Course: IHAO8A

Sustainable Building Standards and Automatic Entrances

An American Institute of Architects Educational Program

Credit for this course is 1 AIA/CES HSW/ SD Learning Unit

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Introduction

Today's building industry has a heightened awareness and sensitivity to the impact buildings have on the environment. The rush is on to integrate these concerns into building standards for new construction.

The following is designed to explain how these standards can be applied to the automatic door industry

Introduction

Describe the Differences between "Sustainable Design", "Green" and "Sustainable Building Standards"

- In the most basic terms, "sustainable design" refers to how a building is constructed and performs, and "green" refers to the materials used. "Sustainable building standards" are any standard or rating system that seeks to promote sustainable design and/or green.
- The following is a review of how an automatic door entrance may be able to help a building achieve rating points:

REVISE

earning Objectives

By the end of this presentation, the designer will be able to:

- Specify an an automatic entrance that can contribute to a sustainable building rating system.
- Understand “green” manufacturing processes & methods related to the industry.
- Understand how an automatic entrance can contribute towards a more environmentally sound structure.

LEED™ (Leadership in Energy and Environmental Design)

Established by the United States Green Building Council (USGBC), LEED is by far the most widely accepted standard used to establish a sustainability rating for buildings. Currently, there are six LEED rating systems:

- LEED for New Construction and Major Renovations
- LEED for Existing Buildings
- LEED for Commercial Interiors
- LEED for Core & Shell
- LEED for Homes
- LEED for Neighborhood Development.

LEED for New Construction and Major Renovations (NC) Version 3.0 – 2009 is the one that applies to the automatic door industry.

LEED Details

The LEED NC rating system awards points in a number of categories including:

- Sustainable Sites (26 possible points)
- Water Efficiency (10 possible points)
- Energy & Atmosphere (35 possible points)
- Materials & Resources (14 possible points)
- Indoor Environmental Quality (15 possible points)
- Innovation & Design Process (6 possible points)

A facility's LEED rating is based on the overall number of points accrued:

- 40-49 points for Certified
- 50-59 for Silver
- 60-79 for Gold
- 80 & above for Platinum

LEED Ratings and Automatic Doors

The sections where automatic door manufacturers may be able to help a facility gain points are:

- Materials & Resources
- Energy & Atmosphere
- Indoor Environmental Quality
- Innovation & Design Process

Materials & Resources (MR)

Goals

- Reduce the amount of materials needed
- Use materials with less environmental impact

The Materials & Resources section contains one applicable opportunity to contribute points: Recycled Content.

Recycled Content

- **A facility can earn a maximum of two points** if up to 20% of the total value of materials used in the project (including packaging) incorporate recycled material. The recycled content value of the material assembly is determined by weight. The recycled percentage is multiplied by the sale price to the end user
- There are two types of recycled content: pre-consumer and post-consumer:
  - Pre-consumer content means that the scraps and materials that are leftover from the manufacturing process are reused in some way. Typically, this content is less environmentally beneficial since it indirectly encourages inefficient manufacturing processes that produce waste.
  - Post-consumer recycled content means material that, after going through its service life, can be disassembled, recycled or safely disposed of without adverse impacts on water, soil, or air.

Recycled Aluminum

- Aluminum billet containing a significant percentage of recycled content results in extrusions with an inferior surface finish that does not meet the aesthetic requirements of the architectural community or the quality expectations of the customer.
- Hence, 100% primary material (billet) is preferred *even though it's use contributes no points*. Points can be earned, however, by cladding the aluminum surface with steel.

Recycled Steel

- Most steel doors and frames are made with some quantity of recycled material, but the exact amount of reclaimed metal will vary greatly depending on how the steel was produced.
- A preferred production process by door and frame manufacturers is the electric arc furnace process by which scrap metal is melted by electrical current in an electric arc furnace and turned into steel.
- Instead of mining the earth to feed its furnaces, mini-mills mine junkyards for old cars and scrap metal. Mini-mill operators estimate that 20 doors can be produced from the steel of one scrapped car.
- In addition, 5,400 BTUs of energy are conserved for every pound of steel recycled. With recycled content totaling around 64% of the product weight, steel doors, frames and cladding material produced by this method exceed the levels targeted by green building standards for recycled content.

