2008	22.02.2008	23.02.2008	24.02.2008	25.02.2008	26.02.2008	27.02.2008	28.02.2008	29.02.2008	01.03.2008	02.03.2008	03.03.2008	04.03.2008
0,0019	0,0019	0,0019	0,0019										
0,0019	0,0019	0,0019	0,0019	0,0019	0,0019	0,0019	0,0019	0,0019					
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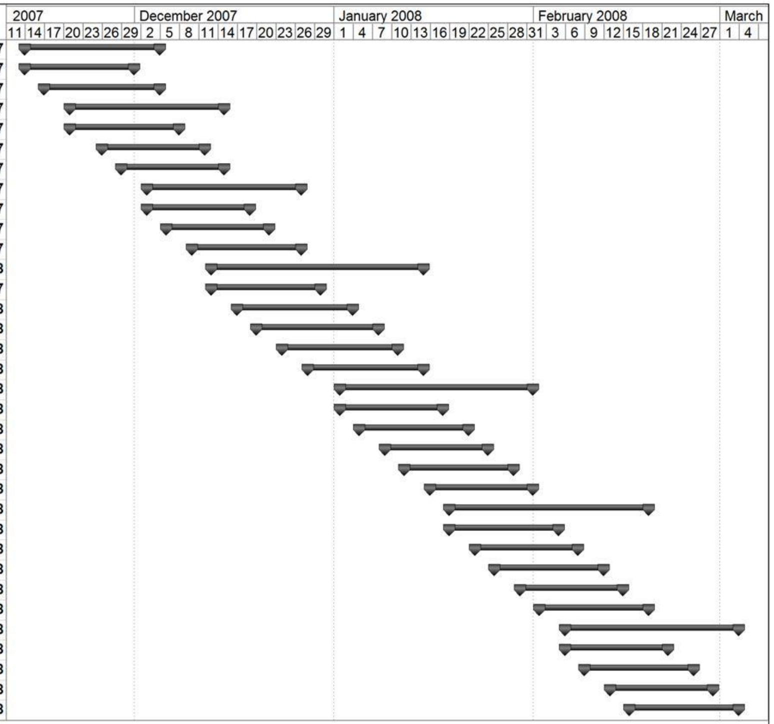
0,0699							0,0531						

05.03.2008	06.03.2008	07.03.2008	08.03.2008	09.03.2008	10.03.2008	11.03.2008	12.03.2008	13.03.2008	14.03.2008	15.03.2008	
0,0022	0,0022	0,0022	0,0022	0,0022							
0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014	0,0014			
0,0015	0,0015	0,0015	0,0015	0,0015	0,0015	0,0015	0,0015	0,0015	0,0015	0,0015	
0,0311							0,0089				1,0

Appendix III : 5D Model Representation

Renovation Schedule of Building

ID	Task Name	Duration	Start	Finish
1	**FIRST FLOOR 32 ROOMS**	17 days	Wed 11/14/07	Tue 12/4/07
2	section 1 (139-169 ODD)	14 days	Wed 11/14/07	Fri 11/30/07
42	section 2 (138-171)	14 days	Sat 11/17/07	Tue 12/4/07
82	**SEVENTH FLOOR 56 ROOMS (INCL SUITI**	20 days	Wed 11/21/07	Fri 12/14/07
83	section 1 (748-771)	14 days	Wed 11/21/07	Fri 12/7/07
123	section 2 (728-747)	14 days	Mon 11/26/07	Tue 12/11/07
163	section 3 (702-725)	14 days	Thu 11/29/07	Fri 12/14/07
203	**SIXTH FLOOR 52 ROOMS (PLUS SUITES)**	20 days	Mon 12/3/07	Wed 12/26/07
204	section 1 (648-671)	14 days	Mon 12/3/07	Tue 12/18/07
244	section 2 (628-647)	14 days	Thu 12/6/07	Fri 12/21/07
284	section 3 (602-625)	14 days	Mon 12/10/07	Wed 12/26/07
324	**FIFTH FLOOR 68 ROOMS (PLUS SUITES)**	26 days	Thu 12/13/07	Mon 1/14/08
325	section 1 (541-566), south	14 days	Thu 12/13/07	Sat 12/29/07
365	section 2 (540-572) north	14 days	Mon 12/17/07	Thu 1/3/08
405	section 3 (510-538) north	14 days	Thu 12/20/07	Mon 1/7/08
445	section 4 (508-519)	14 days	Mon 12/24/07	Thu 1/10/08
485	section 5 (521-539)	14 days	Fri 12/28/07	Mon 1/14/08
525	**FOURTH FLOOR 68 ROOMS (PLUS SUITE**	26 days	Wed 1/2/08	Thu 1/31/08
526	section 1 (441-566)	14 days	Wed 1/2/08	Thu 1/17/08
566	section 2 (440-472)	14 days	Sat 1/5/08	Mon 1/21/08
606	section 3 (410-438)	14 days	Wed 1/9/08	Thu 1/24/08
646	section 4 408-419)	14 days	Sat 1/12/08	Mon 1/28/08
686	section 5 (421-439)	14 days	Wed 1/16/08	Thu 1/31/08
726	**THIRD FLOOR 72 ROOMS (PLUS SUITES)**	26 days	Sat 1/19/08	Mon 2/18/08
727	section 1 (343-369,south)	14 days	Sat 1/19/08	Mon 2/4/08
767	section 2 (350-366, north)	14 days	Wed 1/23/08	Thu 2/7/08
807	section 3 (322-348, north)	14 days	Sat 1/26/08	Mon 2/11/08
847	section 4 (302-320,n,301-307,s)	14 days	Wed 1/30/08	Thu 2/14/08
887	section 5 (309-341,south)	14 days	Sat 2/2/08	Mon 2/18/08
927	**SECOND FLOOR 50 ROOMS**	23 days	Wed 2/6/08	Mon 3/3/08
928	section 1 (237-265,south)	14 days	Wed 2/6/08	Thu 2/21/08
968	section 2 (254-267,north)	14 days	Sat 2/9/08	Mon 2/25/08
1008	section 3 (222-252, north)	14 days	Wed 2/13/08	Thu 2/28/08
1048	section 4 (220-231, inc. Fallon rms)	14 days	Sat 2/16/08	Mon 3/3/08

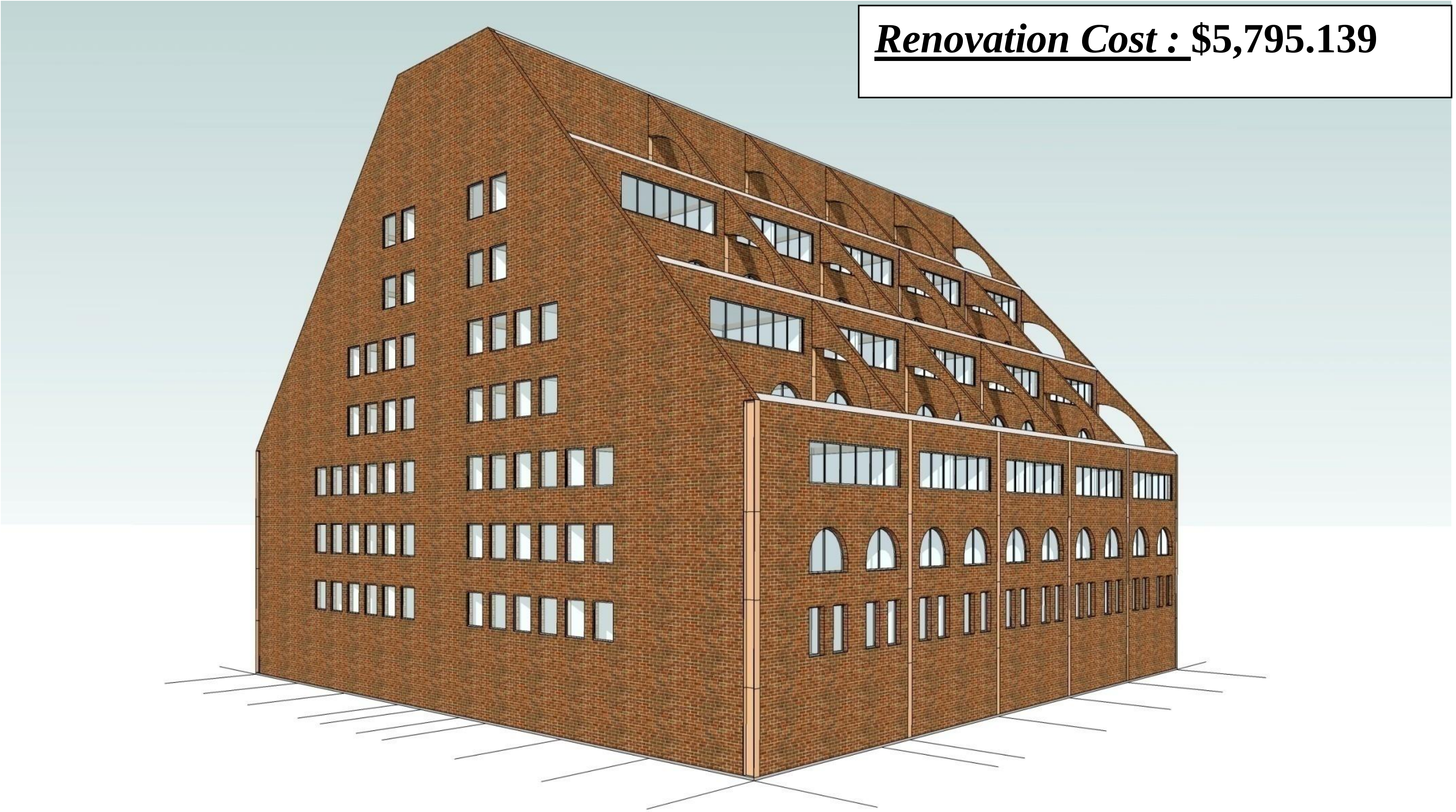


Project: Marriott with 7 rooms at a time
Date: Thu 5/21/09

Task — Split — Progress — Milestone — Summary — Project Summary — External Tasks — External MileTask — Split

