

Opportunities for the Refurbishing of City Hall

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In Conjunction with Wentworth Architecture Department.

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Status of Building at Completion in 1967

John Sinagra, the HVAC Manager with Building Services at City Hall furnished us with a very general and incomplete report of all of the work that has been done regarding upgrades, repairs and maintenance of the Buildings mechanical systems. written by an anonymous source, (presumably someone who was working for the City) from 1967 to 1977. This is the only surviving in-tack description of the workings of the mechanical system to his knowledge, detailing all of the operational and defunct equipment and zoning of the 22 air handling units. From this material and a series of site visits and interviews with the current operating and managing engineering staff at City Hall by the students and our consulting John Cooke PE, we have been able to update the document provided to us by John Sinagra.

In the process of our investigation we interviewed Vic Hagen who is a current employee of the City working with the PFD. Mr. Hagen brought to our attention that there was an Energy Office at one time in City Hall established to monitor and correct potentially wasteful energy use and operational procedures for a number of buildings owned and operated by the City throughout Boston. The program was fully computerized and included research, data collection and system operations for over 100 City owned buildings under the Direction of Mr. Hagen and later one of his Associates George Caan. The program was operational from the mid 70's and disbanded in the mid 80's when energy efficiency considerations were no longer perceived in vogue, at least from the political leadership of the Reagan administration in Washington D.C.

In our search to locate the ten years of archives of The Energy Office 's operation, we were led to three different dead storage offices operated by the city only to be

told in the end that all of the files were destroyed three years ago as there was no longer any perceived need or interest in any of the information by the City. We also found that Mr. Hagen no longer had any of the material relating to the Office nor anyone else contacted in the PFD, the BRA or the current Environmental Committee of Mayor Menino's including the Sustainable Boston Committee. We were also unable to track down Mr. Caan the primary director of the office during its most successful years who had reportedly moved to the Northwest.

In separate interviews with Henry Wood, one of the current partners of Architects Kallmann McKinnel and Knolls who worked as a young clerk of the works on the project and Sid Greenleaf, Chief Mechanical Engineer of the project, both gentlemen informed us that their offices no longer have any information as to the mechanical operational management or energy use of the building.

It appears that this Energy Office and all of its potentially useful 10 years of work is no longer available. This was especially disheartening as we were trying to initiate a study of the operational effectiveness of City Hall during its early years.

Current Operating Condition

The next step in our protocol was to isolate the current operational costs of the building through tabulating all of the current electrical, steam and water bills that the City pays out monthly. These are all listed in appendix B. Knowing the total square footage of the building and dividing this into the total energy /steam and water consumed by the structure converted into BTU', we have been able to calculate the Energy Utilization Rate (EUR) of the building which is 276,953 BTU's /s.f. Comparing this to the Building Energy Performance Standards(BEPS) of 110,000 BTU's/sf listed in the Vital Signs catalog for a large office building in Boston, we clearly see that there is substantial room and opportunity for improving the building's performance.

Operation and maintenance costs on top of energy bills is approximately 1.4 million, and is considered in the payback component of the phases?

In a series of open discussions, the team selected the following three levels of opportunity that begin initially with achieving the most savings with the least investment in retrofit costs. In each case we have attached estimates for initial investment for new equipment and /or construction, time lapse for bringing the operational improvements up to speed, and the annual savings in energy costs that can be expected once fully operating .

Proposed Phases of Retrofit Phase I

This first phase would involve upgrading the existing equipment of the mechanical system, repairing and replacing broken-down, abandoned and inoperable components of the original mechanical system. This would include the revitalization of the variable air volume system, lever controls, the McDonald Miller equipment, self contained Powers #11 valves that regulate the correct use of steam in the building, and eliminating flash steam and subsequent loss to the atmosphere. This would also allow for the removal of what many consider an improperly placed chimney in the middle of the front entry walk to the building.

The suggested cost of this program would range between \$50,000 to \$75,000 initial investment, with an estimated \$100,000 energy savings within the first year and every additional year thereafter. This would possibly be considered as a separate item under the operations and maintenance budget for the building. We believe that the work in this phase could be completed within a six month period.

Phase II

The second phase of the project would entail a complete review of the automatic temperature controls of the building. This would involve the reactivation and salvage of the existing computer control center of the building, which has sat virtually inactive for an undetermined period of time. This is the captain's chair so to speak, the brain center of the ship which regulates the temperature controls along with the power and water controls for the building.