Packaging

Most products are shipped in environmentally friendly recycled cardboard (OCC) that can be further recycled or reused to reduce the amount of waste routed to landfills.

LEED™ MR – Recycled Content Credit

Questions to ask

- Are the automatic and/or manual sliding, swinging, folding or revolving doors made from recycled content (aluminum and/or steel)?
- If so, what percentage % is Pre-consumer content and/or Post-consumer content (preferred)? (% based on weight)
- *20% is required to contribute the maximum 2 points. Specifying steel cladding for the aluminum door will exceed minimum requirements.*

Note: A facility can earn an additional "Exemplary Performance" credit if 30% or more of the total value of materials used in the project incorporate recycled material.

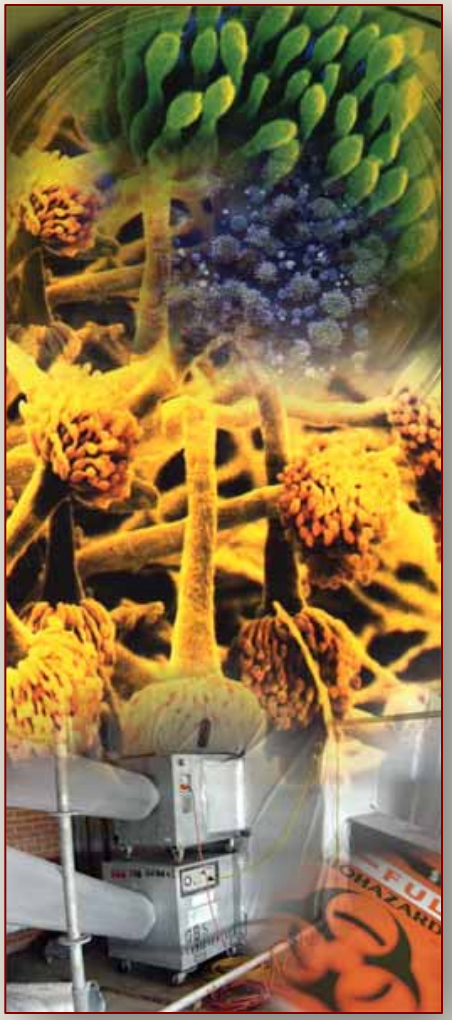
The credit applies to the Innovation & Design Process category ID 1.1.

LEED™ EQ - Indoor Environmental Quality Credit

LEED™ Goals

- Establish good indoor air quality
- Eliminate, reduce, manage the sources of indoor pollutants
- Ensure thermal comfort and system controllability
- Provide for occupant connection to the outdoor environment

- The Indoor Environmental Quality section contains one opportunity for door manufacturers to contribute points: Low-Emitting Materials – Paints & Coatings.



Low-Emitting Materials: Paints & Coatings

A door manufacturer can contribute toward LEED EQ if:

- Anti-corrosive and anti-rust paints applied to interior/exterior metal do not exceed the Volatile Organic Compounds (VOC) content limits of 250 g/L established in Green Seal Standard GC-03, Anti-Corrosive Paints, Second Edition January 7, 1997.
  - Powder coatings are preferred over liquid paint because they incorporate raw materials free of VOC and Hazardous Air

- Aluminum extrusions are anodized. This eliminates the need for painting. They do not contain or produce a significant level of VOC's.

Powder Coat Process

- Powder coating is a type of dry coating, which is applied as a free-flowing, dry powder. The main difference between a conventional liquid paint and a powder coating is that the powder coating does not require a solvent to keep the binder and filler parts in a liquid suspension form.
- The coating is typically applied and then heated to allow it to flow and form an exterior layer tougher than conventional paint.
- Powdered resins along with colored pigments are applied to metal products using an Electro-static charge. The product is then "baked" in a high temperature oven causing the powder to melt, flow, and then cure, forming a molecular fusion bond.
- As with solvent based paints, thermosetting powders can be formulated to produce high and low gloss decorative coatings, metallic, as well as textured & hammered finishes.

