

CREATING THE SANDBOX

*For a market rate Passive House office building in the Upper Midwest



MAINLY ENVELOPE FOCUSED

*And mostly glass....

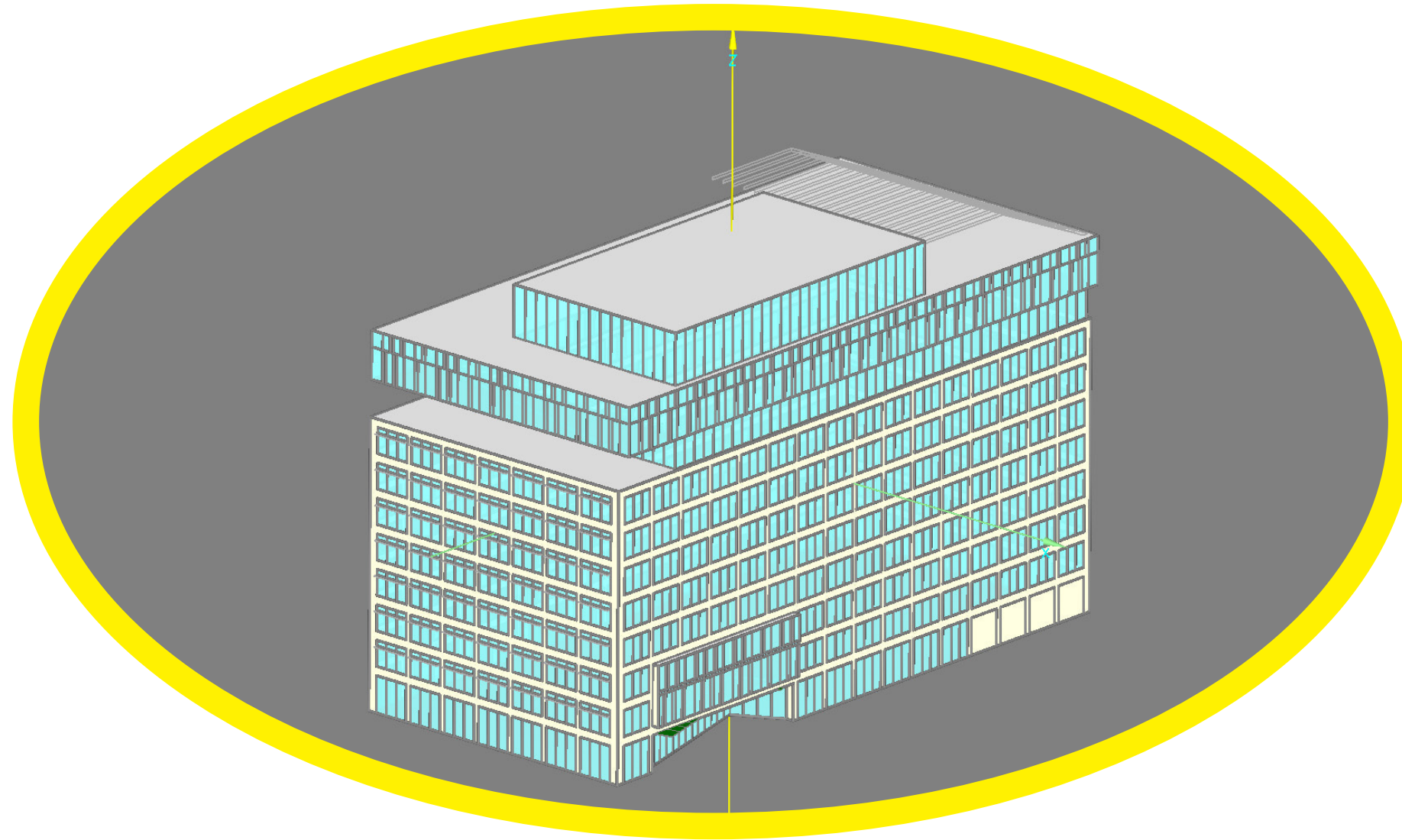


REAL PROJECT

- 270,000 SF SPEC OFFICE
- 9 STORIES
- 68% WINDOW TO WALL
- IN CONCEPTUAL DESIGN/PRICING



MODEL IT



FIND A SET OF TARGET VALUES

COMPARE TO A REFERENCE PROJECT

- 300,000 SF SPEC OFFICE
- 12 STORIES
- 69% WINDOW TO WALL
- UNDER CONSTRUCTION



A young man and woman are laughing joyfully, their heads tilted back. The woman is in the foreground, wearing a white sequined top, and the man is behind her. They are in a room with a Christmas tree decorated with red and gold ornaments and lights. The scene is captured from a low angle, looking up at them.