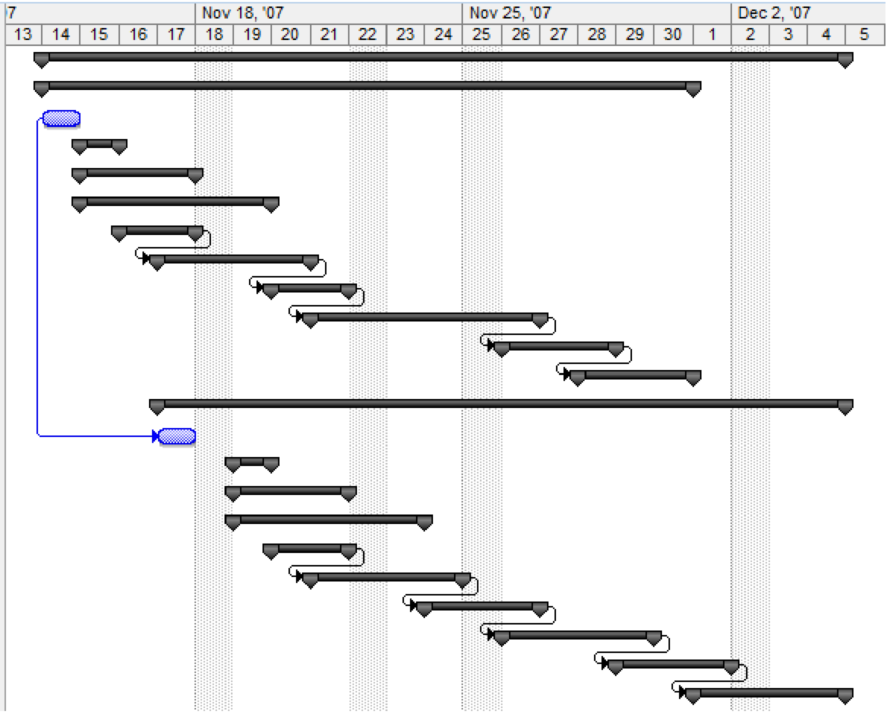
Page 1

Three Dimensional Model of Building

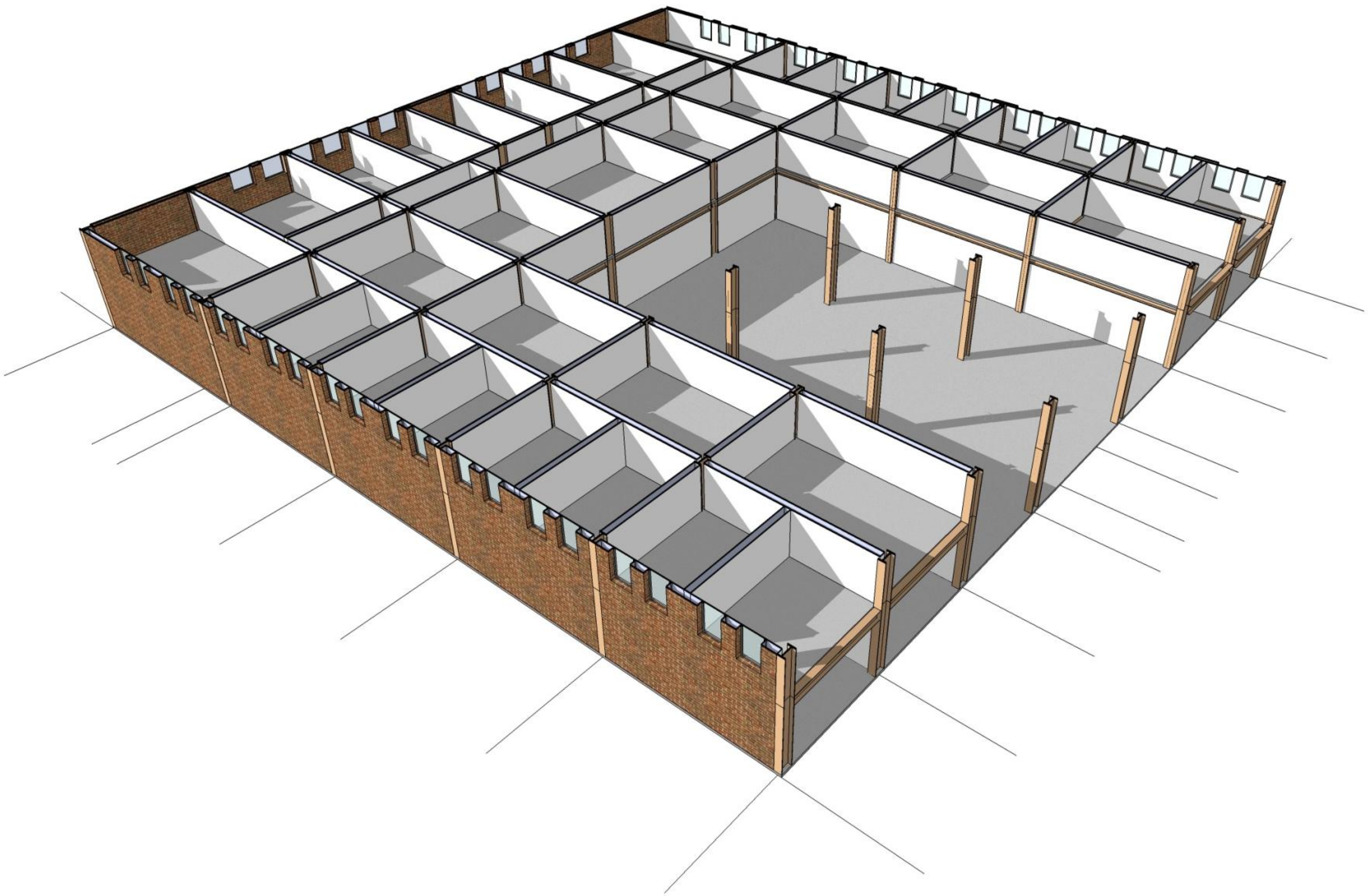


First Floor Renovation Schedule

	Task Name	Start	Finish	Late Start	Late Finish	Free Slack
1	FIRST FLOOR 32 ROOMS	Wed 11/14/07	Tue 12/4/07	Wed 11/14/07	Tue 12/4/07	0 days
2	section 1 (139-169 ODD)	Wed 11/14/07	Fri 11/30/07	Wed 11/14/07	Tue 12/4/07	0 days
3	liquidate 16 rooms (2nd shift)	Wed 11/14/07	Wed 11/14/07	Wed 11/14/07	Wed 11/14/07	0 days
4	demolition	Thu 11/15/07	Thu 11/15/07	Mon 11/19/07	Tue 12/4/07	3 days
10	replace down lights	Thu 11/15/07	Sat 11/17/07	Sat 12/1/07	Tue 12/4/07	13 days
18	wall prep	Thu 11/15/07	Mon 11/19/07	Fri 11/23/07	Tue 12/4/07	6 days
16	millwork install	Fri 11/16/07	Sat 11/17/07	Tue 11/20/07	Wed 11/21/07	0 days
25	tile work	Sat 11/17/07	Tue 11/20/07	Wed 11/21/07	Sat 11/24/07	0 days
28	painting	Tue 11/20/07	Wed 11/21/07	Sat 11/24/07	Tue 11/27/07	0 days
32	vwc	Wed 11/21/07	Mon 11/26/07	Tue 11/27/07	Thu 11/29/07	0 days
36	carpet	Mon 11/26/07	Wed 11/28/07	Thu 11/29/07	Sat 12/1/07	0 days
39	FFE	Wed 11/28/07	Fri 11/30/07	Sat 12/1/07	Tue 12/4/07	3 days
42	section 2 (138-171)	Sat 11/17/07	Tue 12/4/07	Sat 11/17/07	Tue 12/4/07	0 days
43	liquidate 16 rooms (2nd shift)	Sat 11/17/07	Sat 11/17/07	Sat 11/17/07	Sat 11/17/07	0 days
44	demolition	Mon 11/19/07	Mon 11/19/07	Mon 11/19/07	Tue 12/4/07	0 days
50	replace down lights	Mon 11/19/07	Wed 11/21/07	Sat 12/1/07	Tue 12/4/07	10 days
58	wall prep	Mon 11/19/07	Fri 11/23/07	Fri 11/23/07	Tue 12/4/07	3 days
56	millwork install	Tue 11/20/07	Wed 11/21/07	Tue 11/20/07	Wed 11/21/07	0 days
65	tile work	Wed 11/21/07	Sat 11/24/07	Wed 11/21/07	Sat 11/24/07	0 days
68	painting	Sat 11/24/07	Mon 11/26/07	Sat 11/24/07	Tue 11/27/07	0 days
72	vwc	Mon 11/26/07	Thu 11/29/07	Tue 11/27/07	Thu 11/29/07	0 days
76	carpet	Thu 11/29/07	Sat 12/1/07	Thu 11/29/07	Sat 12/1/07	0 days
79	FFE	Sat 12/1/07	Tue 12/4/07	Sat 12/1/07	Tue 12/4/07	0 days



