









## 5. Applications

### 1. Centralised Cooling of Public Spaces

Instead of using a bulky water chilling AHU, a Pykrete based T.E.S. can be used reducing the overall size of the centralised A.C. unit

### 2. Cooling Purposes for Large Server System

Large server rooms generate a sizeable amount of heat since a number of computer systems are used. Hence, they require to be maintained at a certain temperature. This can be achieved by using a T.E.S system which consumes less power than V.C.C. based system.

### 3. Cooling Of Controlled Environment (C.A. / M.A.)

For food preservation and storage of biomedical and biochemical matter requires precisely controlled atmosphere and maintenance of such conditions. In short, such materials are required to be stored in C.A./M.A. systems. Since, rate of heat addition to Pykrete is very slow, it can maintain a particular temperature for a prolonged period of time even during power outages.

## 6. Conclusion

From the above calculations, it has been found out that, cooling capacity of 1 T.R., a Pykrete block of 100\*120\*90 cc is required. Cooling capacity according to requirement can be varied from this value of cooling capacity by varying the volumetric flow rate of air through the system. Hence the desired temperature can be achieved.

### Appendix:

1. For type L Copper tubing, Nominal size used i.e. ¾ in.
  - 1.1. Outer diameter = 0.875 in.
  - 1.2. Inner diameter = 0.785 in.
  - 1.3. Wall thickness = 0.45 in.
  - 1.4. Length of tubing used = 30 cm.
2. Properties of Air at 32<sup>o</sup>
  - 2.1. Density = 1.572 kg.m<sup>-3</sup>
  - 2.2. Specific heat at constant pressure = 1.0065 kJ.kg<sup>-1</sup>.K<sup>-1</sup>
  - 2.3. Dynamic viscosity = 1.8774\*10<sup>-5</sup> kg.m<sup>-1</sup>.s<sup>-1</sup>
  - 2.4. Kinematic viscosity = 1.6224\*10<sup>-5</sup> m<sup>2</sup>.s<sup>-1</sup>
  - 2.5. Conductivity = 0.026489 W.m<sup>-1</sup>.K<sup>-1</sup>
  - 2.6. Prandtl number = 0.71341
  - 2.7. Thermal diffusivity = 2.274\*10<sup>-5</sup> m<sup>2</sup>.s<sup>-1</sup>
  - 2.8. Thermal expansion co-efficient = 3.2771\*10<sup>-3</sup> K<sup>-1</sup>
3. Specific heat of Ice = 2.05 kJ.kg<sup>-1</sup>.K<sup>-1</sup>
4. Volume flow rate of supply air = 630 Cmpm
5. Flow velocity of supply air = 150 mpm
6. Mechanical properties of Ice and Pykrete

**Table 1**

Mechanical Property	Ice	Pykrete
Melting Point (°C)	0	9
Steady State Temperature (°C)	-0.3 to 0	12
Steady state temp. Under controlled environment (°C)	-3 to 0	8
Density (kgm <sup>-3</sup> )	910	980
Thermal Conductivity (W.m <sup>-1</sup> .K <sup>-1</sup> )	2.18	0.48

## References

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