

## Executive Summary

The Broad Institutes new building at 75 Ames Street is set to be done with construction in early 2014. This building has been designed to hold half labs and half executive spaces such as offices and conference rooms. There is also retail space available on the Ames Street front property, and vivariums up on the 12<sup>th</sup> floor. The HVAC system is currently supplied by 4 Air handling units serving the first 11 floors or labs and offices in a ganged duct system, and another spate air handling unit serving the vivarium. The whole system is 100 % outside air due to the lab spaces and interior rooms are supplied by variable air volume boxes with reheat. The exterior spaces are supplied with VAV boxes and use baseboard heaters by the windows to heat the rooms. The purpose of this report is to see the effects of changing the rooms from a VAV reheat supply to a chilled beams system and the effects of putting the labs on a demand controlled ventilation system such as Aircuity Optinets sensing system.

The first mechanical depth studied the effect of just adding the Aircuity Optinet system to a few lab spaces. These lab spaces could then be turned down to ventilation levels of 4 to 2 ACH instead of the more common 6 to 12 ACH. The results in changing to this new system saved The Broad Institute \$189,042.74 a year compared to the original system. While only costing \$160,000 to install.

The second depth explored the economics and environmental effects of placing a chilled beam system. The chilled beams being added to both the labs and offices drastically decreased the supply air needed for each room and allowed the downsizing of air handling units supply fans. Although there was a premium cost of for the chilled beams, extra piping and added pump of \$743,167.79 the annual savings amount to \$532,217.29. This energy cost savings also translates to a high emissions reduction. The rates compared to the original system changed by up to 22%.

The third depth explored coupling the two systems together to make the saving even greater. For this third system the savings amounted to \$604,658.99 while the total cost was only 903,167.79. The emissions rate was also positively affected by the coupling of the two systems. The percent change went up to 24%.

The breadth study shows that that there is some effect to the lighting system in order to position the chilled beams in the most desirable space. But in studying the different lighting styles it was decided that the original lighting could still be utilized, or a more energy conscious LED system could be used., which cost more up front but could have more savings in the long run, f

After the investigation of the three different mechanical changes to the building it is recommended to add both the chilled beams and Aircuity-Optinets demand controlled ventilation system to maximize both the savings and environmental impact of the building. The Aircuity system will also create a better environment for the occupants of the labs ensuring that contaminants remain within a safe level.