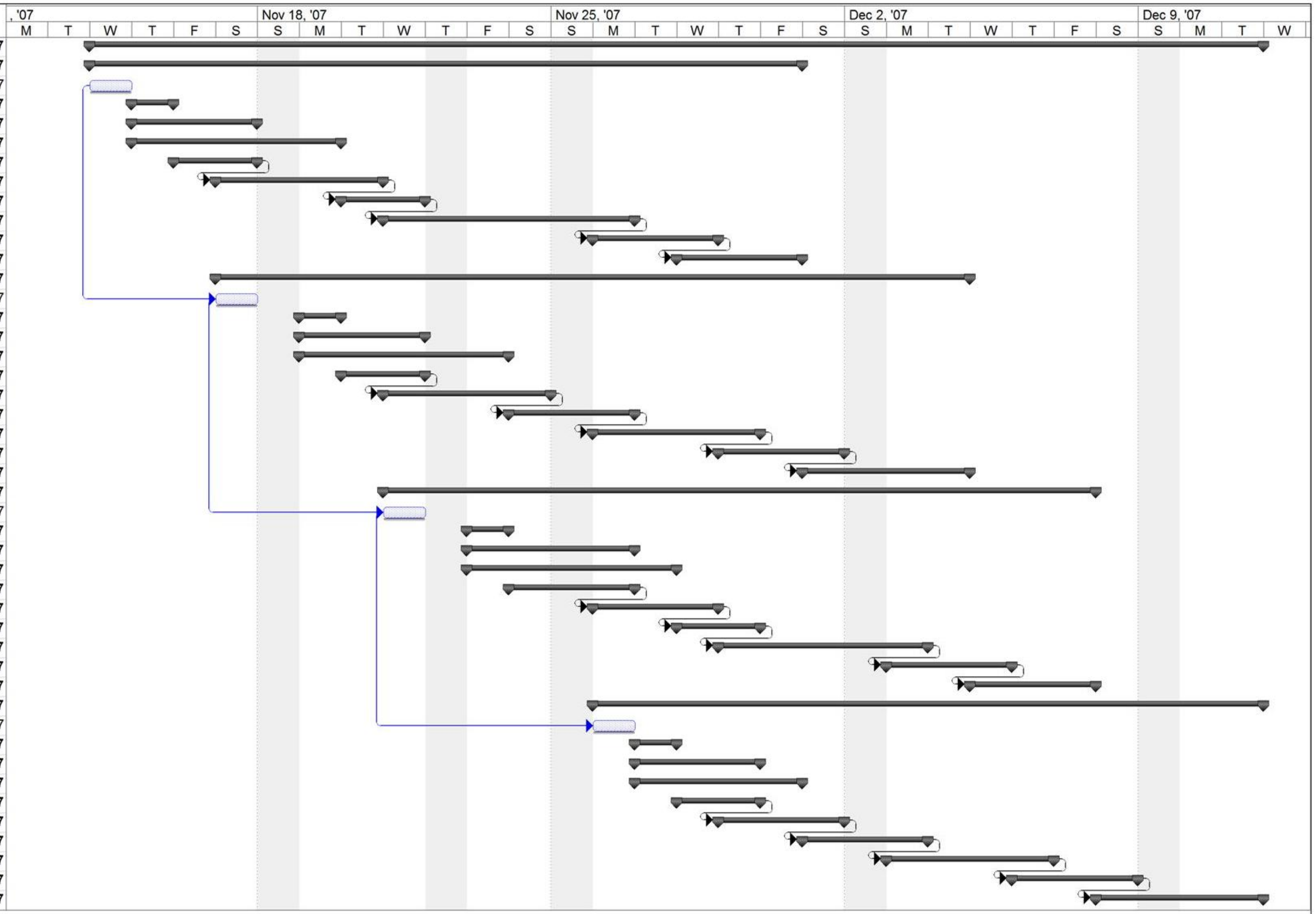
First Floor Renovation Plan



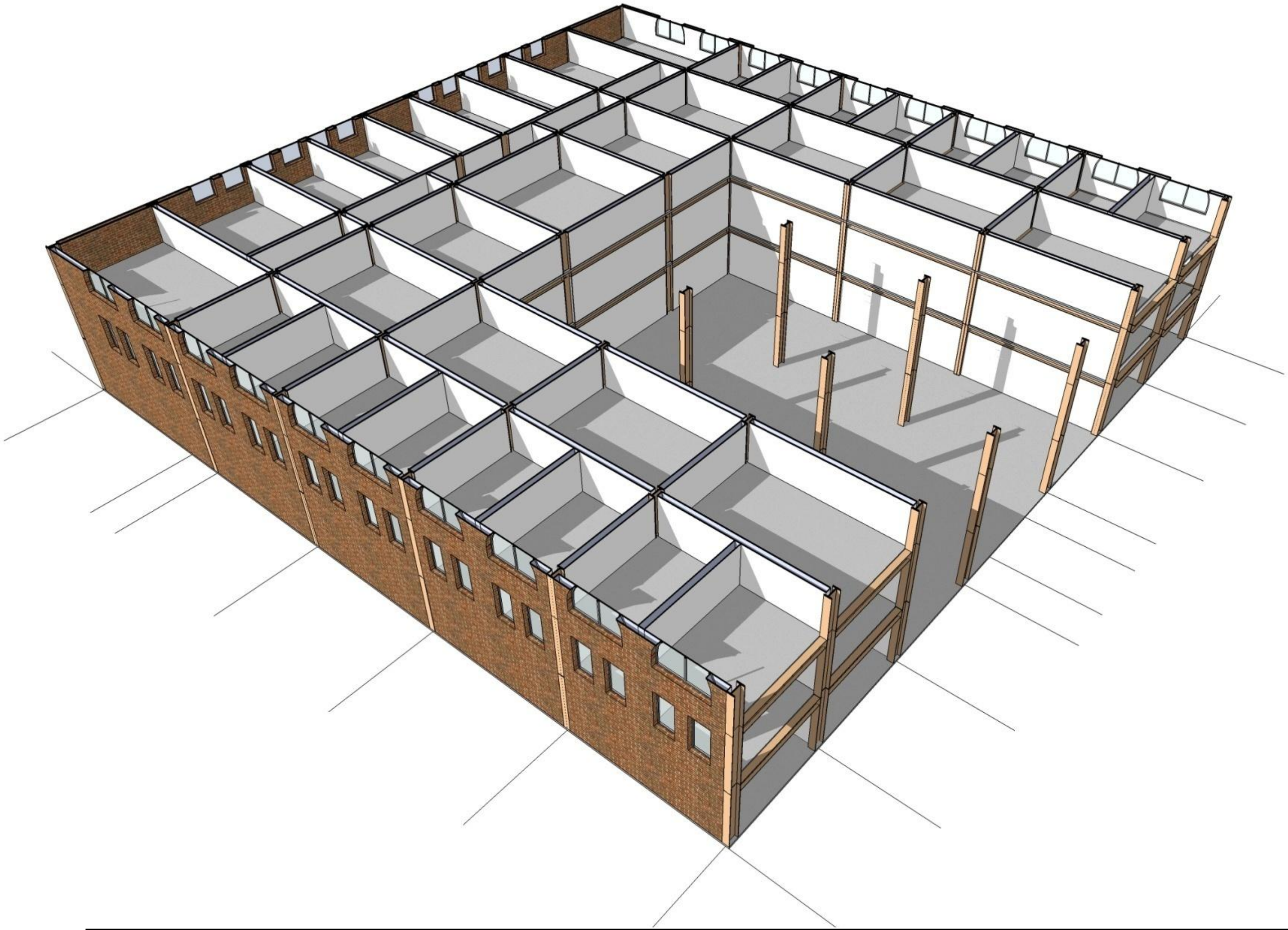
Cost until first floor renovation has finished **: $ 336.118**

Second Floor Renovation Schedule

ID	Task Name	Duration	Start	Finish
1	SECOND FLOOR 50 ROOMS	23 days	Wed 11/14/07	Tue 12/11/07
2	section 1 (237-265,south)	14 days	Wed 11/14/07	Fri 11/30/07
3	liquidate 14 rooms (2nd shift)	1 day	Wed 11/14/07	Wed 11/14/07
4	demolition	1 day	Thu 11/15/07	Thu 11/15/07
10	replace down lights	3 days	Thu 11/15/07	Sat 11/17/07
18	wall prep	4 days	Thu 11/15/07	Mon 11/19/07
16	millwork install	2 days	Fri 11/16/07	Sat 11/17/07
25	tile work	3 days	Sat 11/17/07	Tue 11/20/07
28	painting	2 days	Tue 11/20/07	Wed 11/21/07
32	vwc	4 days	Wed 11/21/07	Mon 11/26/07
36	carpet	3 days	Mon 11/26/07	Wed 11/28/07
39	FFE	3 days	Wed 11/28/07	Fri 11/30/07
42	section 2 (254-267,north)	14 days	Sat 11/17/07	Tue 12/4/07
43	liquidate 14 rooms (2nd shift)	1 day	Sat 11/17/07	Sat 11/17/07
44	demolition	1 day	Mon 11/19/07	Mon 11/19/07
50	replace down lights	3 days	Mon 11/19/07	Wed 11/21/07
58	wall prep	4 days	Mon 11/19/07	Fri 11/23/07
56	millwork install	2 days	Tue 11/20/07	Wed 11/21/07
65	tile work	3 days	Wed 11/21/07	Sat 11/24/07
68	painting	2 days	Sat 11/24/07	Mon 11/26/07
72	vwc	4 days	Mon 11/26/07	Thu 11/29/07
76	carpet	3 days	Thu 11/29/07	Sat 12/1/07
79	FFE	3 days	Sat 12/1/07	Tue 12/4/07
82	section 3 (222-252, north)	14 days	Wed 11/21/07	Fri 12/7/07
83	liquidate 14 rooms (2nd shift)	1 day	Wed 11/21/07	Wed 11/21/07
84	demolition	1 day	Fri 11/23/07	Fri 11/23/07
90	replace down lights	3 days	Fri 11/23/07	Mon 11/26/07
98	wall prep	4 days	Fri 11/23/07	Tue 11/27/07
96	millwork install	2 days	Sat 11/24/07	Mon 11/26/07
105	tile work	3 days	Mon 11/26/07	Wed 11/28/07
108	painting	2 days	Wed 11/28/07	Thu 11/29/07
112	vwc	4 days	Thu 11/29/07	Mon 12/3/07
116	carpet	3 days	Mon 12/3/07	Wed 12/5/07
119	FFE	3 days	Wed 12/5/07	Fri 12/7/07
122	section 4 (220-231, inc. Fallon rms)	14 days	Mon 11/26/07	Tue 12/11/07
123	liquidate 16 rooms (2nd shift)	1 day	Mon 11/26/07	Mon 11/26/07
124	demolition	1 day	Tue 11/27/07	Tue 11/27/07
130	replace down lights	3 days	Tue 11/27/07	Thu 11/29/07
138	wall prep	4 days	Tue 11/27/07	Fri 11/30/07
136	millwork install	2 days	Wed 11/28/07	Thu 11/29/07
145	tile work	3 days	Thu 11/29/07	Sat 12/1/07
148	painting	2 days	Sat 12/1/07	Mon 12/3/07
152	vwc	4 days	Mon 12/3/07	Thu 12/6/07
156	carpet	3 days	Thu 12/6/07	Sat 12/8/07
159	FFE	3 days	Sat 12/8/07	Tue 12/11/07



