

# MECHANICAL CODE DISCUSSION

## Infiltration and Ventilation Air — Impact on Load Calculation



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THIS CODE DISCUSSION IS THE fifth in a series on the code requirements to design a residential HVAC system in accordance with ACCA Manuals J, D, and S.

The focus this issue is the importance to accurately identify the additional load placed on an HVAC system by infiltration and ventilation air. Let's start by re-visiting a couple of definitions in past discussions.

#### Definitions:

#### INFILTRATION.

*Uncontrolled inward air leakage to conditioned spaces through unintentional openings in ceilings, floors and walls from unconditioned spaces or the outdoors caused by pressure differences across these openings resulting from wind, the stack effect created by temperature differences between indoors and outdoors, and imbalances between supply and exhaust airflow rates.*

#### VENTILATION.

*The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, any space.*

#### VENTILATION AIR.

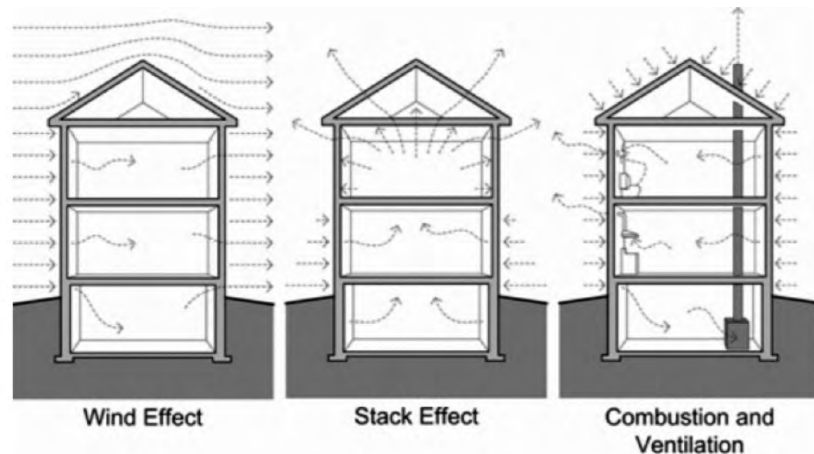
*That portion of supply air that comes*

*from the outside (outdoors), plus any recirculated air that has been treated to maintain the desired quality of air within a designated space.*

The key concept in this discussion is the load calculation for every building

to conduction through building components increase with temperature extremes.

It's relatively easy to identify the quantity or CFM of air introduced through ventilation, as we can calculate and measure the volume introduced by



includes either the *unintentional* or *intentional* introduction of outside air into the building envelope. We heat and cool our buildings for comfort, simply because we want our homes warmer than outside in the winter, and cooler in the summer.

As the cold or hot air enters our building through infiltration or ventilation, additional heating and cooling loads are added to the total loads. These loads increase with outside temperature extremes, just as loads due

an outside air intake. It's a little harder to accurately identify the volume of air leaking into and out of a building.

#### Default Air Change Values

Manual J includes Tables 5A & 5B, which help us make an educated guess for the infiltration rate in a home. The Tables includes a description for a Tight, Average and Loose home, based on air sealing practices followed during the construction process and subsequent improvements.

For example, a **Tight** home has all

seams, joints, penetrations sealed by meticulous craftsmanship, includes tight fitting backdraft dampers on all exhaust, includes only direct vent gas appliance, and sealed fireplaces.

An **Average** home includes homes where reasonable efforts have been made to seal the building envelope, with typical inexpensive backdraft dampers and combustion appliances draw air from inside the home.

A **Loose** home is the opposite, with no effort to seal, and combustion appliances and fireplaces open to the interior of the home.

Table 5A & 5B, recognizing there are many homes which fall somewhere in

between the three described conditions, includes **Semi-tight**, where conditions are approximately between *Tight* and *Average*, and **Semi-Loose**, where conditions are approximately between *Average* and *Loose*. The typical home built today is *Semi-tight*;

*“The typical home built today is Semi-tight”*

however, *Tight* homes are occasionally built. Once we’ve identified the default construction ID for a home, the Table provides an *Air Changes per Hour (ACH)* value, for heating and cooling, and for homes of various volumes.

This default method is only one of several methods which may be used to determine the ACH due to infiltration.

An analysis of individual components described in Tables 5C & 5D requires additional time and effort, for possibly improved accuracy. Finally, for multiple homes built by the same construction teams, blower door testing may be used to verify and fine tune the ACH for homes in a project.

Once we’ve identified the volume of air introduced into a home by infiltration and ventilation, these values are inputted into the Manual J process for the calculation of the required BTU’s per hour due to infiltration and ventilation.

*Please consider taking a little time to open your Manual J, and review this process, insuring your calculations accurately reflect the impact of outside air on the total building load. Thanks again for your input. —Brent ■*

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