COMcheck: High Performance Roll-up Doors and Positive Impacts on Tradeoffs

By Tim Belcher, NBG Energy Lead

In previous energy articles we have discussed utilizing COMcheck to demonstrate compliance with the energy codes using the Building Envelope Trade-Off Method. As newer energy codes have been published and adopted the thermal performance requirements have become more stringent. As a result, the norm is insulation systems that can be more cumbersome to install and require more insulation to achieve the levels of performance required by code.

When utilizing trade-offs in COMcheck it is common for users to first look at increasing the insulation/performance of either the roof or walls. The roof and wall insulation are often considered first because they represent the largest surface area of the exterior of the building and as such the most likely areas where trade-offs can make a noticeable impact. One often overlooked option for trade-offs that can have a significant impact on the envelope performance is fenestration, particularly in the form of rollup doors in the case of metal buildings.

Rollup doors can have a significant impact on the thermal performance of the metal building envelope due to the size and quantity of doors that often occur in metal buildings. By opting for rollup doors with increased thermal performance it may be possible to change to a less cumbersome insulation system, or reduce the thickness of insulation required to meet the energy code.

The below table is a summary of three scenarios on an example project. The project is a 15,000 SF building required to meet the thermal envelope requirements of ASHRAE 90.1-2013, Climate Zone 4, Conditioned Space. The building contains a total of eight roll-up doors, each having a gross area of 224 square feet.

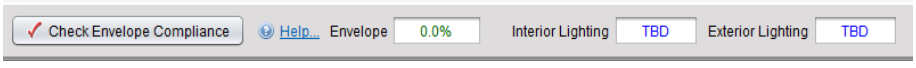
ASHRAE 90.1-2013, CZ-4				
Assembly	**Code Requirements**	**Example 1 Baseline**	**Example 2**	**Example 3**
Roof	U-0.037	R19+R11 Liner (U-0.037)	R30 Single Layer *Tested (U-0.047)	R30 Single Layer *Tested (U-0.047)
Wall	U-0.060	R25 Single Layer in Cavity (U-0.059)	R19 Single Layer **Tested (U-0.094)	R19 Single Layer **Tested (U-0.094)
Roll-up Door	U-0.500	Assembly Max (U-0.500)	Assembly Max (U-0.500)	**High Performance Door (U-0.038)**
Result		PASS 0.0%	FAIL -5.0%	PASS +1.0%

*Tested: NBS tested R30 Single Layer Compressed for Standing Seam Roof. Documentation available upon request.

**Tested: NBS tested R19 Single Layer Compressed for Nucor Accent Wall and Nucor Reverse Classic. Documentation available upon request.

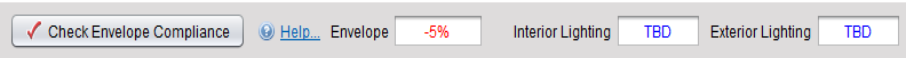
Baseline Example 1: Max Allowed Assembly U-factors

The baseline "Example 1" illustrates the results when using the energy code Max Allowed Assembly U-factors required in ASHRAE 90.1-2013 for Climate Zone 4, Conditioned Space. As you can see a Liner System is used in the roof and a Single Layer in Cavity System is used in the walls along with a roll-up door with a U-factor of U-0.500 which is the Assembly Max U-factor listed in the code. The result is a project that passes at 0.0%.