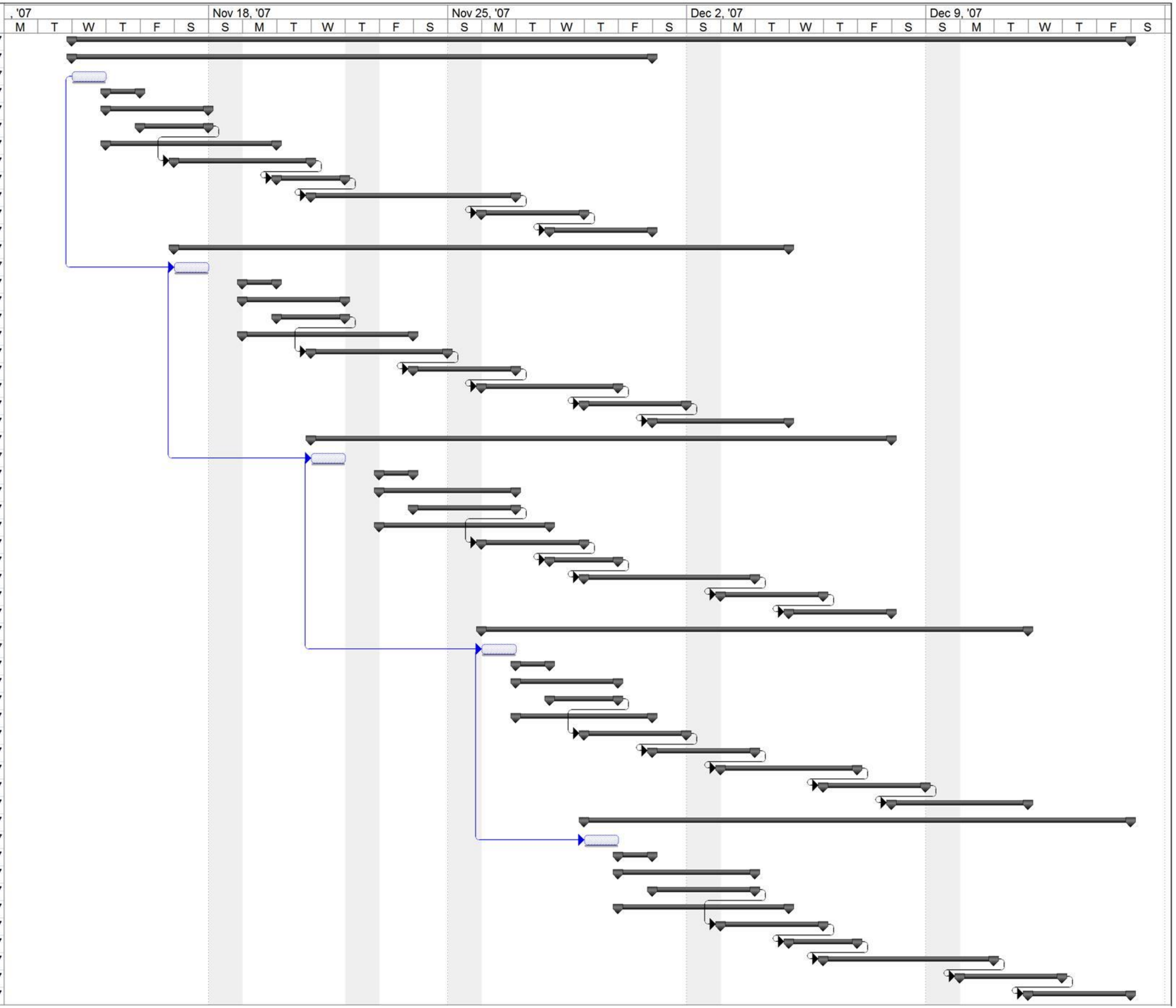
Second Floor Renovation Plan



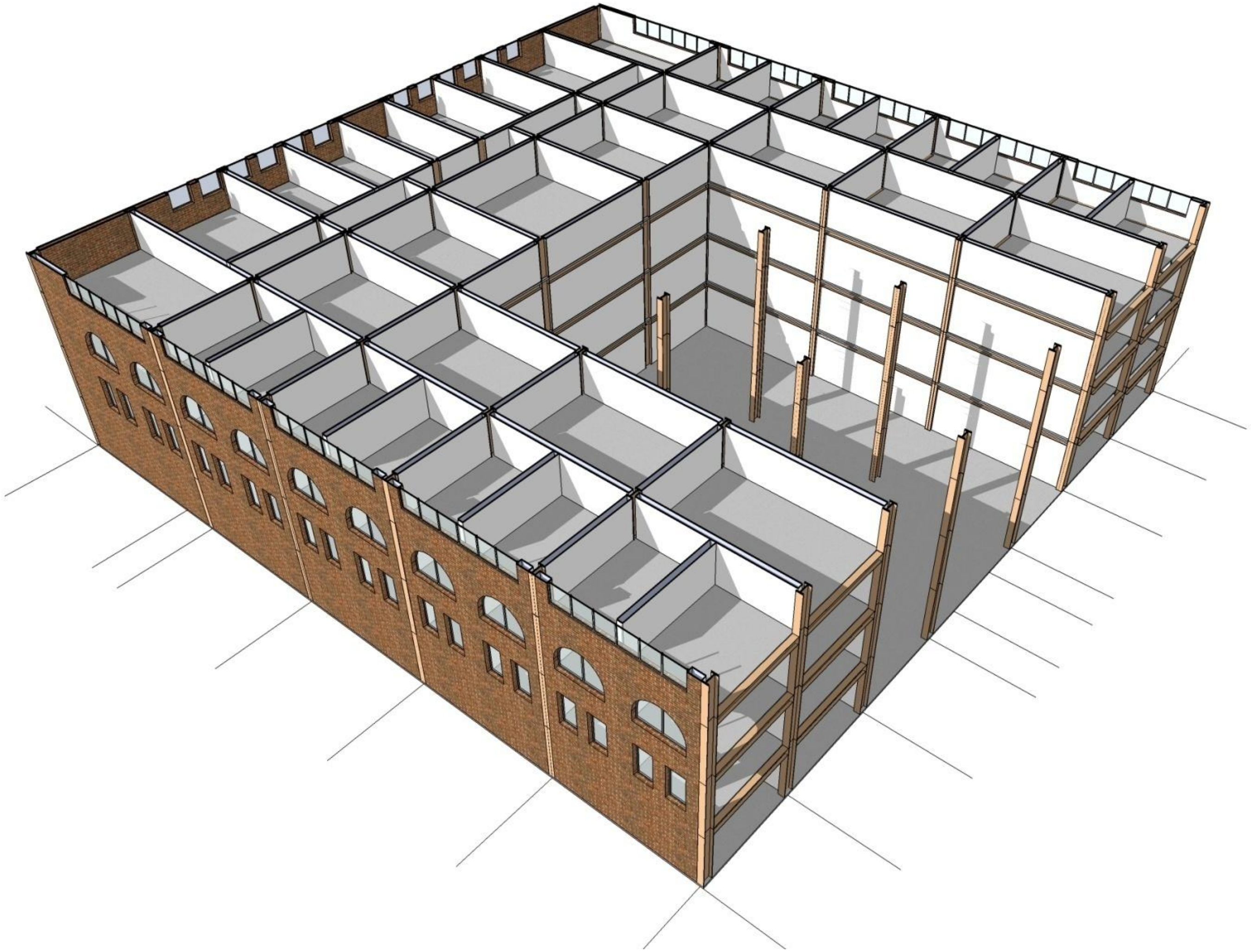
<u>Cost until second floor renovation has finished</u> : $ 816.448

Third Floor Renovation Schedule

ID	Task Name	Duration	Start	Finish
1	THIRD FLOOR 72 ROOMS (PLUS SUITES)	26 days	Wed 11/14/07	Fri 12/14/07
2	section 1 (343-369,south)	14 days	Wed 11/14/07	Fri 11/30/07
3	liquidate 14 rooms (2nd shift)	1 day	Wed 11/14/07	Wed 11/14/07
4	demolition	1 day	Thu 11/15/07	Thu 11/15/07
10	replace down lights	3 days	Thu 11/15/07	Sat 11/17/07
16	millwork install	2 days	Fri 11/16/07	Sat 11/17/07
18	wall prep	4 days	Thu 11/15/07	Mon 11/19/07
25	tile work	3 days	Sat 11/17/07	Tue 11/20/07
28	painting	2 days	Tue 11/20/07	Wed 11/21/07
32	vwc	4 days	Wed 11/21/07	Mon 11/26/07
36	carpet	3 days	Mon 11/26/07	Wed 11/28/07
39	FFE	3 days	Wed 11/28/07	Fri 11/30/07
42	section 2 (350-366, north)	14 days	Sat 11/17/07	Tue 12/4/07
43	liquidate 14 rooms (2nd shift)	1 day	Sat 11/17/07	Sat 11/17/07
44	demolition	1 day	Mon 11/19/07	Mon 11/19/07
50	replace down lights	3 days	Mon 11/19/07	Wed 11/21/07
56	millwork install	2 days	Tue 11/20/07	Wed 11/21/07
58	wall prep	4 days	Mon 11/19/07	Fri 11/23/07
65	tile work	3 days	Wed 11/21/07	Sat 11/24/07
68	painting	2 days	Sat 11/24/07	Mon 11/26/07
72	vwc	4 days	Mon 11/26/07	Thu 11/29/07
76	carpet	3 days	Thu 11/29/07	Sat 12/1/07
79	FFE	3 days	Sat 12/1/07	Tue 12/4/07
82	section 3 (322-348, north)	14 days	Wed 11/21/07	Fri 12/7/07
83	liquidate 14 rooms (2nd shift)	1 day	Wed 11/21/07	Wed 11/21/07
84	demolition	1 day	Fri 11/23/07	Fri 11/23/07
90	replace down lights	3 days	Fri 11/23/07	Mon 11/26/07
96	millwork install	2 days	Sat 11/24/07	Mon 11/26/07
98	wall prep	4 days	Fri 11/23/07	Tue 11/27/07
105	tile work	3 days	Mon 11/26/07	Wed 11/28/07
108	painting	2 days	Wed 11/28/07	Thu 11/29/07
112	vwc	4 days	Thu 11/29/07	Mon 12/3/07
116	carpet	3 days	Mon 12/3/07	Wed 12/5/07
119	FFE	3 days	Wed 12/5/07	Fri 12/7/07
122	section 4 (302-320,n,301-307,s)	14 days	Mon 11/26/07	Tue 12/11/07
123	liquidate 14 rooms (2nd shift)	1 day	Mon 11/26/07	Mon 11/26/07
124	demolition	1 day	Tue 11/27/07	Tue 11/27/07
130	replace down lights	3 days	Tue 11/27/07	Thu 11/29/07
136	millwork install	2 days	Wed 11/28/07	Thu 11/29/07
138	wall prep	4 days	Tue 11/27/07	Fri 11/30/07
145	tile work	3 days	Thu 11/29/07	Sat 12/1/07
148	painting	2 days	Sat 12/1/07	Mon 12/3/07
152	vwc	4 days	Mon 12/3/07	Thu 12/6/07
156	carpet	3 days	Thu 12/6/07	Sat 12/8/07
159	FFE	3 days	Sat 12/8/07	Tue 12/11/07
162	section 5 (309-341,south)	14 days	Thu 11/29/07	Fri 12/14/07
163	liquidate 16 rooms (2nd shift)	1 day	Thu 11/29/07	Thu 11/29/07
164	demolition	1 day	Fri 11/30/07	Fri 11/30/07
170	replace down lights	3 days	Fri 11/30/07	Mon 12/3/07
176	millwork install	2 days	Sat 12/1/07	Mon 12/3/07
178	wall prep	4 days	Fri 11/30/07	Tue 12/4/07
185	tile work	3 days	Mon 12/3/07	Wed 12/5/07
188	painting	2 days	Wed 12/5/07	Thu 12/6/07
192	vwc	4 days	Thu 12/6/07	Mon 12/10/07
196	carpet	3 days	Mon 12/10/07	Wed 12/12/07
199	FFE	3 days	Wed 12/12/07	Fri 12/14/07



