Report to the Board of Trustees:
2007 FCC Air Handler and Roofing Project

The following report was submitted to the Board of Trustees in response to an inquiry regarding an item on the May 1 Board agenda. The item was regarding the roofing system selected for the 2007 FCC Air Handler and Roofing project.

ROOFING SYSTEM SELECTED FOR THE PROJECT:

- The specified Roofing System that is being installed on the Media Center building is a 3 Ply Built Up Asphalt Roofing System.
- The finished Roofing surface is going to be finished with a highly Reflective Aggregate Surfacing that meets the California Title 24 Energy Efficiency Standards and has been tested in accordance with the *"Cool Roof Rating Council."*

In an effort to explain the reason for this roofing system, three different options for roof application were evaluated:

ROOFING SYSTEM OPTIONS EVALUATED FOR USE:

- **Built Up Roofing System**:
  - **Ideal Roof Condition**: Almost Flat. Very Low Slope.
  - **Traffic Tolerance**: High. NOT susceptible to damage due to foot traffic.
  - **Special Maintenance/Materials**: Readily Available
  - **Maintenance Expense**: Low.
  - **Life Expectancy**: 20+ years.

- **Single Ply Roofing System**:
  - **Ideal Roof Condition**: Large Open Areas. Required slope ¼": 12" (The Media Center Roofs have large amounts of equipment on them. Except for the upper most roof, the roof slope in 70% of the areas is less than ¼": 12".)
  - **Traffic Tolerance**: Fair. Very susceptible to damage during construction and after occupancy.
  - **Special Maintenance/Materials**: Readily Available
  - **Maintenance Expense**: Moderate.
  - **Life Expectancy**: 20+ years.

- **Foam Roofing System**:
  - **Ideal Roof Condition**: Sloped to drain. (The Media Center Roofs have low sloping roofs as discussed above.)
  - **Traffic Tolerance**: Fair.

- **Special Maintenance/Materials**: Readily Available but Special Sealants and Foams required.
- **Maintenance Expense**: Moderate.
- **Life Expectancy**: 10+ years

The Board also expressed an interest in the energy savings of both the roofing material and the air handlers being specified.

In regard to the roofing system chosen, the information below compares the solar reflectance, infrared emittance and cooling savings for the built up roof system w/reflective coating and the single ply roofing system using the Department of Energy's "Cool Roof Calculator." As noted above, the built up roof was chosen because of the less-than-required roof slope in 70% of the roof areas, ability to access the roof equipment, low probability of damage to roof material when accessed and low maintenance.

ROOFING ENERGY ANALYSIS *(Based upon the Department of Energy's "Cool Roof Calculator")*

- **Gravel Roofing System** *(This system is the benchmark for all systems):*
  - **Solar Reflectance (SR):** 27.
  - **Infrared Emittance (IE):** 90
  - **Cooling Savings (Per Year):** $0.52 /sf.

- **Built Up Roofing System w/Reflective Coating**:
  - **Solar Reflectance (SR):** 71.
  - **Infrared Emittance (IE):** 86
  - **Cooling Savings (Per Year):** $1.61 /sf.

- **Single Ply Roofing System**:
  - **Solar Reflectance (SR):** 85.
  - **Infrared Emittance (IE):** 85
  - **Cooling Savings (Per Year):** $1.96 /sf.

In regard to the air handlers, the following energy efficiency components were included or considered for inclusion in the project. The only item not included in the project that was considered for its energy conservation measure was the last item on the list with a 30-year payback.

HVAC (Mechanical) Energy Efficiency Modifications Included in the Project:

- **Controls:** The controls for the Air Handlers and Pumping Station have been revised to Digital Controls.

- "**VFD's" (Variable Frequency Drives) at Fan Motors**: VFD's have been provided for all new Fan Motors. This requires that only the necessary

horsepower be provided to the Fan Motor, which in turn results in less energy consumption vs. the Motors operating at one constant speed.

- **Tied into the Existing FCC Central Plant**: By tying into the existing FCC Central Plant, there are less operating costs vs. a "stand alone" system, as the Central Plant is providing services to many FCC buildings.

- **Pump System Design:** The former Pump System did not allow for any variance or modulation in the water being pumped to the building. The new system has additional valves which allow only the required amount of water to be pumped to the new system, therein realizing additional energy savings due to medium not being pumped that is not required.

- **Economizers at New Air Handlers:** The new Air Handlers have variable speed fans in them, which help maintain space pressure and provide for better air quality.

HVAC (Mechanical) Energy Efficiency NOT Included in the Project:

- **Redesign Air Handler 1 to a Variable Air Volume Unit:** This item, similar to the controls at the Mixing Boxes requires significant modifications above the ceiling as there would be major ductwork modifications required for this type of a design. It is estimated the payback for this modification exceeds 30 years, which was viewed as unreasonable.