WHAT WE FOUND

NOT THAT SURPRISING...MOSTLY



COOLING
AND **SOURCE**
ENERGY
DOMINATED

Common Poorwill - daily enters periods
of torpor to conserve energy

LOW PLUG LOAD & LIGHTING POWER

WHAT WILL TENANTS THINK?

Wood Ants - Maximize solar heat absorption by the nest via optimum angle

PV ROOF ARRAY REQUIRED



Emperor Penguin - Use blubber and special feathers to retain heat



ONLY SLIGHTLY
MORE INSULATION

The image shows three large, woolly sheep with thick, curly wool and curved horns standing in a field. The sheep are the central focus, with their wool appearing dense and textured. The background is a bright, clear blue sky with some light clouds, and a white fence is visible in the distance. The overall scene is outdoors and well-lit.

**HOWEVER...
TRIPL
GLAZING IS
REQUIRED**

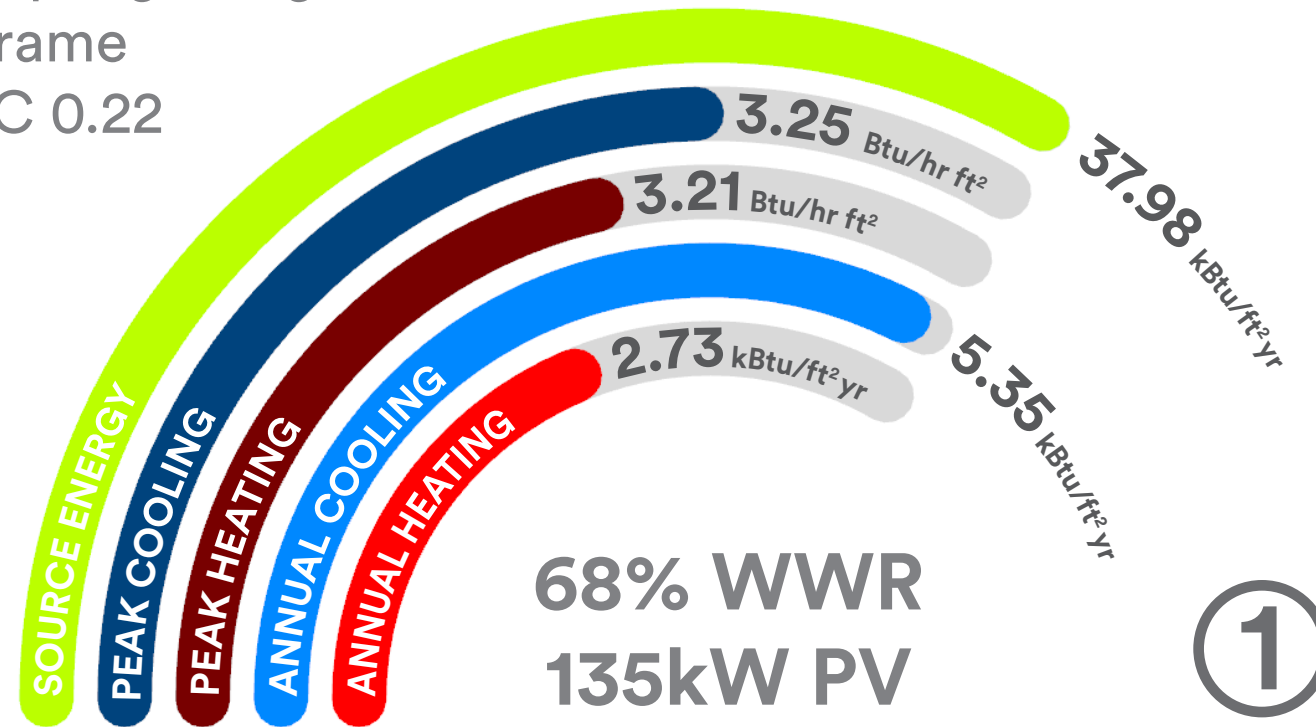
**DOUBLE PANE POSSIBLE NEAR
40% WWR**



