THE LOADS AND STRUCTURES COMPONENT LIBRARY (GENERAL DESCRIPTIONS)

Library of Building Templates

This set of buildings is based on research carried out at the Pacific Northwest Laboratory (PNL). The United States office building stock was categorized using a statistically valid sample of the nation's office building sector known as the Commercial Building Energy Consumption Survey (CBECS) [EIA 1986, 1989]. The categories were developed using a statistical technique known as cluster analysis based on attributes such as size, age and location. Twenty buildings representing the existing building stock as of 1979 were described by Briggs et al (1987) and five buildings representing expected construction between 1980 and 1995 were described by Crawley et al (1992). The resulting twenty five buildings were entered into TRNBuild and include template TRNSYS Studio projects including schedules for occupancy, lighting, equipment, heating and cooling set points.

Type660: MULTI ZONE LUMPED CAPACITANCE BUILDING

This subroutine models the temperature and humidity level of a simple building zone subject to infiltration effects, ventilation effects, skin losses, internal heat and mass gains, and conductive and convective exchanges with adjacent zones. The model uses two differential equations to solve for the heat and mass balances at each time step. This model is unique in that the user may operate the building in one of two unique control modes. In the first mode, the user controls the temperature and humidity of the zone externally through the control of the ventilation flow stream. This method of control is termed temperature level control and requires that the user typically set the available heating, cooling, humidifying and dehumidifying capacities to zero.

In the second mode, the temperature and humidity are ideally controlled inside the model to maintain user specified set points. The model then outputs the energies that were required to maintain these set points. This method of control is often termed energy rate control. See the discussion on energy rate control in the main TRNSYS manual for more details about this topic.

Type682: LOAD IMPOSED ON A LIQUID STREAM

Often in simulating an HVAC system, the heating and cooling loads on the building have already been determined, either by measurement or through the use of another simulation program and yet the simulation task at hand is to simulate the effect of these loads upon the system. This component allows for there to be an interaction between such precalculated loads and the HVAC system by imposing the load upon a liquid flowing through a pipe.

Type686: SYNTHETIC BUILDING LOADS GENERATOR

This component will generate hourly heating and cooling loads for a synthetic building based on user-defined peak heating and cooling loads and modifying sine-wave functions used to account for seasonal variations, time-of-day variations and weekday/weekend differences. The user may also have the model generate some random noise on both an hourly basis and a daily basis to more realistically model real building loads. This component is an excellent first choice for simulations requiring heating and cooling loads for commercial, industrial, and residential buildings. The model represents a quick method of providing realistic loads without the time-intensive modeling required of a real building.

Type687: NATIONAL FENESTRATION RATING COUNCIL (NFRC) WINDOW

The Type687 model calculates the amount of solar energy and illumination transmitted through a window given only the basic information available on the National Fenestration Rating Council label of any window commercially available in the United States.

Type690: ENERGY RATE LOADS CONVERSION

This component models a single node lumped capacitance using a differential equation. It then takes inputs of heating load, sensible and latent cooling load (which may have been generated by some other simulation program such as DOE-2) and, using knowledge of the lump capacitance, turns those loads into a modulating temperature. The component also has inputs for the conditions of ventilation streams, which may be conditioned to control the modulating temperature. Type690 is quite a useful component for those seeking to model new HVAC systems for buildings whose heating and cooling loads have already been simulated by other parties, perhaps not using TRNSYS.

Type693: LOAD IMPOSED ON AN AIR STREAM

Often in simulating an HVAC system, the heating and cooling loads on the building have already been determined, either by measurement or through the use of another simulation program. This component allows for there to be an interaction between such precalculated loads and the HVAC system by imposing them upon air flowing through a duct.

Type759: LUMPED CAPACITANCE MULTIZONE BUILDING WITH NO CONTROLS

This subroutine models the temperature and humidity level of a simple building zone subject to infiltration effects, ventilation effects, skin losses, internal heat and mass gains, and conductive and convective exchanges with adjacent zones. The model uses two differential equations to solve for the heat and mass balances at each time step. The zone temperature and humidity are controlled externally through the conditioning of a ventilation flow stream.