This effort would be best served by soliciting a design/build process for a \$30-50,000 mechanical design contract and a subsequent \$100 to \$150,000 construction budget. Filed sub-bids would be solicited for plumbing, electrical, sheet metal and automatic temperature controls. The estimated savings after an 18 month period of design and construction would be approximately \$100,000 , and an additional \$100,000 each additional year thereafter.

Phase III-A

The third phase of this proposal would be a design/build contract to renovate the Interior court of City Hall, providing a new insulated glass and panel skin on the exposed faces of the structure and the roof opening, developing a fully conditioned space made accessible from the new plaza and through a direct connection to Congress St and a balcony connection to the new Congress St.

bridge. We also propose that the interior light wells on the third floor deck be removed and that a portion of the ceiling be removed to provide another escalator run from the second to the third level.

This new interior space would be also tied into the existing interior shafts running from levels 3 to 9 on either side of the Mayor's offices above the main concourse. By removing the two upper roof monitors, capping these existing shafts with part of the new roof structure and removing substantial sections of the window wall separating the current central core from the entrance concourse on the third and fourth floors, the interior of the building could be transformed into one looped stack or continuous column of air. Integrating the public into the building is one clear benefit of opening up the core as a circulation corridor between Faneuil Hall and the new plaza. It will go a long way in reconnecting the 2000 or so city workers on all of the nine levels of the building with their home and the public who pass through on a daily basis.

The final components of this design would incorporate the redevelopment of the existing garage and dead storage areas which comprise approximately 30,000 sf and 300 lineal feet of Street front opposite the Quincy Market. Sitting across the street from one of the most successful commercial centers in the U.S., we visualize this area as a series of street front shops that sell environmentally certified merchandise, connected to a new Ecological Demonstration, Research, Education and Monitoring Center in the remaining area of this reclaimed space. This phase work would also involve the development of a new public access to the roof of the building in the form of a new exterior elevator with an off street entry from Congress St and a stop at the new third floor public atrium level.

The renovated roof would house a new public restaurant and a series of greenhouses and laboratory spaces tied into the Ecological Center. The roof would also house a year round promenade and viewing platform for the city, incorporating dioramas on the history of the city, the region and City Hall as the central point of the region. In addition , sections of this level and the open atrium will house components of a living museum of technologies geared to demonstrating and teaching Sustainable and Alternative technologies to the public.

Phase III-B

In addition to the potential opportunities that this new one looped stack or continuous column of air will provide architecturally, it will become a primary component of a state of the art mechanical heat recovery system which will reduce energy costs of the building in conjunction with the first two phases by 65% (from the current sum of 1.6 million to roughly 600,000).

The core of the new system would be the substitution of a new 400 ton double-bundle heat recovery air handling machine for the existing electric 750 ton York

machine (which would become the secondary) and the chilled steam cooling absorber chiller which would become the tertiary system. Air balance and training seminars to compliment the economizer' conservation cycle for future operators will be run before the system is fully engaged. This will include studies in the phasing of the construction, life safety, fire evacuation and security alarm systems. This state of the art system will be integrated into the first two phases, engaging the complete integration of the restored Automatic Temperature Controls, providing a model system for City Hall as we enter the 21st century.

The system will transfer the internal heat generated by the new core activity and added space to the perimeter of the building through the existing mechanical equipment (including all condensers and piping already brought up to date in the previous two phases, reduced from the current 22 air handling units to 10, one for each floor. Because the building is always in need of cooling and/or supplemental heat, this heat recovery can be harnessed to provide (as an example) all of the domestic hot water (DHW) for the building year round, instead of buying the extra steam from the Trigen Company. At certain times of the year, excess steam condensate is being cooled off and pumped away to the MWRA with hundreds of thousands of clean fresh water. With this new system, we will be amassing what are referred to as avoided or saved costs in such things as water and chemical treatment costs (within the building and at Deer Island) as well as cooling tower maintenance costs.

The building will also be given a new fresh air system as a result of this renovation. The potential of a purge system is accomplished by moderate renovations to the existing ductwork and piping of the 22 air handling units now reduced to 10, with new horizontal and vertical air flows which will become the driving force for the new purge mode of operation of the system. The current air handling system is pushing 390,000 to 410,000 cfm of air through the building. With the new system proposed this would be reduced to 196,000 cfm, 87,000 of which will be outside air, thus providing a very generous improvement of over 40-cfm per person.