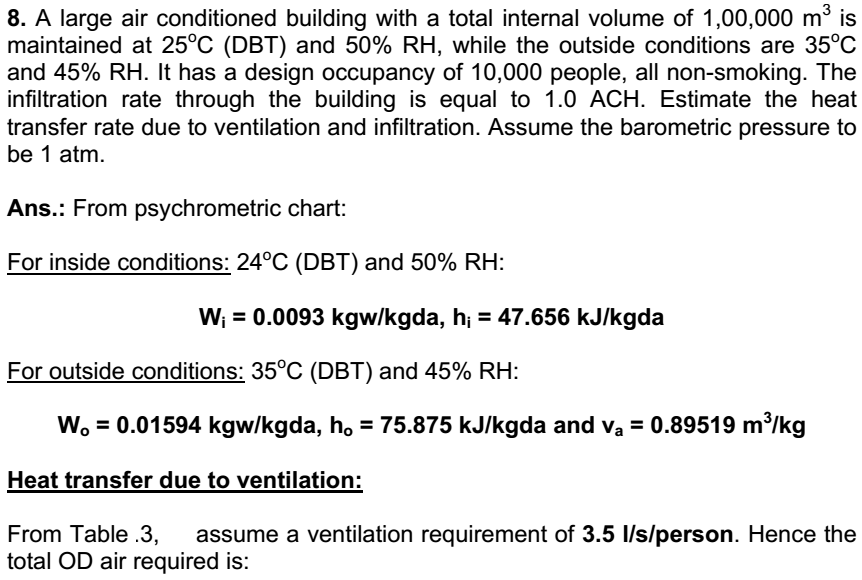
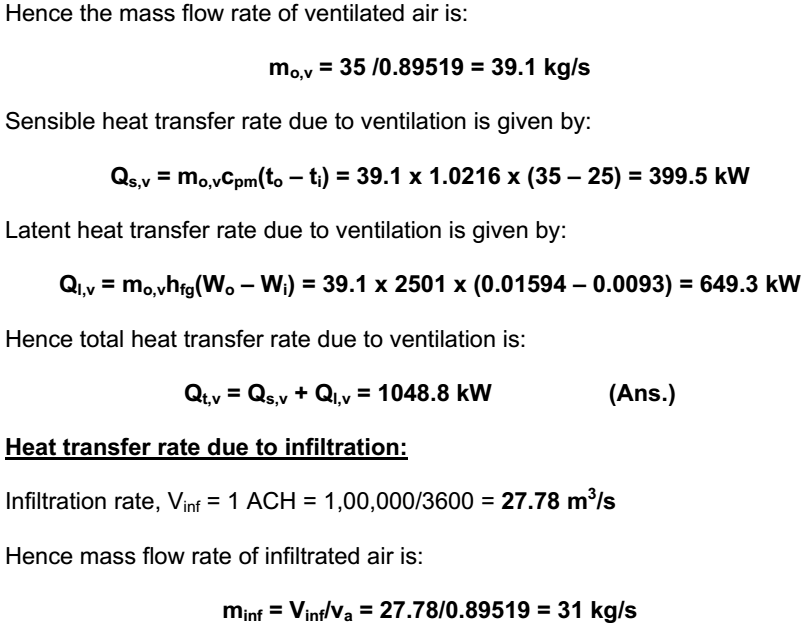
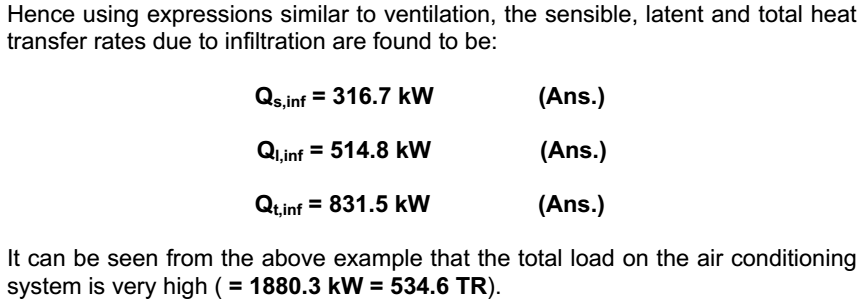


