# EXECUTIVE SUMMARY

This report has been written to determine if the UCSD Rady School of Management would benefit from the incorporation of an active chilled beam (ACB) system in conjunction with a dedicated outdoor air system (DOAS). This system will be designed and compared to the existing variable air volume (VAV) system.

The report begins with an overview of the building and its various systems. The existing mechanical system design and operation are then examined to provide a basis for the redesign. My redesign proposal is presented and the process for the design is laid out.

I begin my redesign by calculating the amount of ventilation air required by ASHRAE 62.1. This value is based on occupancy loads and building area. The required ventilation rates then become the basis for my airflow rates since 100% outdoor air will be supplied. This value was found to be 36,191 CFM. A Trane TRACE 700 block analysis energy model was then created to determine the building's loads. With the loads and airflow rates established, the required supply air humidity ratio needed to handle all latent loads was determined to be 40 gr/lb of dry air. It was then found that the cooling coil capacity needed to be 77.4 tons for area A, and 141.3 tons for area B&C. The sensible cooling capacity for the supply air was determined and subtracted from the total sensible loads to find the load that will need to be handled by the ACBs. Using this information, I determined that the building would require a total of 1,396 2'x4' ACBs.

With all of this information know, I could then perform a first cost analysis. This was done by determining what components could be eliminated, and what ones needed to be added. It was concluded that one of the building's AHUs and six of the seven FCUs could be eliminated. The VAV boxes were kept to prevent overcooling to the rooms, but the majority of them were reduced in size. The required pumping power for the hot and chilled water loops was calculated, and it was found that eight 100 HP pumps would need to be installed. Using this information, it was found that the initial cost would be roughly $648,570 higher for this system. An energy analysis then found that the system would lead to an 11.4% reduction in energy costs, or $10,610 a year. This resulted in a payback period of 61 years and made it evident that this type of system would not be economically viable. Although these systems can be very beneficial under certain circumstances, it was no so in this case. With such a large payback period, the use of this type of system cannot be rationalized, and the owner would most likely favor the use of the VAV system.

Although the use of this system could not be validated, the effect it would have on the electrical system was investigated. Along with this, a construction management breadth was performed to calculate about how much time the system would take to install.