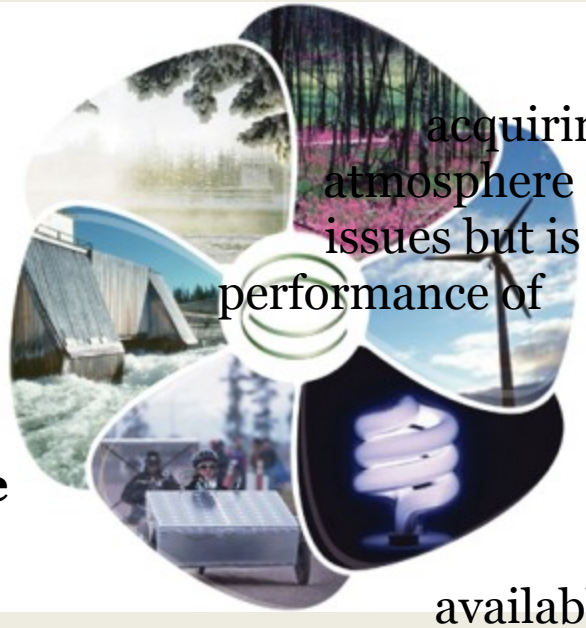
Powder Coat Additional Benefits

- The manufacturing process does not generate any airborne contaminants.
- The powder manufacturing equipment is cleaned utilizing water as the primary cleaning agent.
- The sludge is removed from the waste water before it is discharged into the city sewer system.
- The use of volatile organic solvents to clean the equipment is eliminated.
- Architectural grade powder is designed to be applied and cured in a process that requires ~20% less energy than comparable liquid products.

Energy & Atmosphere (EA)

The Energy and Atmosphere (EA) performance category accounts for 17 of the total 69 LEED credits.

Achieving higher levels of LEED certification (Gold and Platinum) is difficult without acquiring credits in this area. The energy and atmosphere category deals with a number of issues but is primarily focused on the energy performance of buildings.



EA Credit 1: Optimize Energy Performance

Credit EA I provides points for achieving greater levels of energy efficiency. A total of 10 points are available under this credit, the largest number of any LEED credit. To demonstrate compliance with EA credit 1 energy simulation software is used to model energy performance.

Revolving doors can make a significant contribution to energy reduction strategies.

How Does Using a Revolving Door Save Energy?

- Air flows in and out of a building because of differences in air pressure.
- In the winter, heated air rises toward the top of a building, and cold air rushes in to replace it. The opposite happens in the summer - cold air flows out the front doors.
- Regular foot traffic in a large office building can result in air leaks of up to 30,000 cubic feet per minute.
- To minimizing unwanted air flow, a revolving creates a unique “always open, always closed” barrier. Every time the door spins, some air will leave the building and some will come in, but overall, much less passes.

A Solution in the Revolving Door

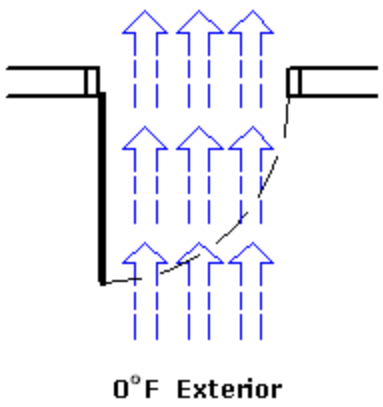
How do you allow people and things to move in and out of a building while minimizing unwanted air flow?

- The revolving door was presented as a solution for this age-old problem more than 100 years ago.
- The primary purpose, according to the original patent application—filed by one Theophilus Van Kannel of Philadelphia—was to prevent the "entrance of wind, snow, rain or dust."
- A revolving door isn't airtight, but the barrier it creates makes the impact of that air pressure differential less important. Every time the door spins, some air will leave the building and some will come in, but overall, much less passes.

