NFRC CMA Technical TG

CMA Methodology for products with Spacer-less Glazing-Cavities

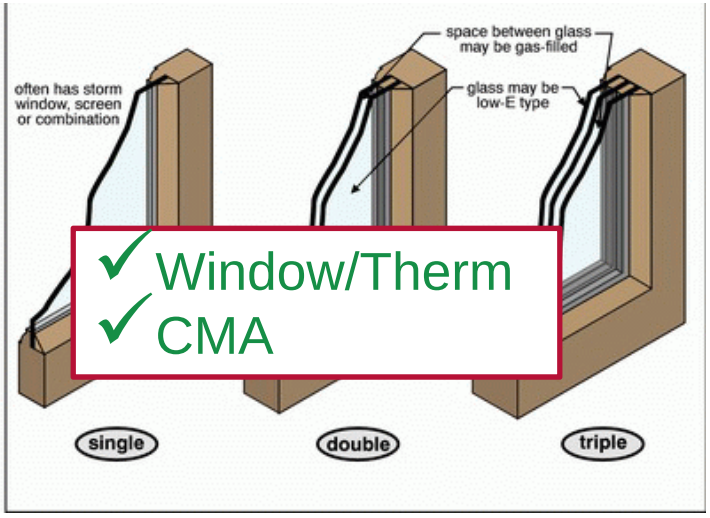
Sneh Kumar

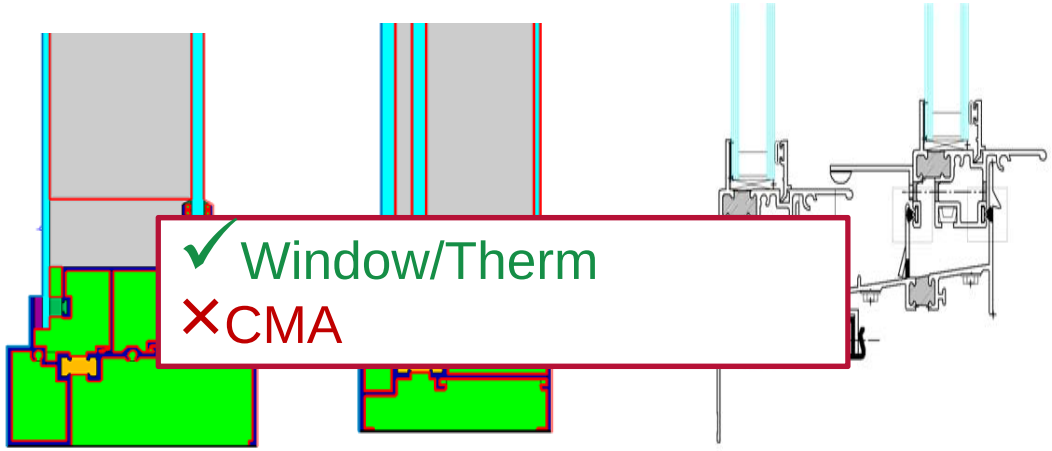
Sneh.kumar@alcoa.com

TRACO/Kawneer/Alcoa

Background

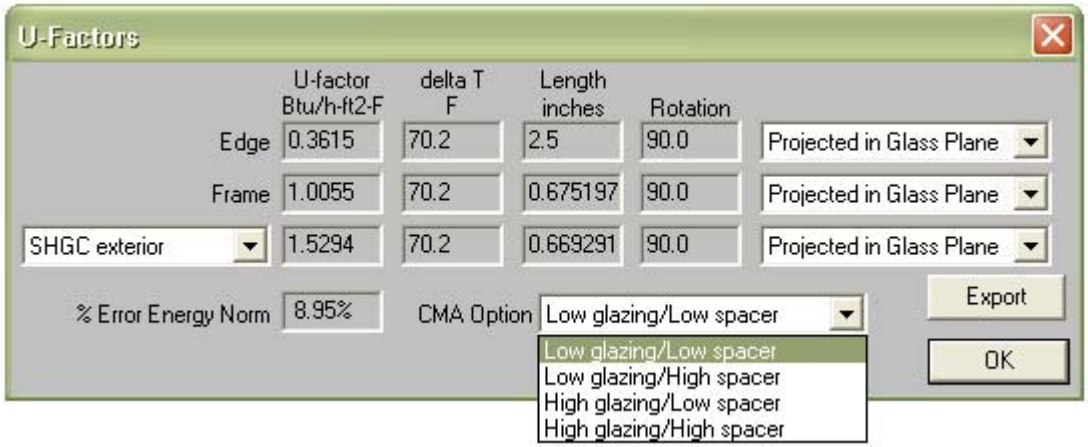
- CMA launched in 2010 for commercial fenestration products
- Expectation to move all existing commercial product certification to CMA certification
- Limitations of CMA
  - ~~Condensation resistance (CR)~~