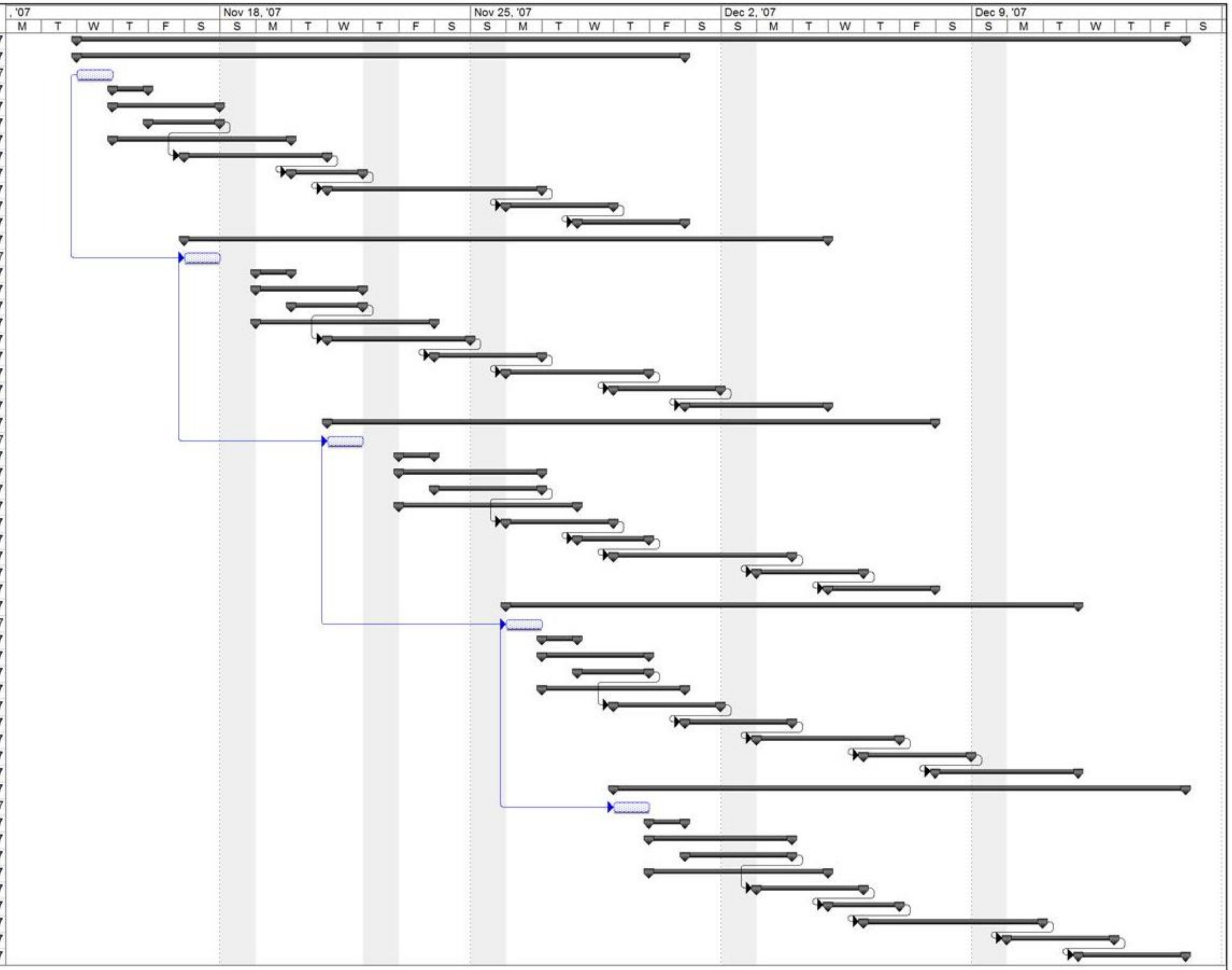
Third Floor Renovation Plan



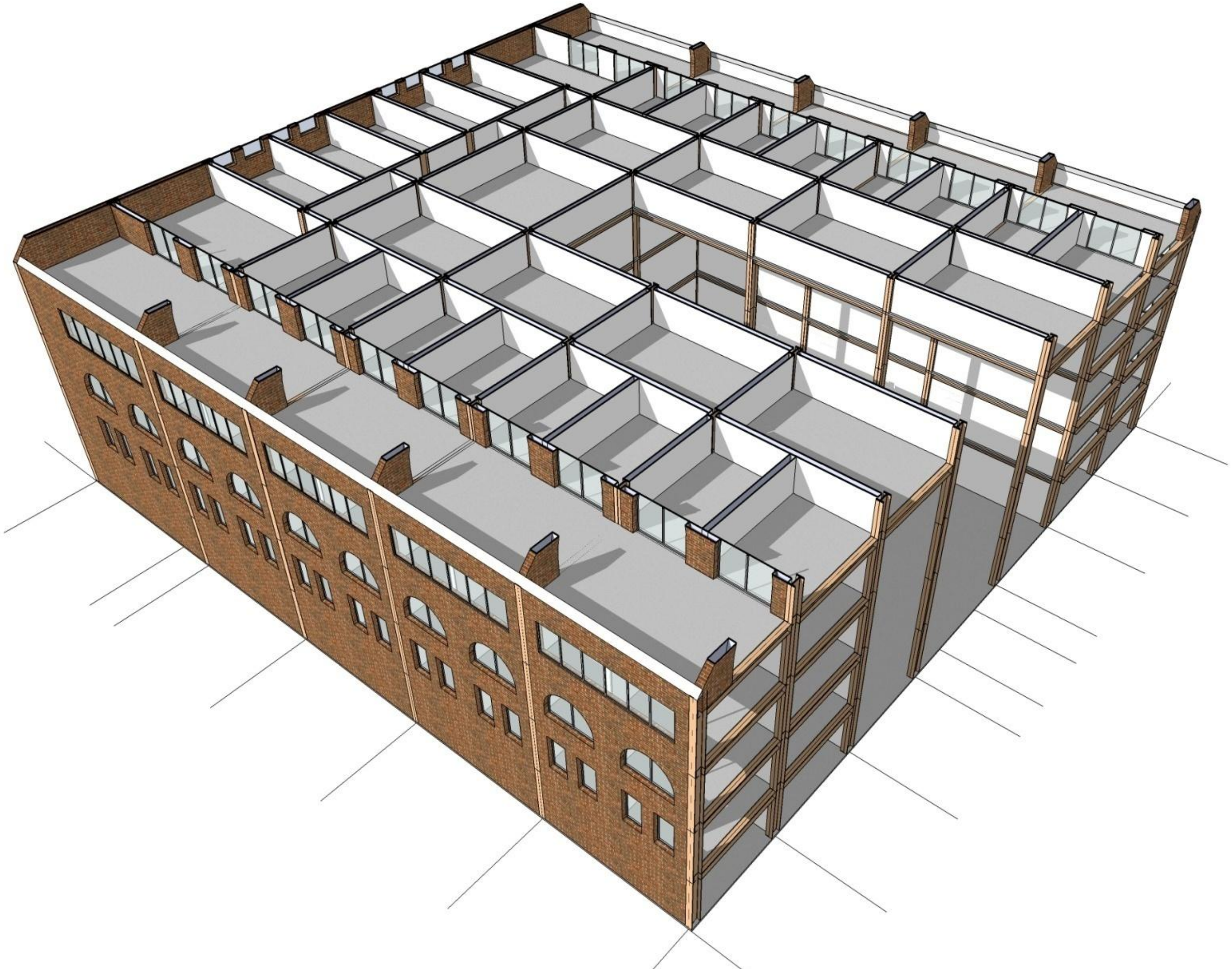
Cost until third floor renovation has finished : $ 1.524.179

Fourth Floor Renovation Schedule

ID	Task Name	Duration	Start	Finish
1	FOURTH FLOOR 68 ROOMS (PLUS SUITES	26 days	Wed 11/14/07	Fri 12/14/07
2	section 1 (441-566)	14 days	Wed 11/14/07	Fri 11/30/07
3	liquidate 15 rooms (2nd shift)	1 day	Wed 11/14/07	Wed 11/14/07
4	demolition	1 day	Thu 11/15/07	Thu 11/15/07
10	replace down lights	3 days	Thu 11/15/07	Sat 11/17/07
16	millwork install	2 days	Fri 11/16/07	Sat 11/17/07
18	wall prep	4 days	Thu 11/15/07	Mon 11/19/07
25	tile work	3 days	Sat 11/17/07	Tue 11/20/07
28	painting	2 days	Tue 11/20/07	Wed 11/21/07
32	vwc	4 days	Wed 11/21/07	Mon 11/26/07
36	carpet	3 days	Mon 11/26/07	Wed 11/28/07
39	FFE	3 days	Wed 11/28/07	Fri 11/30/07
42	section 2 (440-472)	14 days	Sat 11/17/07	Tue 12/4/07
43	liquidate 15 rooms (2nd shift)	1 day	Sat 11/17/07	Sat 11/17/07
44	demolition	1 day	Mon 11/19/07	Mon 11/19/07
50	replace down lights	3 days	Mon 11/19/07	Wed 11/21/07
56	millwork install	2 days	Tue 11/20/07	Wed 11/21/07
58	wall prep	4 days	Mon 11/19/07	Fri 11/23/07
65	tile work	3 days	Wed 11/21/07	Sat 11/24/07
68	painting	2 days	Sat 11/24/07	Mon 11/26/07
72	vwc	4 days	Mon 11/26/07	Thu 11/29/07
76	carpet	3 days	Thu 11/29/07	Sat 12/1/07
79	FFE	3 days	Sat 12/1/07	Tue 12/4/07
82	section 3 (410-438)	14 days	Wed 11/21/07	Fri 12/7/07
83	liquidate 15 rooms (2nd shift)	1 day	Wed 11/21/07	Wed 11/21/07
84	demolition	1 day	Fri 11/23/07	Fri 11/23/07
90	replace down lights	3 days	Fri 11/23/07	Mon 11/26/07
96	millwork install	2 days	Sat 11/24/07	Mon 11/26/07
98	wall prep	4 days	Fri 11/23/07	Tue 11/27/07
105	tile work	3 days	Mon 11/26/07	Wed 11/28/07
108	painting	2 days	Wed 11/28/07	Thu 11/29/07
112	vwc	4 days	Thu 11/29/07	Mon 12/3/07
116	carpet	3 days	Mon 12/3/07	Wed 12/5/07
119	FFE	3 days	Wed 12/5/07	Fri 12/7/07
122	section 4 408-419)	14 days	Mon 11/26/07	Tue 12/11/07
123	liquidate 14 rooms (2nd shift)	1 day	Mon 11/26/07	Mon 11/26/07
124	demolition	1 day	Tue 11/27/07	Tue 11/27/07
130	replace down lights	3 days	Tue 11/27/07	Thu 11/29/07
136	millwork install	2 days	Wed 11/28/07	Thu 11/29/07
138	wall prep	4 days	Tue 11/27/07	Fri 11/30/07
145	tile work	3 days	Thu 11/29/07	Sat 12/1/07
148	painting	2 days	Sat 12/1/07	Mon 12/3/07
152	vwc	4 days	Mon 12/3/07	Thu 12/6/07
156	carpet	3 days	Thu 12/6/07	Sat 12/8/07
159	FFE	3 days	Sat 12/8/07	Tue 12/11/07
162	section 5 (421-439)	14 days	Thu 11/29/07	Fri 12/14/07
163	liquidate 10 rooms (2nd shift)	1 day	Thu 11/29/07	Thu 11/29/07
164	demolition	1 day	Fri 11/30/07	Fri 11/30/07
170	replace down lights	3 days	Fri 11/30/07	Mon 12/3/07
176	millwork install	2 days	Sat 12/1/07	Mon 12/3/07
178	wall prep	4 days	Fri 11/30/07	Tue 12/4/07
185	tile work	3 days	Mon 12/3/07	Wed 12/5/07
188	painting	2 days	Wed 12/5/07	Thu 12/6/07
192	vwc	4 days	Thu 12/6/07	Mon 12/10/07
196	carpet	3 days	Mon 12/10/07	Wed 12/12/07
199	FFE	3 days	Wed 12/12/07	Fri 12/14/07



