

## **Effect of Courtyard on Thermal Performance of Commercial Buildings in Hot-Dry Climate, Ahmedabad, India**

### **Abstract**

Energy Efficiency in buildings is becoming an important concern to the building designers. Commercial buildings consume a huge amount of energy in heating, cooling and lighting of the building spaces, hence there is a need to find effective design measures to develop energy efficient buildings. Courtyard is a traditional design measure which can be used in reducing energy consumption of buildings. Many research studies suggest that courtyard as a climatic modifier helps in improving thermal environment and enhancing daylight deep into the interior thus reducing energy consumption of the building. The current urban development plans in India are also trying to integrate courtyards in the design of buildings. However what would be the effect of incorporating courtyards in the energy consumption of commercial buildings, also to what extent would courtyards help within the limitations of building bylaws and varying site proportions of new master plans in Indian cities. The study focuses on the effect of courtyard form with different proportions, wall to window ratio (WWR) and overhangs on the energy consumption of the commercial buildings. The hypothetical model of courtyard building configurations depends on available urban schemes (Site Proportions) and building bylaws (Setbacks, Ground Coverage and Floor Area Ratio). For varying building heights, different hypothetical building configurations have been derived. After developing the hypothetical models various WWR and overhangs have been applied to understand the thermal performance of the building model. This study also helps to understand the barriers of courtyard building configurations to its maximum potential for new commercial architecture in hot-dry climate of India. This entire exercise has been carried out using validated Building Simulation program. The formulation of the simulation exercise has been established on the available weather data. The result would be the analysis of energy performance of different building models.

**Keywords:** Courtyards, Building Configuration, Energy Consumption, Thermal Simulation, Computer Modeling.