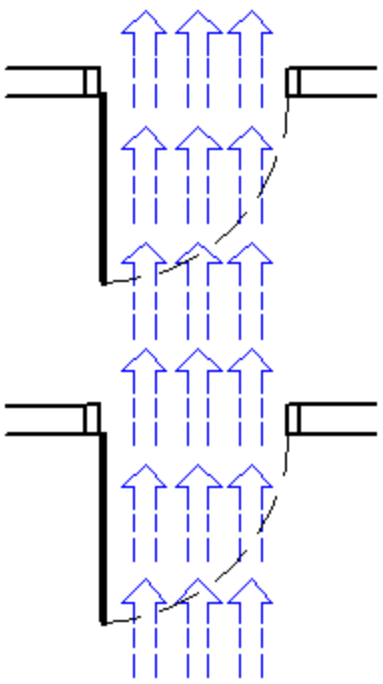
A Solution in the Revolving Door

AIR FILTRATION (WINTER) - SWING DOOR
Based On Passage of 500 Persons Per Hour

SINGLE SWING DOOR
Air Passage 900 Cu./Ft. Person



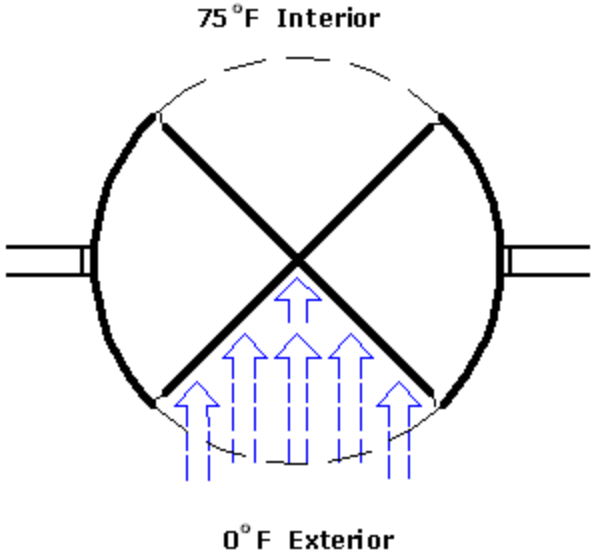
VESTIBULE ENTRANCE
Air Passage 550 Cu./Ft. Person



AIR FILTRATION (WINTER) - REVOLVING DOORS
Based On Passage of 1,000 Persons Per Hour

MANUAL REVOLVING
Air Passage 60 Cu./Ft. Person

POWER SECURITY
Air Passage 32 Cu./Ft. Person



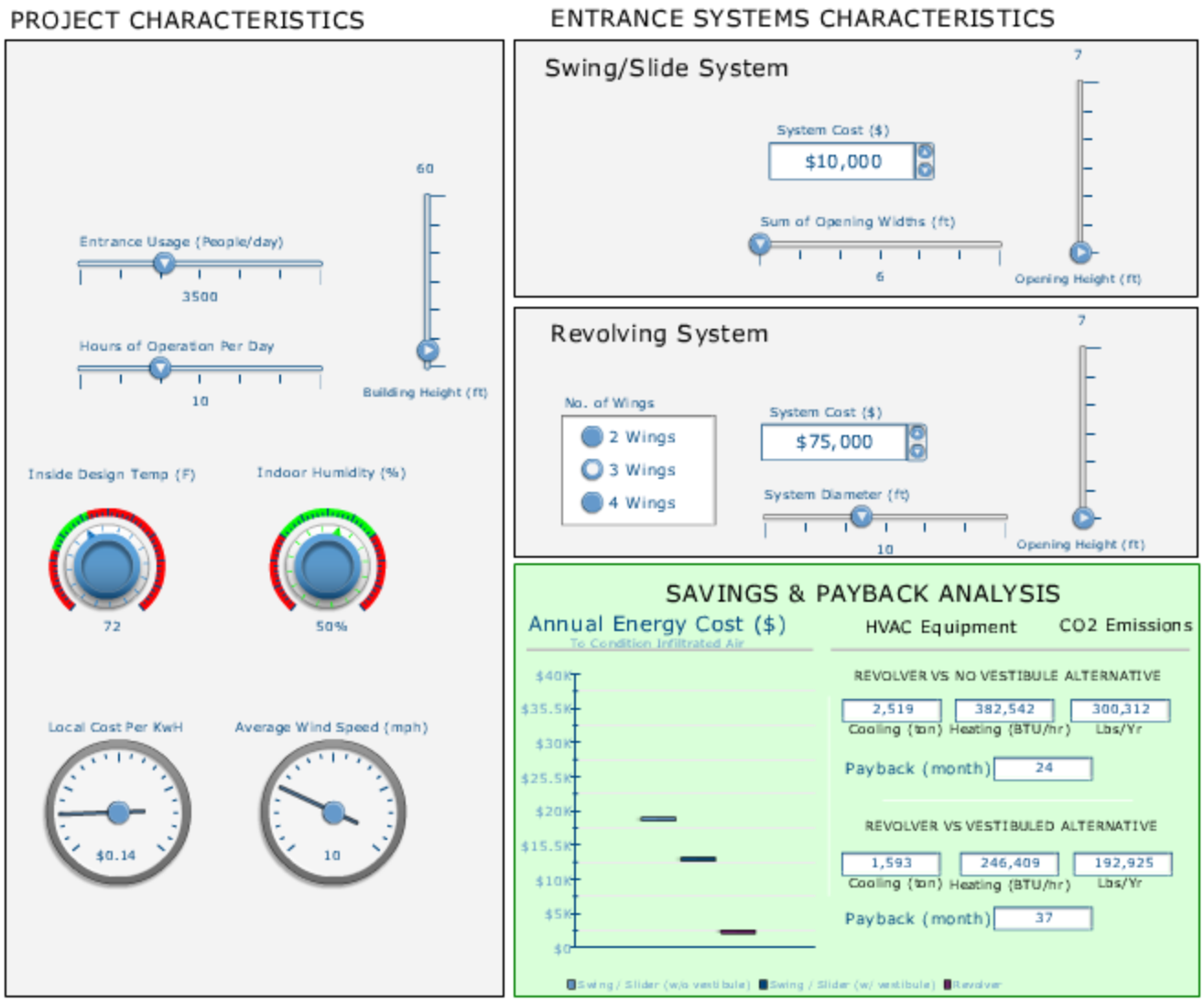
Do Revolving Doors Make a Difference?