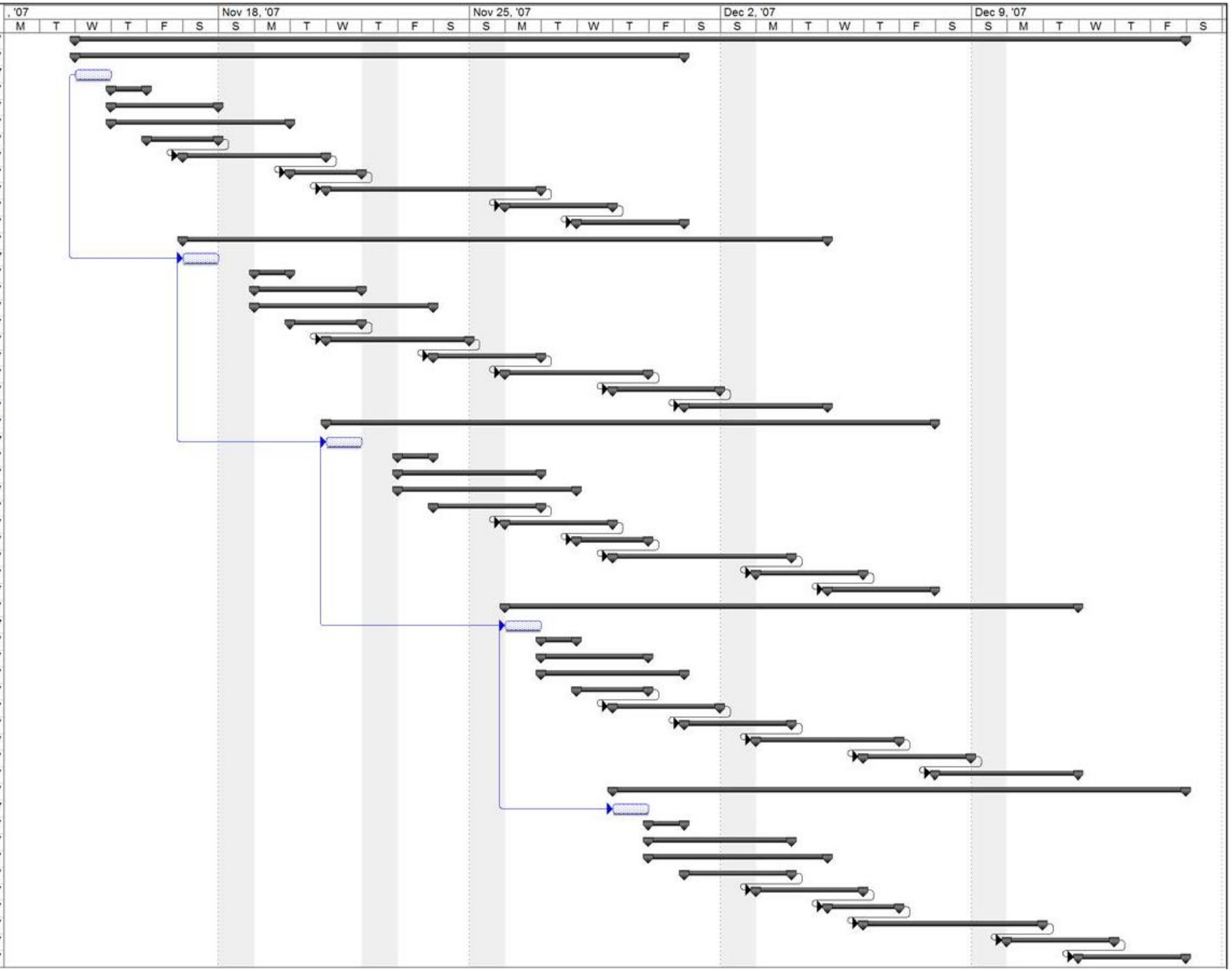
Forth Floor Renovation Plan



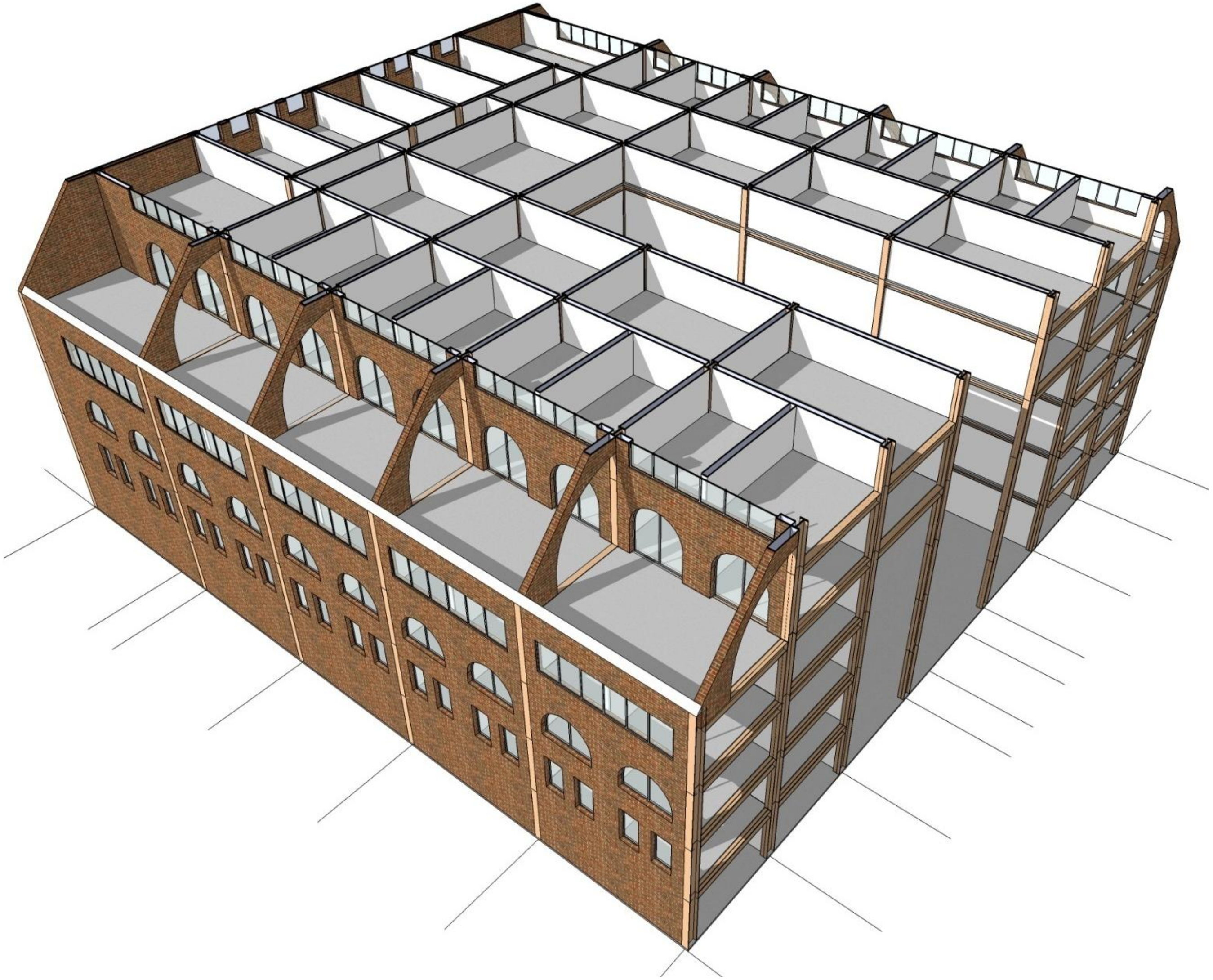
Cost until forth floor renovation has finished : $ 2.595.097

Fifth Floor Renovation Schedule

ID	Task Name	Duration	Start	Finish
1	**FIFTH FLOOR 68 ROOMS (PLUS SUITES)**	**26 days**	**Wed 11/14/07**	**Fri 12/14/07**
2	**section 1 (541-566), south**	**14 days**	**Wed 11/14/07**	**Fri 11/30/07**
3	**liquidate 15 rooms (2nd shift)**	1 day	Wed 11/14/07	Wed 11/14/07
4	**demolition**	**1 day**	**Thu 11/15/07**	**Thu 11/15/07**
10	**replace down lights**	**3 days**	**Thu 11/15/07**	**Sat 11/17/07**
18	**wall prep**	**4 days**	**Thu 11/15/07**	**Mon 11/19/07**
16	**millwork install**	**2 days**	**Fri 11/16/07**	**Sat 11/17/07**
25	**tile work**	**3 days**	**Sat 11/17/07**	**Tue 11/20/07**
28	**painting**	**2 days**	**Tue 11/20/07**	**Wed 11/21/07**
32	**vwc**	**4 days**	**Wed 11/21/07**	**Mon 11/26/07**
36	**carpet**	**3 days**	**Mon 11/26/07**	**Wed 11/28/07**
39	**FFE**	**3 days**	**Wed 11/28/07**	**Fri 11/30/07**
42	**section 2 (540-572) north**	**14 days**	**Sat 11/17/07**	**Tue 12/4/07**
43	**liquidate 15 rooms (2nd shift)**	1 day	Sat 11/17/07	Sat 11/17/07
44	**demolition**	**1 day**	**Mon 11/19/07**	**Mon 11/19/07**
50	**replace down lights**	**3 days**	**Mon 11/19/07**	**Wed 11/21/07**
58	**wall prep**	**4 days**	**Mon 11/19/07**	**Fri 11/23/07**
56	**millwork install**	**2 days**	**Tue 11/20/07**	**Wed 11/21/07**
65	**tile work**	**3 days**	**Wed 11/21/07**	**Sat 11/24/07**
68	**painting**	**2 days**	**Sat 11/24/07**	**Mon 11/26/07**
72	**vwc**	**4 days**	**Mon 11/26/07**	**Thu 11/29/07**
76	**carpet**	**3 days**	**Thu 11/29/07**	**Sat 12/1/07**
79	**FFE**	**3 days**	**Sat 12/1/07**	**Tue 12/4/07**
82	**section 3 (510-538) north**	**14 days**	**Wed 11/21/07**	**Fri 12/7/07**
83	**liquidate 15 rooms (2nd shift)**	1 day	Wed 11/21/07	Wed 11/21/07
84	**demolition**	**1 day**	**Fri 11/23/07**	**Fri 11/23/07**
90	**replace down lights**	**3 days**	**Fri 11/23/07**	**Mon 11/26/07**
98	**wall prep**	**4 days**	**Fri 11/23/07**	**Tue 11/27/07**
96	**millwork install**	**2 days**	**Sat 11/24/07**	**Mon 11/26/07**
105	**tile work**	**3 days**	**Mon 11/26/07**	**Wed 11/28/07**
108	**painting**	**2 days**	**Wed 11/28/07**	**Thu 11/29/07**
112	**vwc**	**4 days**	**Thu 11/29/07**	**Mon 12/3/07**
116	**carpet**	**3 days**	**Mon 12/3/07**	**Wed 12/5/07**
119	**FFE**	**3 days**	**Wed 12/5/07**	**Fri 12/7/07**
122	**section 4 (508-519)**	**14 days**	**Mon 11/26/07**	**Tue 12/11/07**
123	**liquidate 14 rooms (2nd shift)**	1 day	Mon 11/26/07	Mon 11/26/07
124	**demolition**	**1 day**	**Tue 11/27/07**	**Tue 11/27/07**
130	**replace down lights**	**3 days**	**Tue 11/27/07**	**Thu 11/29/07**
138	**wall prep**	**4 days**	**Tue 11/27/07**	**Fri 11/30/07**
136	**millwork install**	**2 days**	**Wed 11/28/07**	**Thu 11/29/07**
145	**tile work**	**3 days**	**Thu 11/29/07**	**Sat 12/1/07**
148	**painting**	**2 days**	**Sat 12/1/07**	**Mon 12/3/07**
152	**vwc**	**4 days**	**Mon 12/3/07**	**Thu 12/6/07**
156	**carpet**	**3 days**	**Thu 12/6/07**	**Sat 12/8/07**
159	**FFE**	**3 days**	**Sat 12/8/07**	**Tue 12/11/07**
162	**section 5 (521-539)**	**14 days**	**Thu 11/29/07**	**Fri 12/14/07**
163	**liquidate 10 rooms (2nd shift)**	1 day	Thu 11/29/07	Thu 11/29/07
164	**demolition**	**1 day**	**Fri 11/30/07**	**Fri 11/30/07**
170	**replace down lights**	**3 days**	**Fri 11/30/07**	**Mon 12/3/07**
178	**wall prep**	**4 days**	**Fri 11/30/07**	**Tue 12/4/07**
176	**millwork install**	**2 days**	**Sat 12/1/07**	**Mon 12/3/07**
185	**tile work**	**3 days**	**Mon 12/3/07**	**Wed 12/5/07**
188	**painting**	**2 days**	**Wed 12/5/07**	**Thu 12/6/07**
192	**vwc**	**4 days**	**Thu 12/6/07**	**Mon 12/10/07**
196	**carpet**	**3 days**	**Mon 12/10/07**	**Wed 12/12/07**
199	**FFE**	**3 days**	**Wed 12/12/07**	**Fri 12/14/07**