  - CMA does calculation for IGU and single-glazed products but NOT for Products with spacer-less glazing cavities





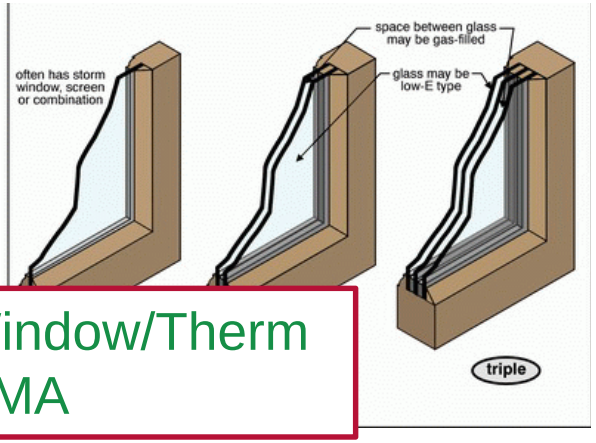
How CMA works

- Create High and Low (H/L) options for IGU and SESA (Spacer Edge seal assembly)
- http://nfrc.org/documents/NFRC100-2010_E0A5.pdf
  - Go to section NFRC 100 - **9.3 Standard Simulation and Testing**
- Get results for –
  1. Low Glazing + Low SESA
  2. Low Glazing + Hi SESA
  3. Hi Glazing + Hi SESA
  4. Hi Glazing + Low SESA