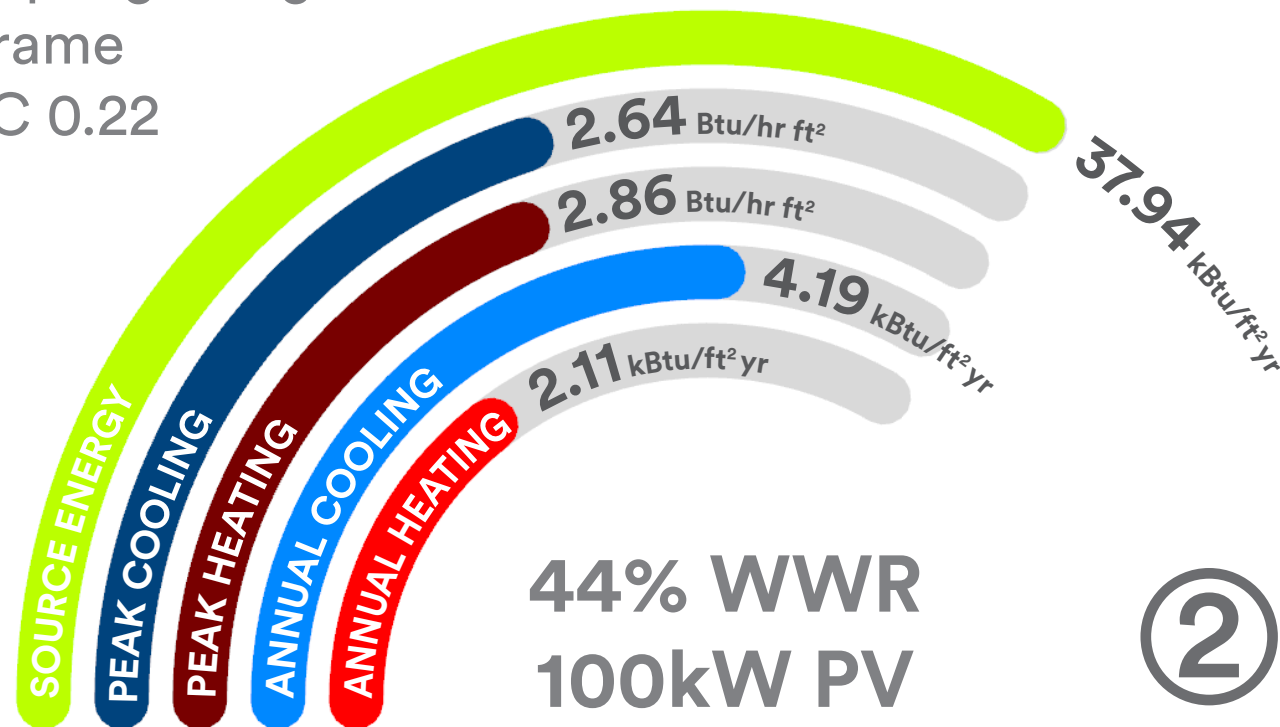
SENSITIVITY ANALYSIS

SCENARIOS

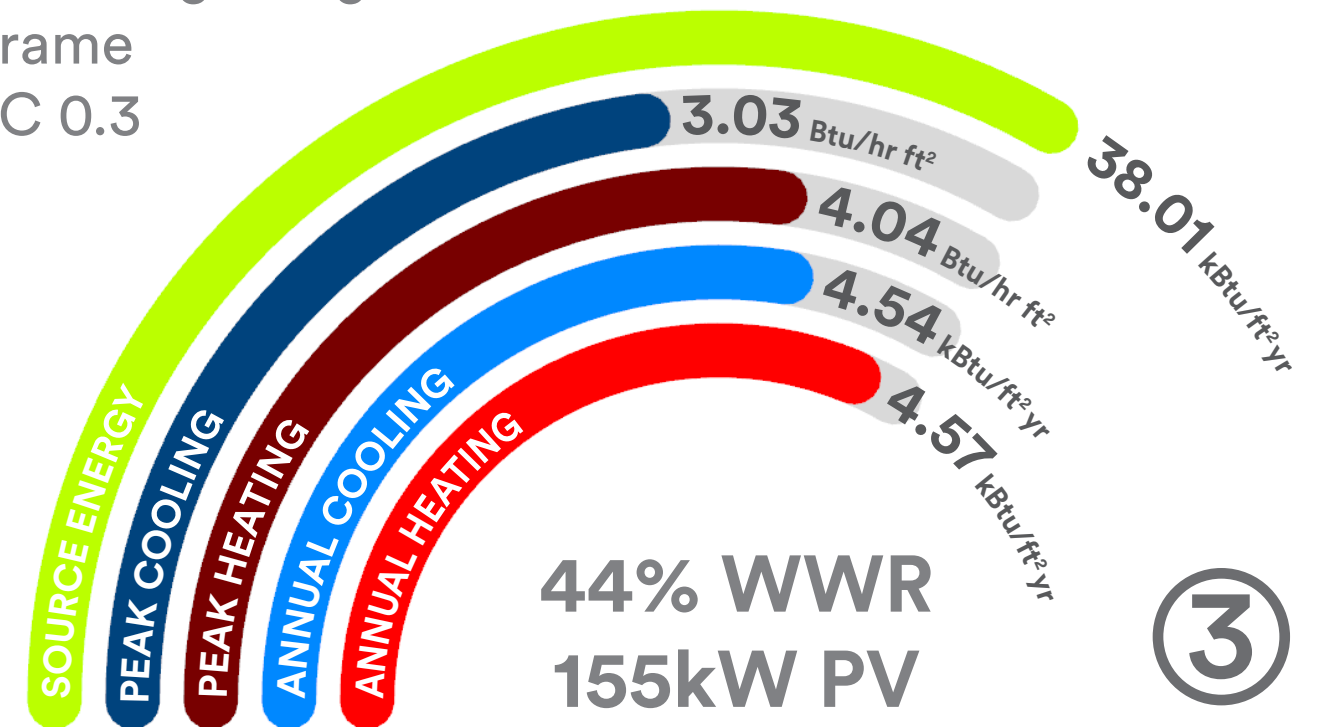
R-8 triple glazing
R-4 frame
SHGC 0.22



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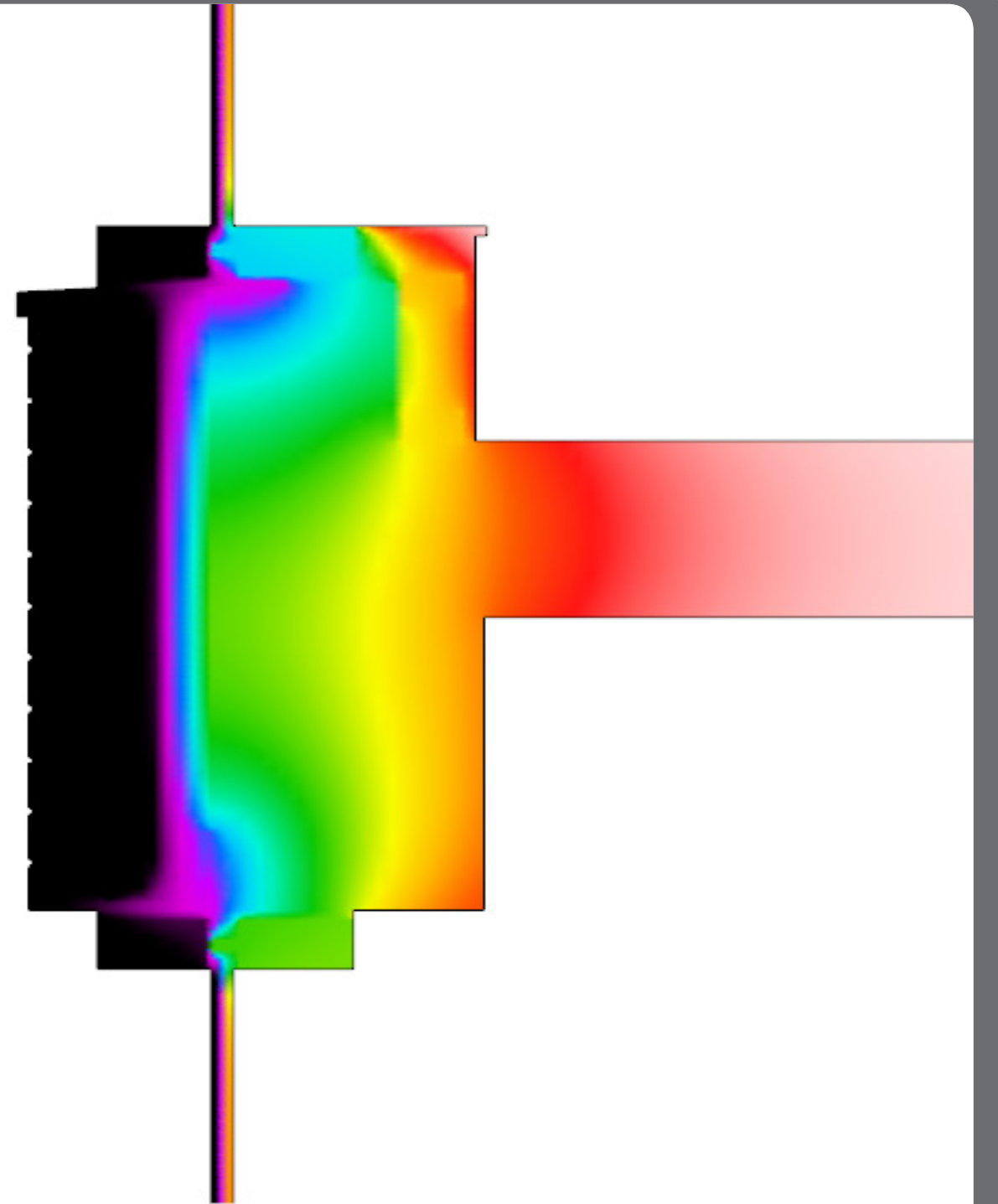
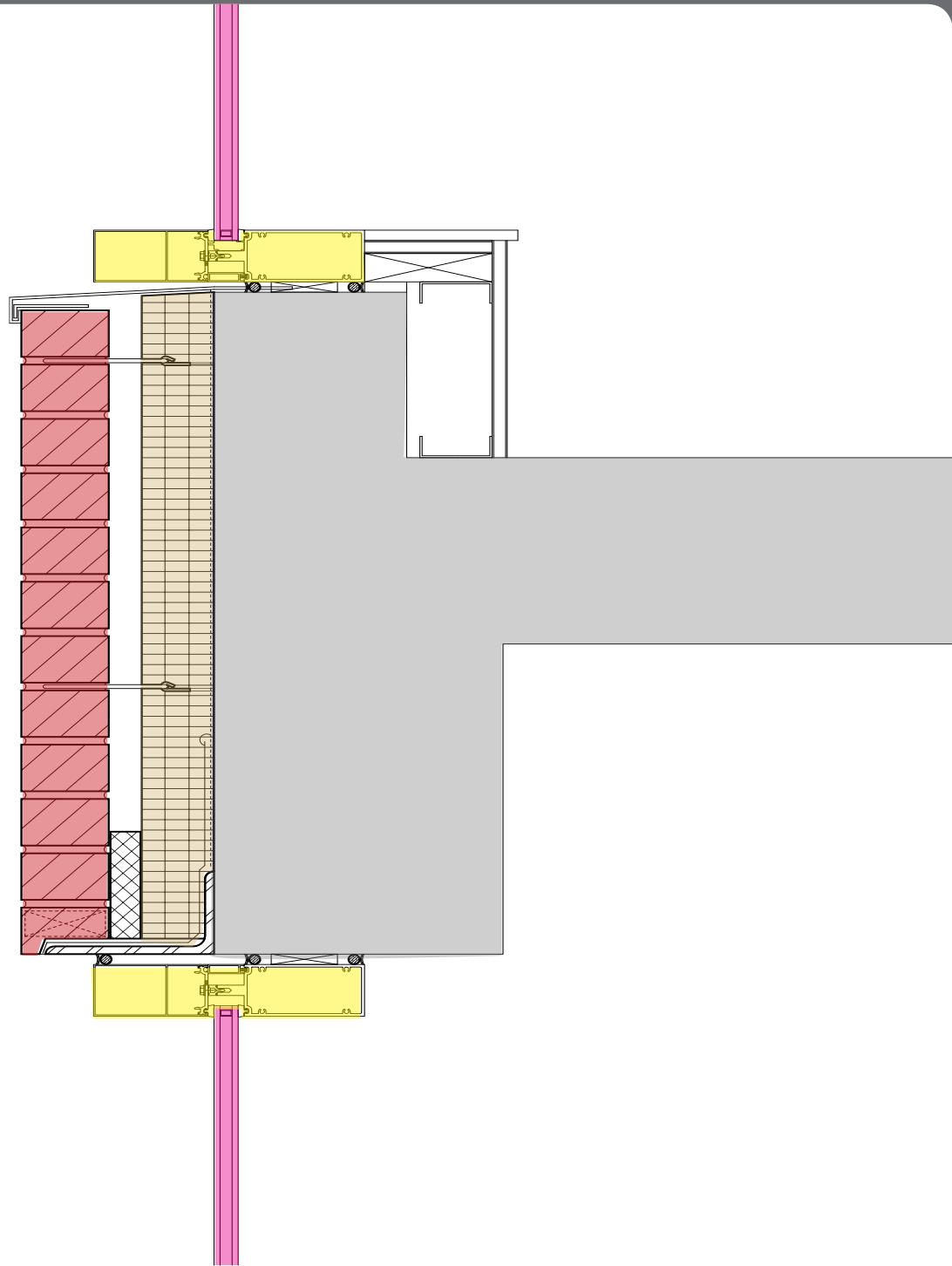