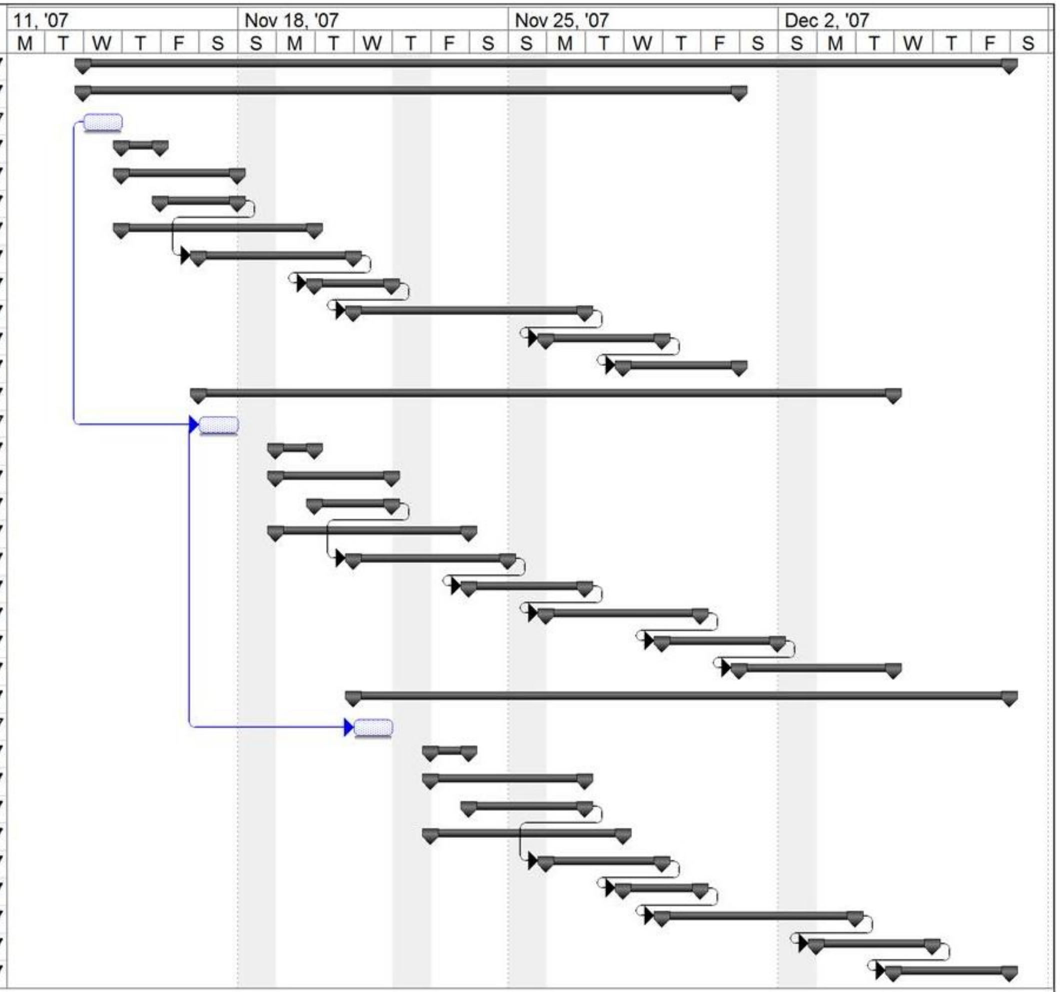
Fifth Floor Renovation Plan



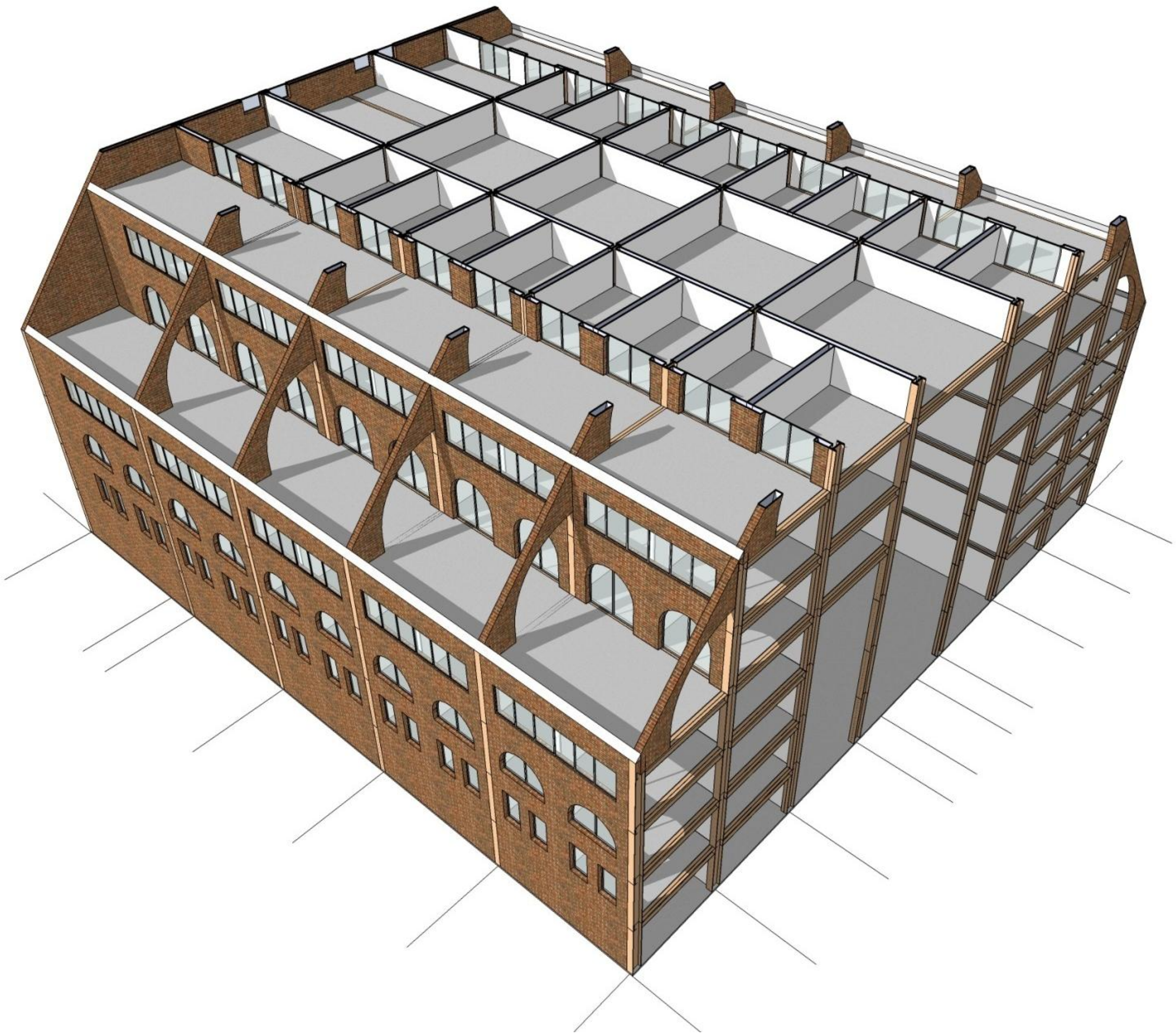
***Cost until fifth floor renovation has finished* : $ 3.649.408**

Sixth Floor Renovation Schedule

ID	Task Name	Duration	Start	Finish
1	SIXTH FLOOR 52 ROOMS (PLUS SUITES)	20 days	Wed 11/14/07	Fri 12/7/07
2	section 1 (648-671)	14 days	Wed 11/14/07	Fri 11/30/07
3	liquidate 18 rooms (2nd shift)	1 day	Wed 11/14/07	Wed 11/14/07
4	demolition	1 day	Thu 11/15/07	Thu 11/15/07
10	replace down lights	3 days	Thu 11/15/07	Sat 11/17/07
16	millwork install	2 days	Fri 11/16/07	Sat 11/17/07
18	wall prep	4 days	Thu 11/15/07	Mon 11/19/07
25	tile work	3 days	Sat 11/17/07	Tue 11/20/07
28	painting	2 days	Tue 11/20/07	Wed 11/21/07
32	vwc	4 days	Wed 11/21/07	Mon 11/26/07
36	carpet	3 days	Mon 11/26/07	Wed 11/28/07
39	FFE	3 days	Wed 11/28/07	Fri 11/30/07
42	section 2 (628-647)	14 days	Sat 11/17/07	Tue 12/4/07
43	liquidate 18 rooms (2nd shift)	1 day	Sat 11/17/07	Sat 11/17/07
44	demolition	1 day	Mon 11/19/07	Mon 11/19/07
50	replace down lights	3 days	Mon 11/19/07	Wed 11/21/07
56	millwork install	2 days	Tue 11/20/07	Wed 11/21/07
58	wall prep	4 days	Mon 11/19/07	Fri 11/23/07
65	tile work	3 days	Wed 11/21/07	Sat 11/24/07
68	painting	2 days	Sat 11/24/07	Mon 11/26/07
72	vwc	4 days	Mon 11/26/07	Thu 11/29/07
76	carpet	3 days	Thu 11/29/07	Sat 12/1/07
79	FFE	3 days	Sat 12/1/07	Tue 12/4/07
82	section 3 (602-625)	14 days	Wed 11/21/07	Fri 12/7/07
83	liquidate 21 rooms (2nd shift)	1 day	Wed 11/21/07	Wed 11/21/07
84	demolition	1 day	Fri 11/23/07	Fri 11/23/07
90	replace down lights	3 days	Fri 11/23/07	Mon 11/26/07
96	millwork install	2 days	Sat 11/24/07	Mon 11/26/07
98	wall prep	4 days	Fri 11/23/07	Tue 11/27/07
105	tile work	3 days	Mon 11/26/07	Wed 11/28/07
108	painting	2 days	Wed 11/28/07	Thu 11/29/07
112	vwc	4 days	Thu 11/29/07	Mon 12/3/07
116	carpet	3 days	Mon 12/3/07	Wed 12/5/07
119	FFE	3 days	Wed 12/5/07	Fri 12/7/07