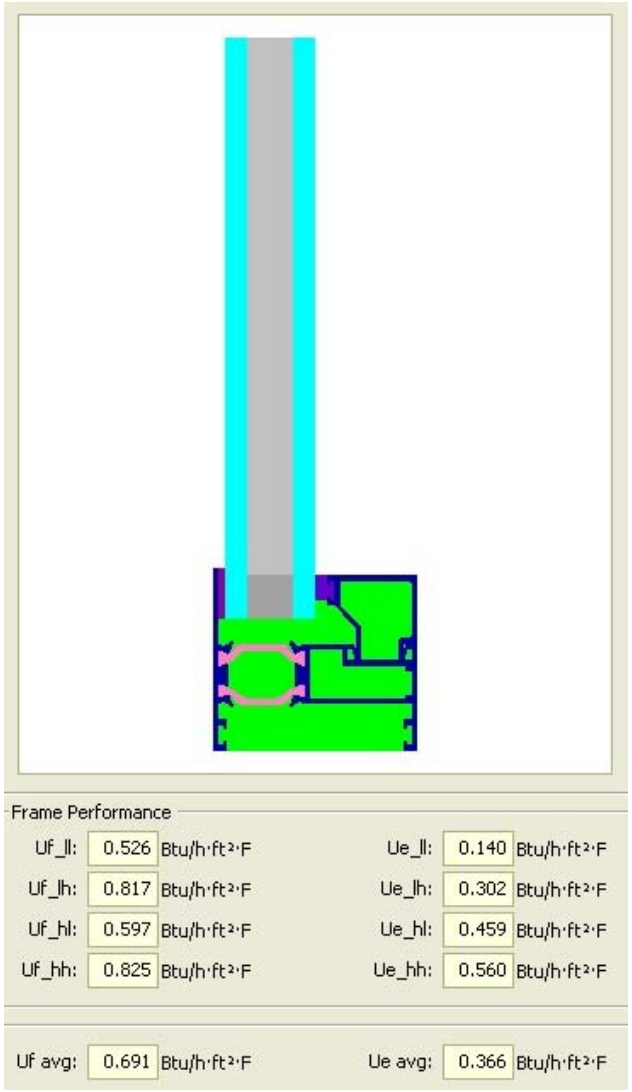
High/Low Glazing and Spacer

- Glazed products
  - Low Glazing – Double glazed, low-E, with the invented gas fill properties that produces R12.5 insulation value – Ucog = 0.45 W/m2-K (0.08 Btu/hr-ft2-F)
  - High glazing – Double glazed clear air - Ucog = 2.684 W/m2-K (0.473 Btu/hr-ft2-F)
- Single glazing:
  - Low Glazing – Low-E single glass, with low-E facing indoor side – Ucog = 3.24 W/m2-K (0.57 Btu/hr-ft2-F)
  - High glazing Ucog = 5.82 W/m2-K (1.03 Btu/hr-ft2-F)
- SESA
  - Low Spacer –keff = 0.01 W/m-K (0.006 Btu/hr-ft-F)
  - HighSpacer – keff = 10.0 W/(m-K) (5.8 Btu/hr-ft-F)