How big a difference can using a revolving door make?

- In 2006, a team of graduate students at MIT conducted an analysis of door use in one building on campus, where they found just 23 percent of visitors used the revolving doors.
- According to their calculations, the swinging door allowed as much as eight times more air to pass through the building than the revolving door.

Revolving-door usage	50%	75%	100%
Saving of annual energy consumption	14.5%	38.7%	74.0%
# of houses the saved energy can heat in one year	1.0	2.7	5.1
# of years the saved energy can light a 100W bulb	5.8	15.3	29.0
Tons of CO_2 prevented	3.0	7.7	14.6

Energy, CO2 Savings and Payback Calculator



Saved Energy

- Applying average Boston weather to their equations, the MIT team found that if everyone used the revolving doors, it would save more than 75,000 kilowatt-hours of energy—about 1.5 percent of the total required to heat and cool the building—and prevent 14.6 tons of carbon dioxide from being emitted.
- By way of comparison, the EPA says an average American vehicle emits about six tons of carbon dioxide over a year.

No. of Large SUV Equivalent Co2 Savings/yr

Traffic in People Per Day

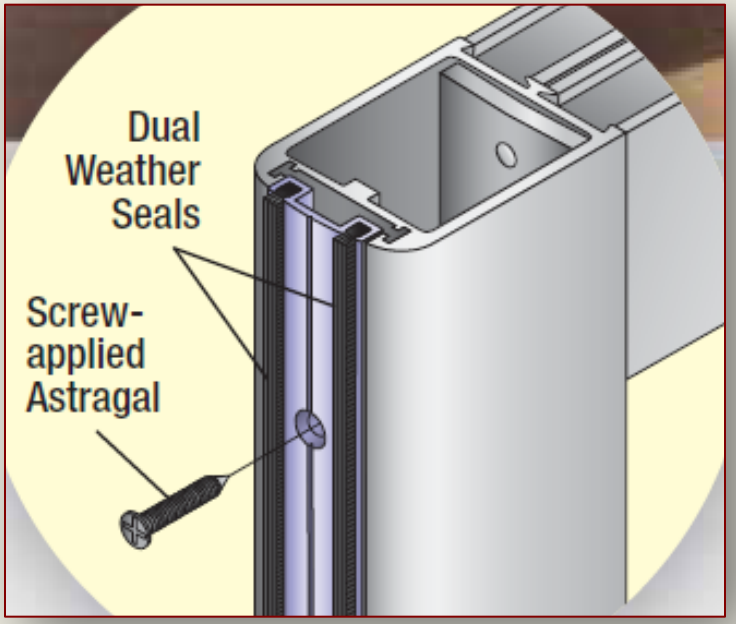
Wind Speed (mph)	12.20	10000	6500	6000	5500	5000	4500	4000	3500	3000	2500	2000
	32	56.1	50.6	48.6	46.2	43.6	40.6	37.3	33.8	29.9	25.7	21.2
	30	52.6	47.5	45.6	43.4	40.9	38.1	35.0	31.7	28.0	24.1	19.9
	28	49.0	44.3	42.6	40.5	38.2	35.6	32.8	29.6	26.2	22.5	18.6
	26	45.5	41.2	39.6	37.7	35.6	33.2	30.5	27.6	24.4	21.0	17.3
	24	42.0	38.1	36.6	34.9	32.9	30.7	28.2	25.5	22.6	19.4	16.0
	22	38.5	35.1	33.7	32.1	30.3	28.3	26.0	23.5	20.8	17.9	14.8
	20	35.1	32.1	30.8	29.4	27.7	25.8	23.8	21.5	19.1	16.4	13.5
	18	31.7	29.1	28.0	26.6	25.2	23.5	21.6	19.6	17.3	14.9	12.3
	16	28.4	26.2	25.2	24.0	22.6	21.1	19.5	17.6	15.6	13.4	11.1
	14	25.2	23.3	22.4	21.4	20.2	18.9	17.4	15.7	14.0	12.0	9.9
	12	22.1	20.5	19.8	18.9	17.8	16.7	15.4	13.9	12.3	10.6	8.8
	10	19.1	17.9	17.3	16.5	15.6	14.6	13.5	12.2	10.8	9.3	7.7
	8	16.4	15.5	15.0	14.3	13.5	12.7	11.7	10.6	9.4	8.1	6.7
	6	13.9	13.4	12.9	12.3	11.7	11.0	10.1	9.2	8.2	7.0	5.8
	4	11.9	11.6	11.2	10.8	10.2	9.6	8.8	8.0	7.1	6.2	5.1
	2	10.6	10.4	10.1	9.7	9.2	8.6	8.0	7.2	6.4	5.6	4.6

How Can Slide or Swing Doors Save Energy?