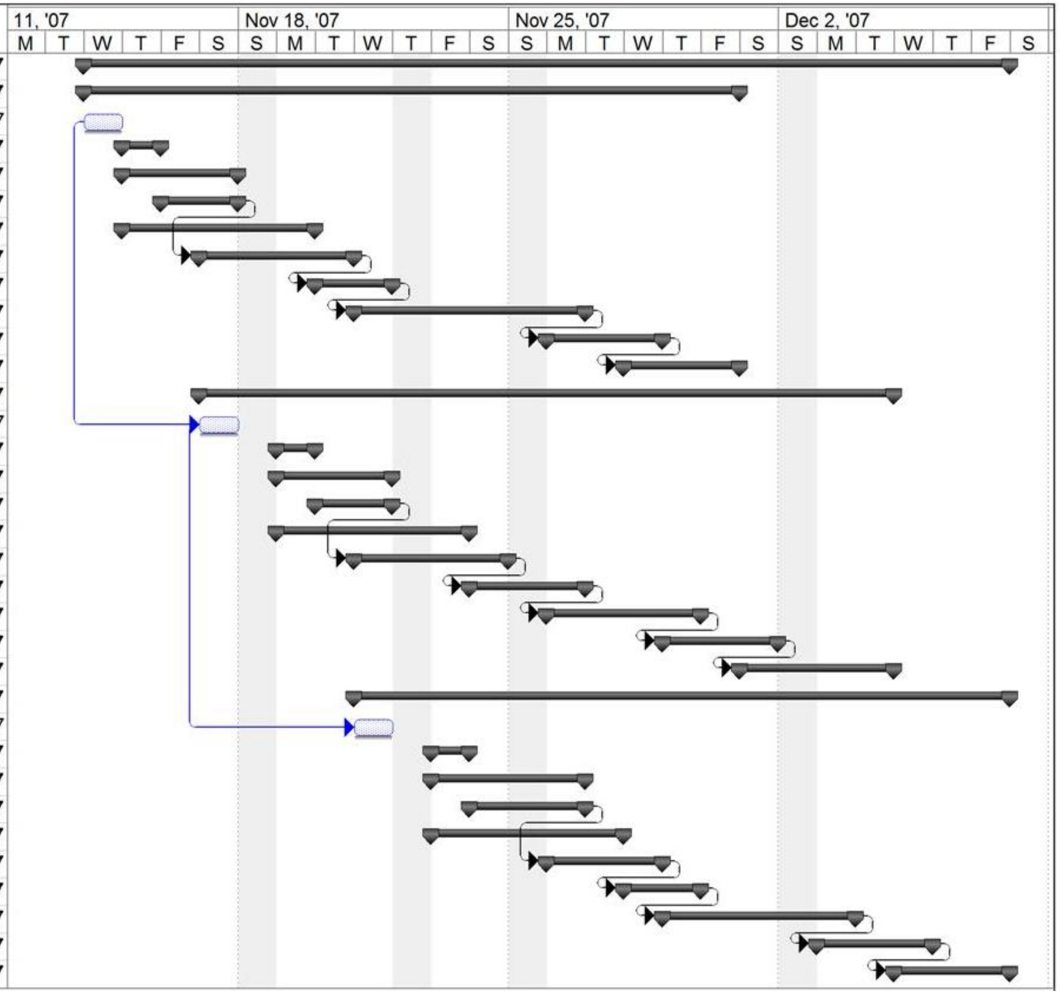
Sixth Floor Renovation Plan



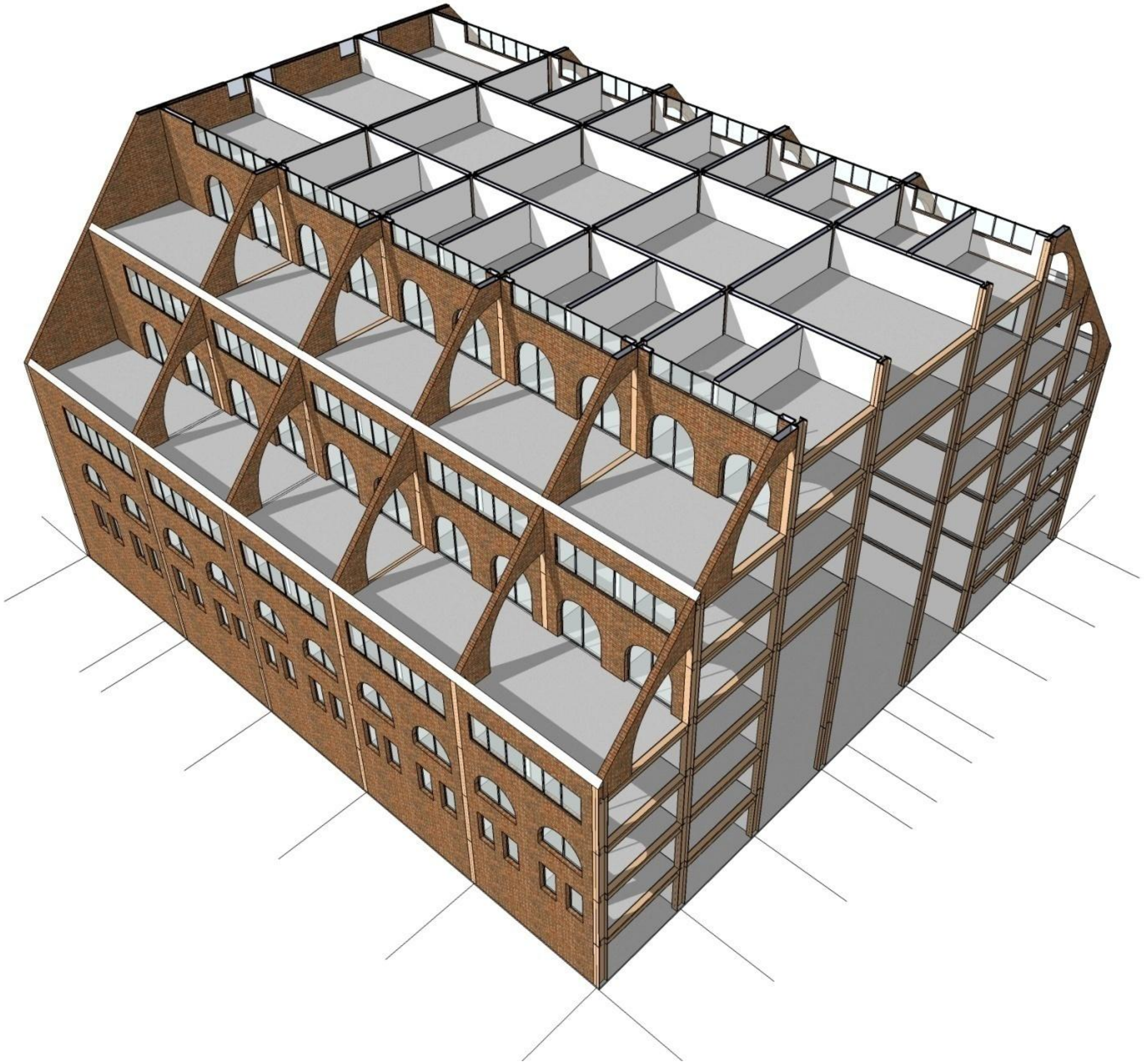
Cost until sixth floor renovation has finished : $ 4.798.312

Seventh Floor Renovation Schedule

ID	Task Name	Duration	Start	Finish
1	**SEVENTH FLOOR 56 ROOMS (INCL SUITI**	**20 days**	**Wed 11/14/07**	**Fri 12/7/07**
2	**section 1 (748-771)**	**14 days**	**Wed 11/14/07**	**Fri 11/30/07**
3	**liquidate 18 rooms (2nd shift)**	1 day	Wed 11/14/07	Wed 11/14/07
4	**demolition**	**1 day**	**Thu 11/15/07**	**Thu 11/15/07**
10	**replace down lights**	**3 days**	**Thu 11/15/07**	**Sat 11/17/07**
16	**millwork install**	**2 days**	**Fri 11/16/07**	**Sat 11/17/07**
18	**wall prep**	**4 days**	**Thu 11/15/07**	**Mon 11/19/07**
25	**tile work**	**3 days**	**Sat 11/17/07**	**Tue 11/20/07**
28	**painting**	**2 days**	**Tue 11/20/07**	**Wed 11/21/07**
32	**vwc**	**4 days**	**Wed 11/21/07**	**Mon 11/26/07**
36	**carpet**	**3 days**	**Mon 11/26/07**	**Wed 11/28/07**
39	**FFE**	**3 days**	**Wed 11/28/07**	**Fri 11/30/07**
42	**section 2 (728-747)**	**14 days**	**Sat 11/17/07**	**Tue 12/4/07**
43	**liquidate 18 rooms (2nd shift)**	1 day	Sat 11/17/07	Sat 11/17/07
44	**demolition**	**1 day**	**Mon 11/19/07**	**Mon 11/19/07**
50	**replace down lights**	**3 days**	**Mon 11/19/07**	**Wed 11/21/07**
56	**millwork install**	**2 days**	**Tue 11/20/07**	**Wed 11/21/07**
58	**wall prep**	**4 days**	**Mon 11/19/07**	**Fri 11/23/07**
65	**tile work**	**3 days**	**Wed 11/21/07**	**Sat 11/24/07**
68	**painting**	**2 days**	**Sat 11/24/07**	**Mon 11/26/07**
72	**vwc**	**4 days**	**Mon 11/26/07**	**Thu 11/29/07**
76	**carpet**	**3 days**	**Thu 11/29/07**	**Sat 12/1/07**
79	**FFE**	**3 days**	**Sat 12/1/07**	**Tue 12/4/07**
82	**section 3 (702-725)**	**14 days**	**Wed 11/21/07**	**Fri 12/7/07**
83	**liquidate 20 rooms (2nd shift)**	1 day	Wed 11/21/07	Wed 11/21/07
84	**demolition**	**1 day**	**Fri 11/23/07**	**Fri 11/23/07**
90	**replace down lights**	**3 days**	**Fri 11/23/07**	**Mon 11/26/07**
96	**millwork install**	**2 days**	**Sat 11/24/07**	**Mon 11/26/07**
98	**wall prep**	**4 days**	**Fri 11/23/07**	**Tue 11/27/07**
105	**tile work**	**3 days**	**Mon 11/26/07**	**Wed 11/28/07**
108	**painting**	**2 days**	**Wed 11/28/07**	**Thu 11/29/07**
112	**vwc**	**4 days**	**Thu 11/29/07**	**Mon 12/3/07**
116	**carpet**	**3 days**	**Mon 12/3/07**	**Wed 12/5/07**
119	**FFE**	**3 days**	**Wed 12/5/07**	**Fri 12/7/07**



Seventh Floor Renovation Plan



***Cost until sixth floor renovation has finished* : $ 5.525.208**