R-3 double glazing
R-3 frame
SHGC 0.3

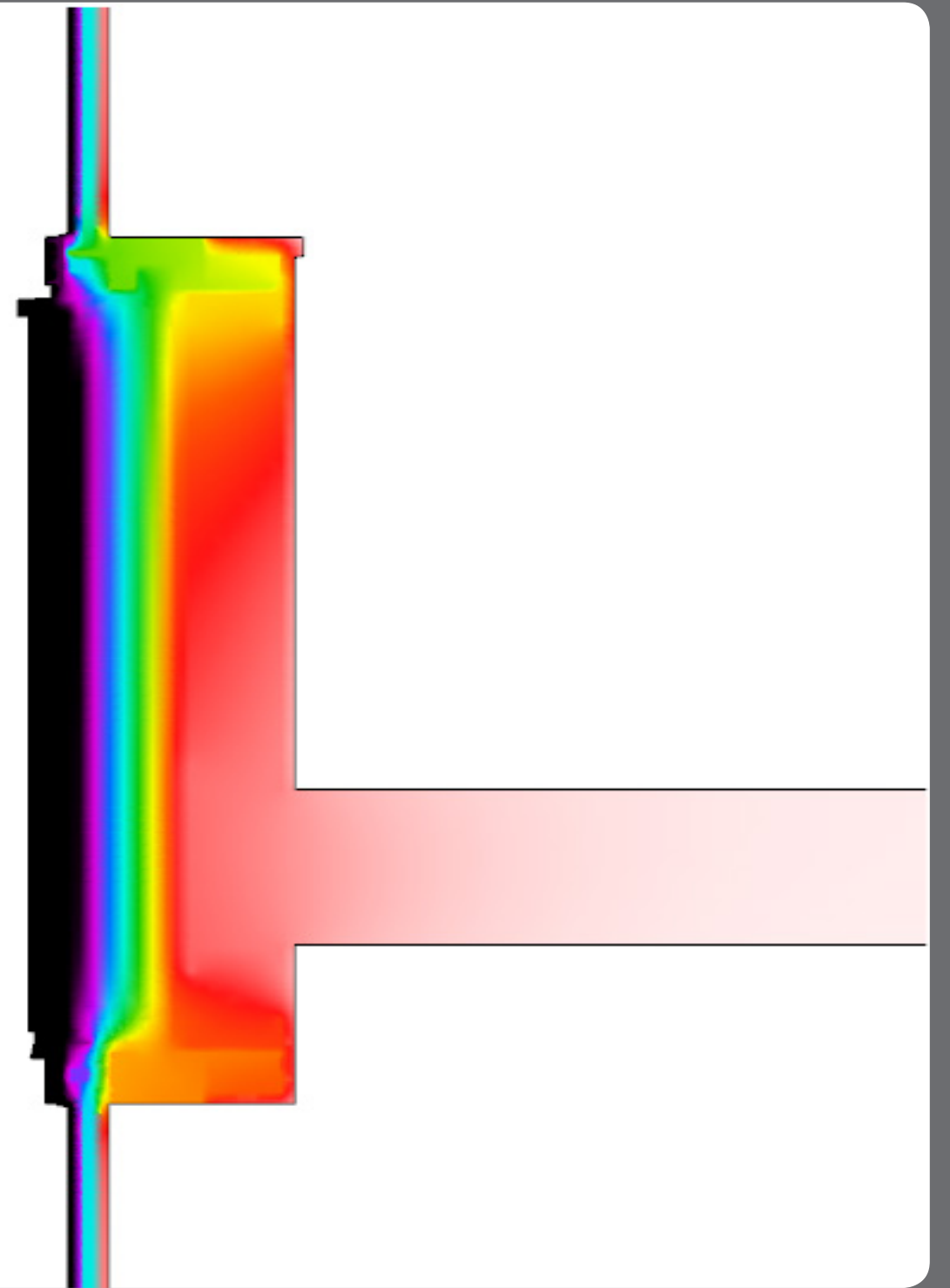