Manufacturing processes vary with regard to weather seals used on automatic doors. Typically, an astragal is a molding or strip whose purpose is to cover or close the gap between the edges of a pair of doors or jamb, thus, creating a weather seal. This strip is normally applied with adhesive.

How Can Slide or Swing Doors Save Energy?

- Some automatic door manufacturers provide double astragal weather seals at the strike edge of the door. The weather seal material is captured in an extruded aluminum astragal that is screw applied to the panel. This creates a positive weather-tight seal.
- Additionally, door panels can be glazed with insulated glass to further promote energy savings.



LEED™ and Energy

Question to ask

- Has an energy study been performed using the automatic entrance equipment?
- If so, what was the energy savings ratio?
- *An energy study resulting in 15% to 20% energy savings can contribute towards LEED certification (total points determined by the LEED accredited professional)*

Holistic Goals

- Adhering to green building standards requires a holistic approach to construction; all elements of the building, regardless of their size, should be scrutinized to determine how they can contribute towards a more environmentally sound structure.
- Automatic doors are examples of building components that, although small in the scope of the overall project, can be used to create buildings that are more environmentally sound.

Ensure Applicable Code Compliance

OBJECTIVE #3

Codes and Standards

In addition to addressing structural & environmental concerns, the automatic door equipment should also comply with local and national safety codes such as:

- AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):
  - ANSI Z97.1: Safety Glazing Materials Used in Buildings - Methods of Test.
  - ANSI A156.10: For Power Operated Pedestrian Doors; Sliding, Swing or Folding Door section.
  - ANSI A156.19: For Power Assist and Low Energy Power Operated Doors
  - ANSI.117.1: Accessible and Usable Buildings and Facilities
  - ANSI 156.27: Power and Manual Operated Revolving Pedestrian Doors

Codes and Standards

- AMERICANS WITH DISABILITIES ACT (ADA) 1990
- NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) 101: Code for Safety to Life from Fire in Buildings & Structures.

Questions?

This concludes the continuing education course.

The next 10 minutes will be focused on discussing the course material.