LEED® for New Construction (NCv2.2) Rating System Guide for MCAA Contractors

Indoor Environmental Quality – Credit 2

MCAA Contractor Involvement - HIGH

One Point – Increased Ventilation

Intent

Provide additional outdoor air ventilation to improve indoor air quality for improved occupant comfort, well-being and productivity.

Requirements

FOR MECHANICALLY VENTILATED SPACES

- Increase breathing zone outdoor air ventilation rates to all occupied spaces by at least 30% above the minimum rates required by ASHRAE Standard 62.1-2004 as determined by EQ Prerequisite 1.

FOR NATURALLY VENTILATED SPACES

Design natural ventilation systems for occupied spaces to meet the recommendations set forth in the Carbon Trust "Good Practice Guide 237" [1998]. Determine that natural ventilation is an effective strategy for the project by following the flow diagram process shown in Figure 1.18 of
the Chartered Institution of Building Services Engineers (CIBSE) Applications Manual 10: 2005, Natural ventilation in non-domestic buildings.

AND

- Use diagrams and calculations to show that the design of the natural ventilation systems meets the recommendations set forth in the CIBSE Applications Manual 10: 2005, Natural ventilation in non-domestic buildings.

OR

- Use a macroscopic, multi-zone, analytic model to predict that room-by-room airflows will effectively naturally ventilate, defined as providing the minimum ventilation rates required by ASHRAE 62.1-2004 Chapter 6, for at least 90% of occupied spaces.

Potential Technologies & Strategies

Design ventilation systems to exceed the minimum outdoor air ventilation rates as described in the ASHRAE standard by 30%. Balance the impacts of ventilation rates on energy use and indoor air quality to optimize for energy efficiency and occupant health. Use the ASHRAE 62 Users Manual for detailed guidance on meeting the referenced requirements.

How MCAA Contractors Can Impact This Credit
This standard focuses on the ventilation requirements of buildings and does not include thermal comfort requirements. There are three methods for ventilating buildings:

1) Active Ventilation (Mechanical)
2) Passive Ventilation (Natural)
3) Mixed-Mode Ventilation (Combined)

For mechanical contractors, the focus for this credit is on active and mixed mode ventilation. The standard that applies to active ventilation is ASHRAE 62.1-2004.

ASHRAE 62.1-2004
This credit requires that you exceed ASHRAE 62.1-2004 requirements by 30%. For mechanically ventilated systems, section six contains procedures for determining required ventilation rates. Two procedures can be used to determine that the credit has been met, the ventilation rate procedure (6.2) and the IAQ procedure (6.3). The ventilation rate procedure is the more common method for meeting this credit. For a preview of ASHRAE 62.1-2004, visit ASHRAE's website.

Ventilation Rate Procedure – Section 6.2
The ventilation rate procedure breaks a building into zones to determine if each zone meets breathing zone outdoor airflow requirements. To meet this credit, systems must demonstrate that **Delivered Minimum Zone Outdoor Airflow** (V_{oz}) for each zone and the **Outdoor Air Intake Flow (V_{ot})** for the system exceed ASHRAE 62.1-2004 by 30%.

Determination of these two figures takes multiple calculations. Although the LEED online template does not require the calculations to be completed for this requirement, a narrative must be included. If your company does not already have a spreadsheet to determine the minimum zone outdoor airflow or the outdoor air intake, ASHRAE provides a user's manual that includes an excel spreadsheet to perform all of the necessary calculations. To order the user's manual or download online, visit ASHRAE's bookstore located on their website.

The first step in the calculations is to determine the rate of breathing zone outdoor airflow (V_{bz}) of each zone to ensure that each complies with the minimum requirements. The calculation for the Breathing Zone Outdoor Airflow is:

$$\mathbf{V_{bz} = (R_p)(P_z) + (R_a)(A_z)}$$

Where:
V_{bz} = Breathing Zone Outdoor Airflow
R_p = Outdoor airflow rate required per person (Using Table 6-1 from ASHRAE 62.1)
P_z = Zone Populations (Largest number of people to typically occupy zone)
R_a = Outdoor airflow rate required per unit area (Using Table 6-1 from ASHRAE 62.1)
A_z = Zone floor area (Net occupiable floor area)

After the breathing zone outdoor airflow is calculated, it must be adjusted with the zone air distribution effectiveness to determine the required zone outdoor airflow (V_{oz}). The zone outdoor airflow calculation is:

$V_{oz} = V_{bz} / E_z$

Where:
V_{OZ} = Zone Outdoor Airflow
V_{bz} = Breathing Zone Outdoor Airflow
E_z = Zone Air Distribution Effectiveness (Found in Table 6-2 from ASHRAE 62.1)

In single zone systems, the Zone Outdoor Airflow = The Outdoor Air Intake Flow **($V_{oz} = V_{ot}$)**

In multiple zone systems, the zone outdoor air intake flow requires the following calculation:

$V_{ot} = V_{ou} / E_v$
Where:
V_{ot} = Zone Outdoor Air Intake Flow
V_{ou} = Uncorrected Outdoor Intake
E_V = System Ventilation efficiency (Using Table 6-3 from ASHRAE 62.1)

Finally, the design can determine if the project meets the required ASHRAE 62.1. In most cases, determining these calculations is a standard part of doing business with little added in the process. However, documenting the calculations to LEED standards takes time and money. Developing templates for documentation can significantly decrease this added cost, but accounting for these additional soft costs will be higher in the beginning.

Considerations
This credit is often only achieved in gold and platinum buildings. Although there are studies regarding the positive effects of increased ventilation, exceeding ASHRAE standards by 30% may lead to oversizing the system and decreasing its efficiency. Achieving a 30% increase over ASHRAE 62.1-2004 will increase energy costs and negatively impact energy performance. It might be asked why anyone would opt for a ventilation system that negatively affects a building's energy performance. This system is typically used in buildings that have a need for increased ventilation like hospitals, health clubs, gymnasiums detoxification facilities, morgues and any building that requires more air to remove odors.

Synergies Available
EA credit 1 – Optimize Energy Performance
EQ prerequisite 1 – Minimum IAQ Performance
EQ credit 1 – Outdoor Air Delivery Monitoring
EQ credit 3 – Construction IAQ Management

Primary Responsible Parties
The mechanical engineer is the primary responsible party for this credit.