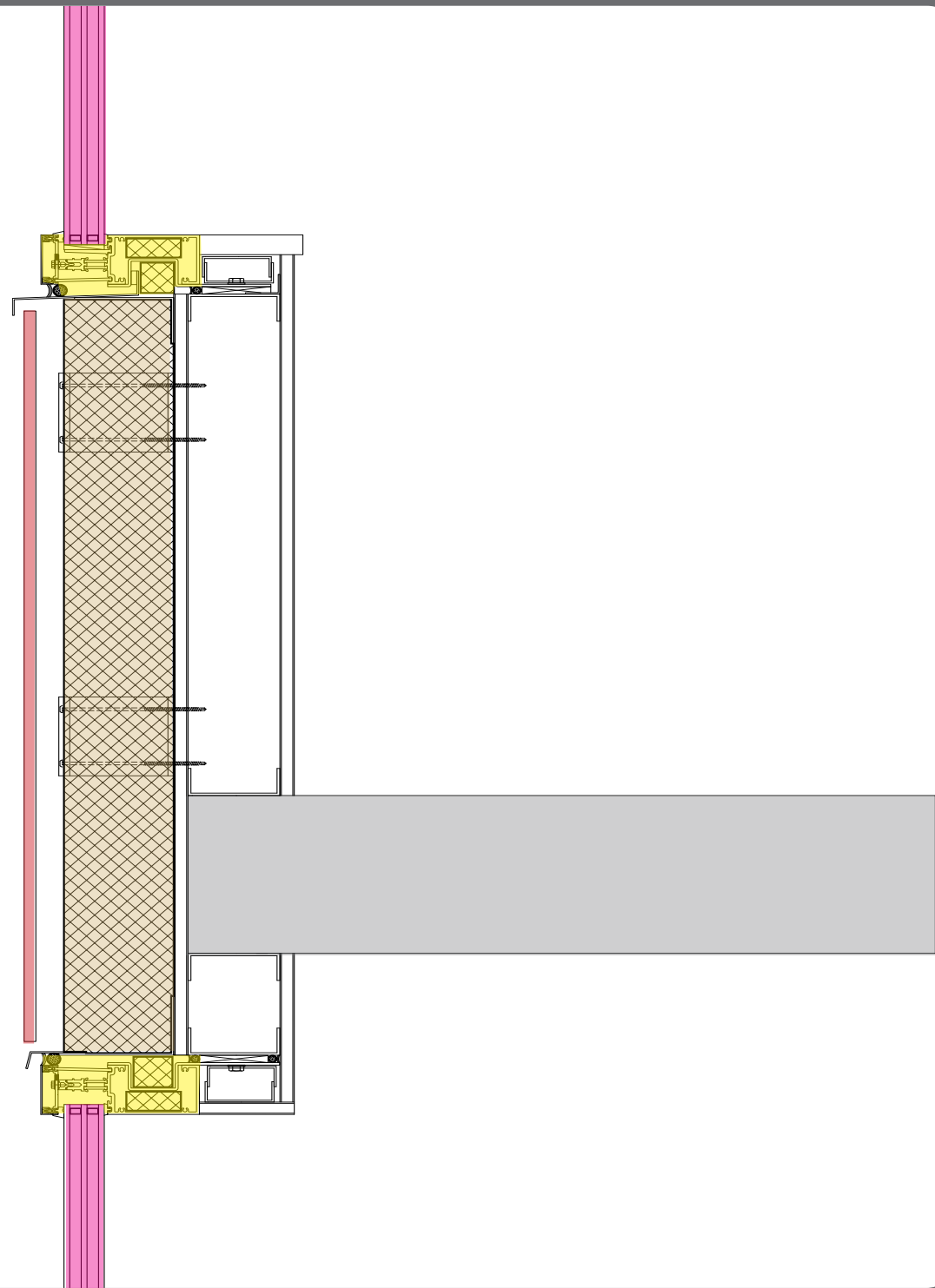