Q = UA (CLTD) CORR. =









**9. Compute the heat gain from a window facing South at 32o latitude north at: 1200, 1400, 1600, on August 21st. The widow is heat resisted double glazed with 13 mm air space and without internal shading. Total area of the window is 9.29 m2. The indoor design temperature is 25.5 oC and the outside temperature is 32.2 oC with 11.1 oC daily change rate. Building construction is medium. The overall heat transfer coefficient is 3.46 W/m2.C.**

**Ans.:**

**The instantaneous heat rate through fenestration with shading is given by:**

**q = [ (SHG)max (SC) (CLF) + U (CLTD)Corr. ] A**

**i – let us calculate first thermal conduction: U (CLTD)**

**by using AHRAE tables for (CLTD), then the correction by using the equation:**

**(CLTD)Corr. = CLTD + ( 25.5 – TR ) + ( To – 29.4 )**

**Daily change rate = Tmax – Tmin = 11.1**

|  |  |  |  |
| --- | --- | --- | --- |
| **Time** | **CLTD** | **(CLTD)C** | **q = UA(CLTD)C** |
| **1200** | **5** | **2.25** | **96.2** |
| **1400** | **7** | **4.25** | **181.6** |
| **1600** | **8** | **5.25** | **224.4** |

**ii – Solar heat gain:**

**q s = A (SHG)max (SC) (CLF)**

**(SHG)max, SC, and CLF are found from tables as:**

**(SHG)max = 350 W/m2 (SC) = 0.83**

**CLF: at 1200 = 0.52, 1400 = 0.58, 1600 = 0.47**

|  |  |
| --- | --- |
| **Time** | **q s = A (SHG)max (SC) (CLF)** |
| **1200** | **1369.5** |
| **1400** | **1527.5** |
| **1600** | **1237.8** |

**iii – The total heat gain through the widow is the sum of solar and conduction heat transfer:**

|  |  |
| --- | --- |
| **Time** | **qT = qC + qs** |
| **1200** | **1465.7** |
| **1400** | **1709.1** |
| **1600** | **1462.2** |

**10. Compute the total heat gain for a window facing west, having the same location and design condition of the window in problem (9), but with single clear glass of 6 mm thick, with light color venetian blind internal shading, and its overall heat transfer coefficient = 4.6 W/ m2.C.**

**Ans. :**

**i – Conduction heat transmission: qC = UA (CLTD)C**

**U = 4.6 W/m2.C given**

**A = 9.29 m2 given**

**From ASHRAE tables: CLTD are found for the times stated same as in problem 9. The correction of CLTD for windows is according to:**

**(CLTD)Corr. = CLTD + ( 25.5 – TR ) + ( To – 29.4 )**

**TR & TO are the same as in prob.9**

|  |  |  |  |
| --- | --- | --- | --- |
| **Time** | **CLTD** | **(CLTD)C** | **qC = UA(CLTD)C** |
| **1200** | **5** | **2.25** | **72.3** |
| **1400** | **7** | **4.25** | **136.6** |
| **1600** | **8** | **5.25** | **168.8** |

**ii – Solar heat gain:**

**From tables: (SHG) max = 691 W/m2.**

|  |  |
| --- | --- |
| **Time** | **CLF** |
| **1200** | **0.17** |
| **1400** | **0.53** |
| **1600** | **0.82** |

**CLF is:**

**SC = 0.67**

**The solar heat gain:**

|  |  |
| --- | --- |
| **Time** | **q s = A (SHG)max (SC) (CLF)** |
| **1200** | **600** |
| **1400** | **1871** |
| **1600** | **2895** |

|  |  |
| --- | --- |
| **Time** | **qT = qC + qs** |
| **1200** | **672.3** |
| **1400** | **2007.6** |
| **1600** | **3063.8** |

**Total heat gain qT = qC + qS**