✓Window/Therm
✓CMA

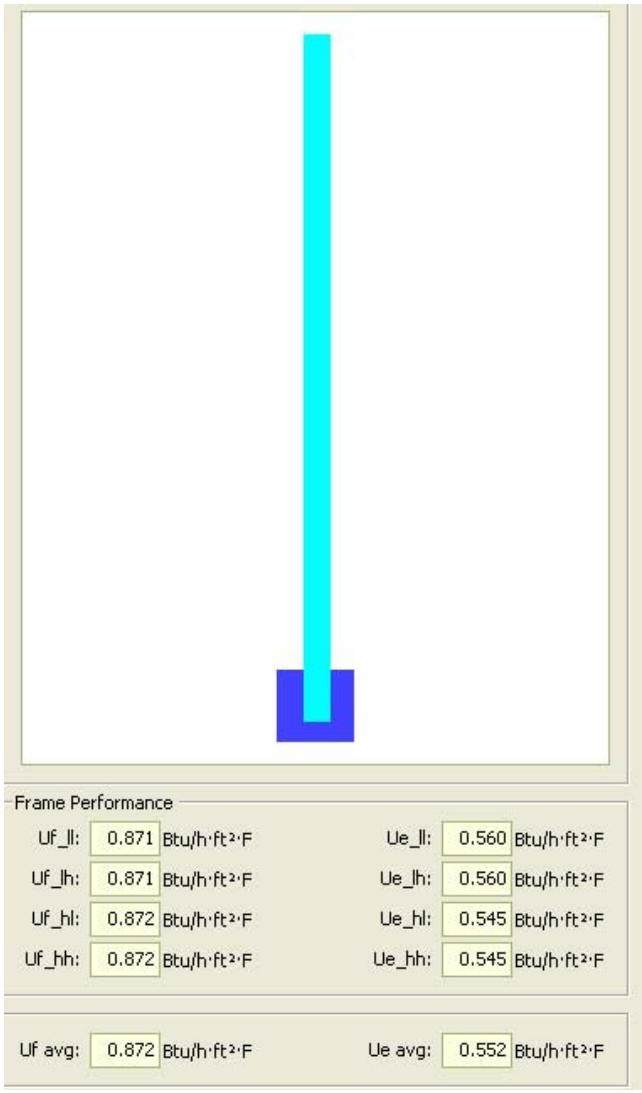
High-low options



Frame Performance

Uf_ll:	0.526	Btu/h·ft²·F	Ue_ll:	0.140	Btu/h·ft²·F
Uf_lh:	0.817	Btu/h·ft²·F	Ue_lh:	0.302	Btu/h·ft²·F
Uf_hl:	0.597	Btu/h·ft²·F	Ue_hl:	0.459	Btu/h·ft²·F
Uf_hh:	0.825	Btu/h·ft²·F	Ue_hh:	0.560	Btu/h·ft²·F

Uf avg:	0.691	Btu/h·ft²·F	Ue avg:	0.366	Btu/h·ft²·F



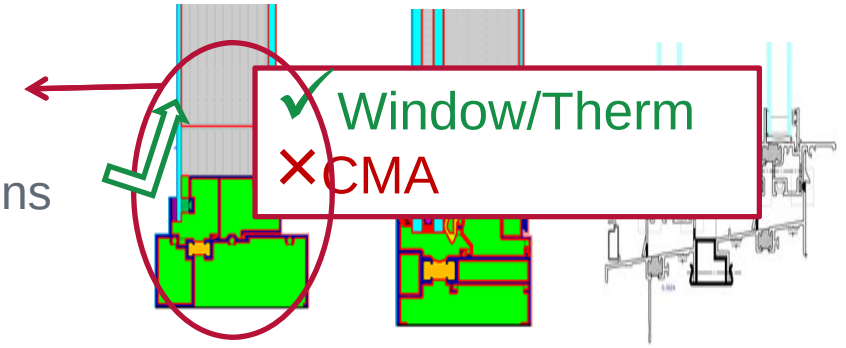
Frame Performance

Uf_ll:	0.871	Btu/h·ft²·F	Ue_ll:	0.560	Btu/h·ft²·F
Uf_lh:	0.871	Btu/h·ft²·F	Ue_lh:	0.560	Btu/h·ft²·F
Uf_hl:	0.872	Btu/h·ft²·F	Ue_hl:	0.545	Btu/h·ft²·F
Uf_hh:	0.872	Btu/h·ft²·F	Ue_hh:	0.545	Btu/h·ft²·F

Uf avg:	0.872	Btu/h·ft²·F	Ue avg:	0.552	Btu/h·ft²·F

Methodology for other Products – **with all spacer-less glazing cavities (no SESA)**

For products without any SESA



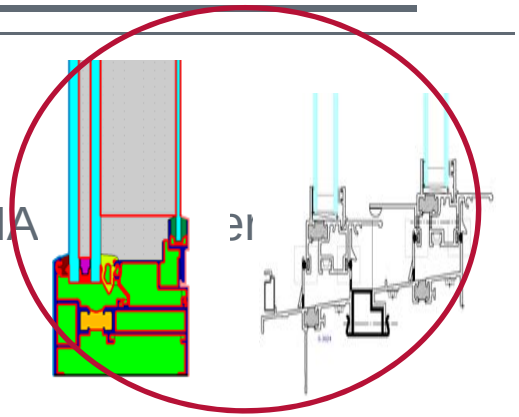
- Generate Therm6 files for two CMA options
  - Low glazing (0.08 Btu/hr-ft2-F)
  - High glazing (0.472 Btu/hr-ft2-F)

Follow the similar process as single glazed products (glazing without spacer)

- **Automated Process** - LBNL creates a custom Non-SESA CMA Glazing option in Therm6 that generate the high/low options – *more complex, Time(?)*
  - No CMAST modifications required
- **Manual Process** – Labs Simulate the Therm6 files with high and low glazing
  - CMAST modification required to create Frame cross-section data as the Frame data can not be imported from the .Thmx file
  - Manual import of results in to CMAST for all the high and low options – **NON Automated**
  - **Once Frame Cross-section data is available, CMAST would generate the simulation results**

