# *MEMORANDUM*

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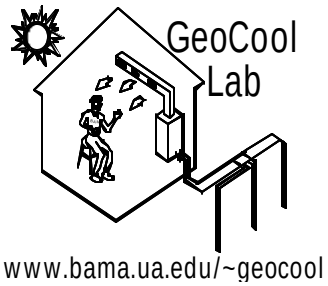


Date: August 2001
To: Technical Note
From: Steve Kavanaugh
Re: Normal Cooling Loads for Classrooms

One of the most common reasons for not doing Ground Source Heat Pumps is high cost due to what I term "Sandbagging the Cooling Loads". This is the practice of fudging on the load calculation, which leads to over-sizing the equipment (which adds some costs) and sizing the ground loop to meet the "Sandbagged" cooling loads. This leads to very high costs. A 1995 ASHRAE publication, "*Operating Experiences with Commercial GSHPs – 863RP*" studied 30 installations in North America in which the average area per cooling unit was **142 ft$^2$ per ton** for offices and schools. **Normal** areas would be **260 to 280 ft$^2$ per ton for classrooms** and **325 to 350 ft$^2$ per ton for offices**.

So if your engineer says ground source heat pumps are too expensive, make sure you're not being "sandbagged". Below are a few values to check out results.

| | Typical Classroom<br>2+ watts/ft$^2$ Lighting<br>R20 Ceilings, R10 walls<br>Clear, Single Pane Windows | Energy Efficient Classroom<br>< 1.5 watts/ft$^2$ Lighting<br>R20+ Ceilings, R10+ walls<br>Tinted, Double Pane Windows |
|---|---|---|
| No Outside Air Equipment | 260 – 280 ft$^2$ / Ton | 300 – 350 ft$^2$ / Ton |
| Total Heat Recovery Unit | 310 – 350 ft$^2$ / Ton | 390 – 450 ft$^2$ / Ton |
| Dedicated Outside Air Unit | 350 – 400 ft$^2$ / Ton | 450 – 500 ft$^2$ / Ton |

The web site www.geokiss.com contains two free programs for calculating cooling and heating loads. ***TideLoad4Z.xls*** is a CLTD/CLF method designed for teaching and learning how to do heat loss/gain calculations. It follows methods outlined in older *ASHRAE Fundamentals Handbooks* so that users have some reference to explanations of computations. ***BamaLoad*** is a more powerful tool for calculating loads and is driven by weather data files from 30 locations in the USA. It can also generate loads for bin method energy calculations using ASHRAE weather data that is sub-divided into six-4 hour time increments. Did I mention the programs are **FREE**?