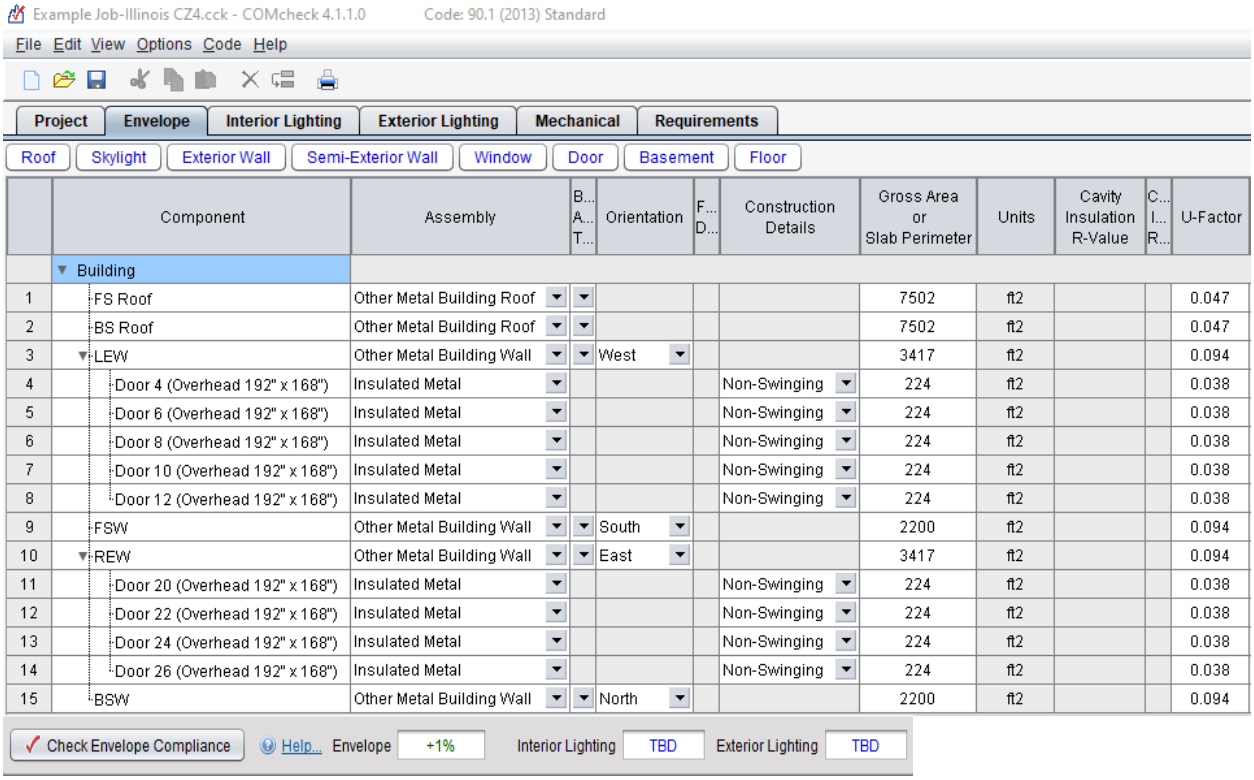
Example 2: Single Layer Compressed *Tested Roof and Wall Insulation

In "Example 2" we have replaced the Liner System in the Roof and Single Layer in Cavity in the walls with NBS Tested Single Layer assemblies in an effort to utilize more economical options for insulating the roof and walls. The performance of the roll-up door has remained the same. As a result our project now fails at -5%.



Example 3: **Same as Example 2 with addition of High Performance Roll-up Doors**

In "Example 3" we have kept the same insulation systems in the roof and walls but have now chosen to select roll-up doors with significantly improved thermal performance. The project now passes at +1% due to the change in performance of the roll-up doors.



	Component	Assembly	B... A... T...	Orientation	F... D...	Construction Details	Gross Area or Slab Perimeter	Units	Cavity Insulation R-Value	C... I... R...	U-Factor
	Building										
1	FS Roof	Other Metal Building Roof					7502	ft2			0.047
2	BS Roof	Other Metal Building Roof					7502	ft2			0.047
3	LEW	Other Metal Building Wall		West			3417	ft2			0.094
4	Door 4 (Overhead 192" x 168")	Insulated Metal				Non-Swinging	224	ft2			0.038
5	Door 6 (Overhead 192" x 168")	Insulated Metal				Non-Swinging	224	ft2			0.038
6	Door 8 (Overhead 192" x 168")	Insulated Metal				Non-Swinging	224	ft2			0.038
7	Door 10 (Overhead 192" x 168")	Insulated Metal				Non-Swinging	224	ft2			0.038
8	Door 12 (Overhead 192" x 168")	Insulated Metal				Non-Swinging	224	ft2			0.038
9	FSW	Other Metal Building Wall		South			2200	ft2			0.094
10	REW	Other Metal Building Wall		East			3417	ft2			0.094
11	Door 20 (Overhead 192" x 168")	Insulated Metal				Non-Swinging	224	ft2			0.038
12	Door 22 (Overhead 192" x 168")	Insulated Metal				Non-Swinging	224	ft2			0.038
13	Door 24 (Overhead 192" x 168")	Insulated Metal				Non-Swinging	224	ft2			0.038
14	Door 26 (Overhead 192" x 168")	Insulated Metal				Non-Swinging	224	ft2			0.038
15	BSW	Other Metal Building Wall		North			2200	ft2			0.094

By choosing to utilize roll-up doors on this project, we were able to limit the insulation systems to a single layer of compressed R-30 fiberglass in the roof and a single layer of compressed R-19 in the walls, both of which would be an improvement over those systems outlined in Example 1. If you have any questions regarding your energy code compliance please call the Energy Hotline at 844-682-6724.