Methodology for other Products - **with combination SESA**

At least 1 cavity with SESA cavity and 1 without SESA



Follow manual process of creating & importing Therm files in CMA

Therm6 files for four CMA options

1. Low Glazing + Low SESA
2. Low Glazing + Hi SESA
3. Hi Glazing + Hi SESA
4. Hi Glazing + Low SESA

Challenge

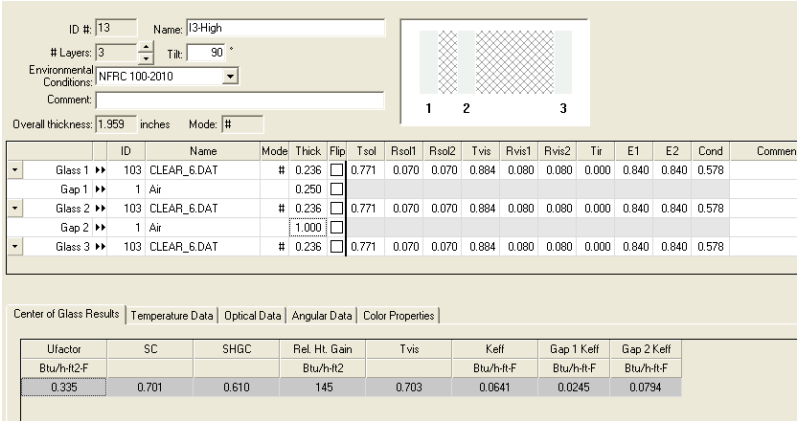
- Low glazing (0.08 Btu/hr-ft2-F) - OK
- High glazing (0.472 Btu/hr-ft2-F) - Difficult to achieve with 3 layers of glass (worst U-Factor ~ 0.35 Btu/hr-ft2-F)

Solution

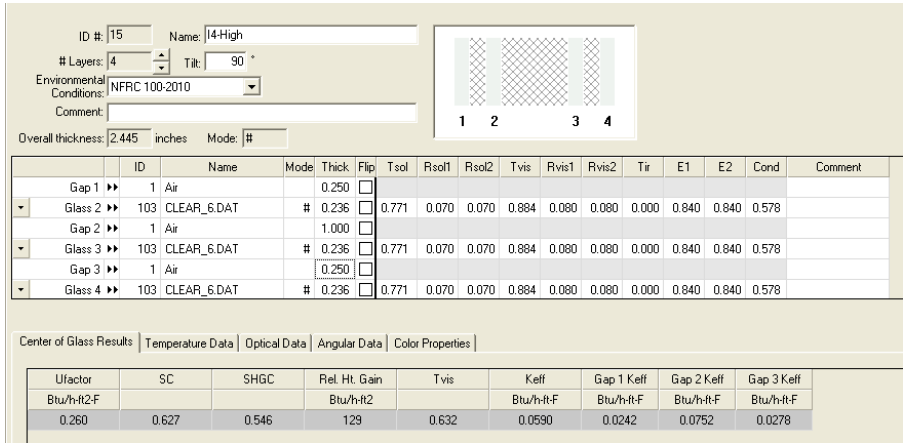
1. Use fictional gas with high conductivity to create high glazing with U of 0.472 ? OR
2. Define new high and low glazing for such products (remember high and low glazing for single glazed products are different from regular glazed products)

Methodology for other Products - **with combination SESA**

- 2nd solution - Define separate high and Low Glazing options
  - Low glazing (0.08 Btu/hr-ft2-F) - leave as existing – easy to achieve
  - High glazing (0.472 Btu/hr-ft2-F) -
  - For I3 products (COG_High_U =0.335)



  - For I4 products (COG_High_U =0.26)



Changes required in CMAST
(without LBNL-Therm6 changed)