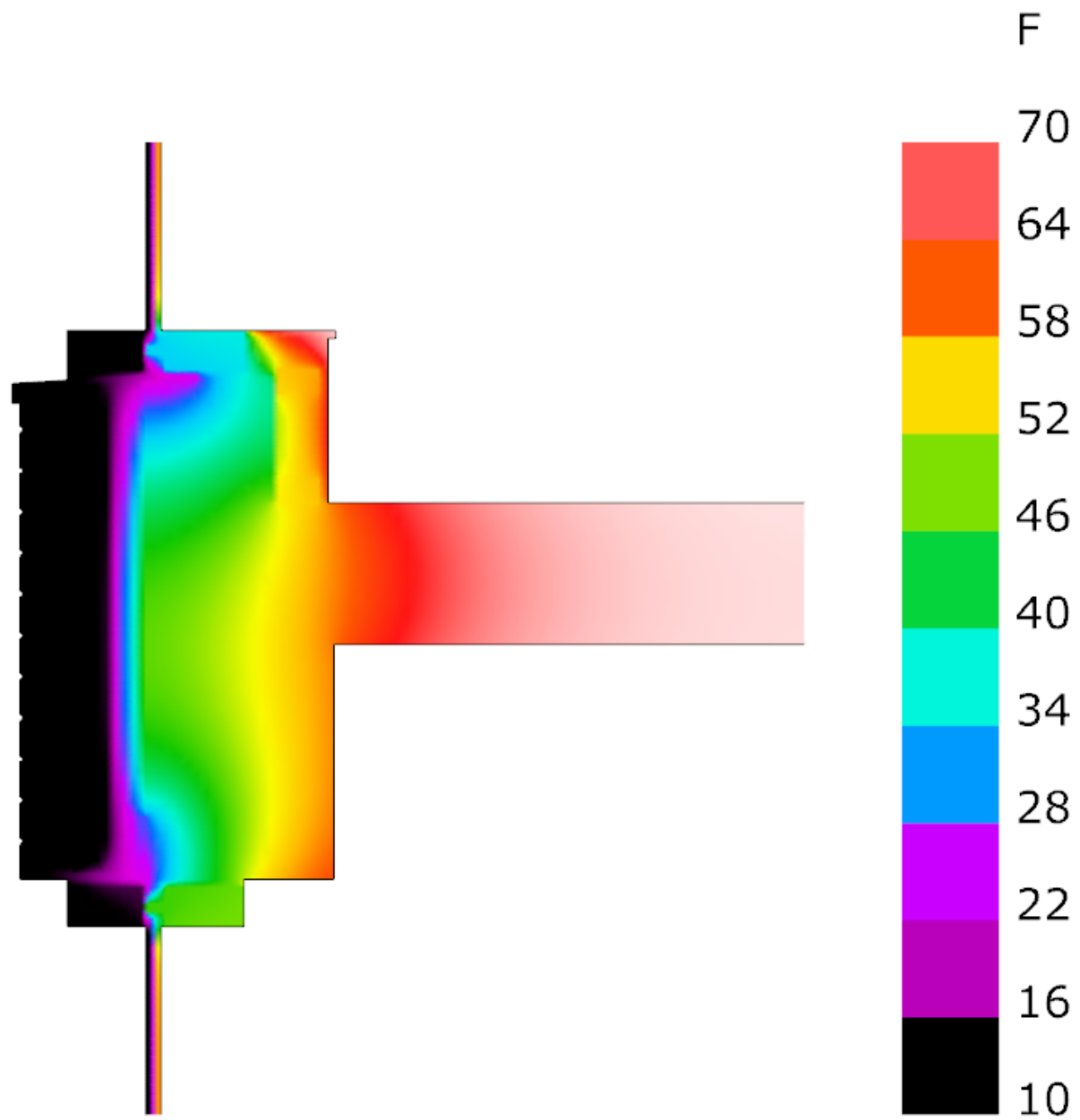
EVALUATE
DETAILS



**REFERENCE BUILDING
WALL**

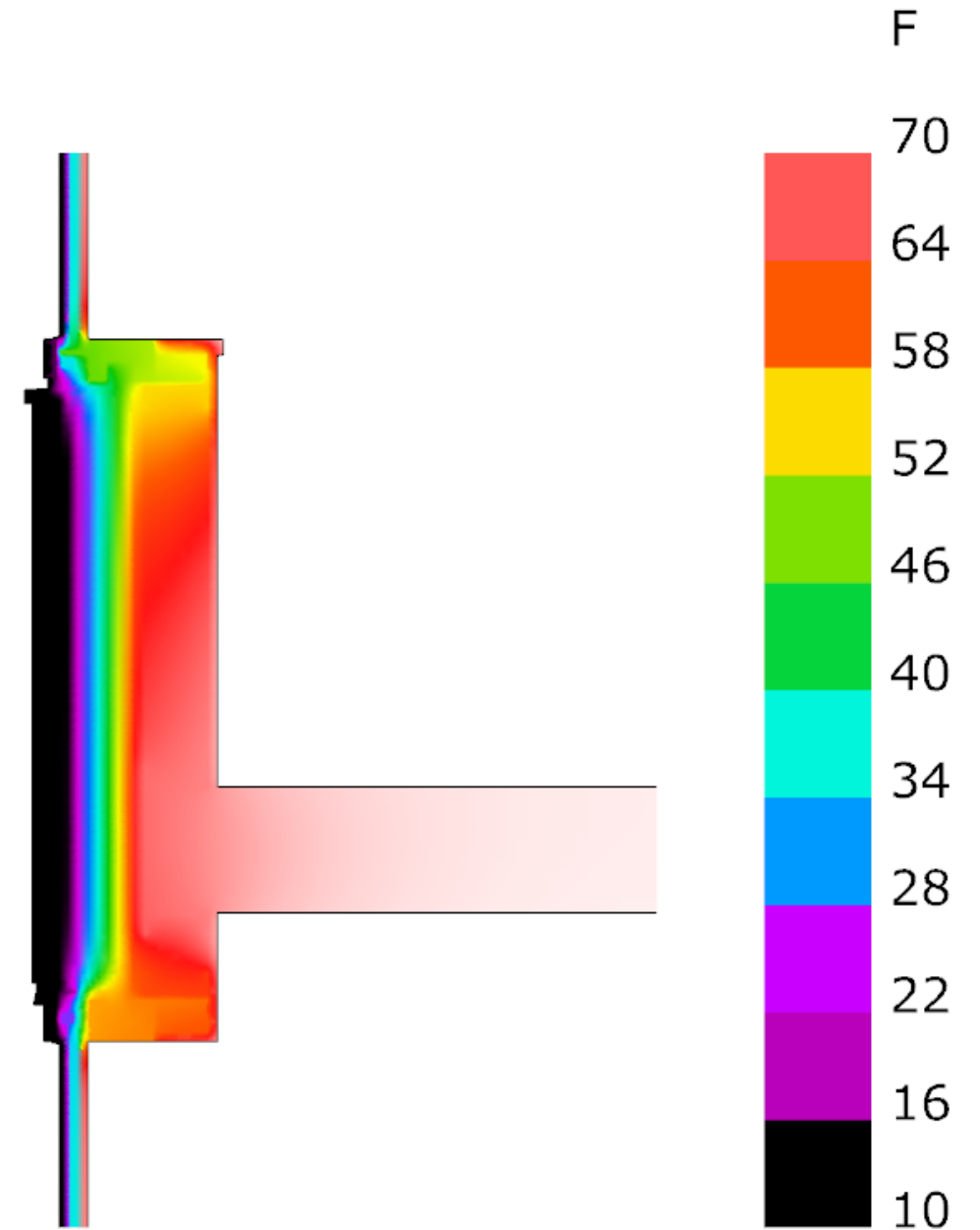


IMPROVED WALL



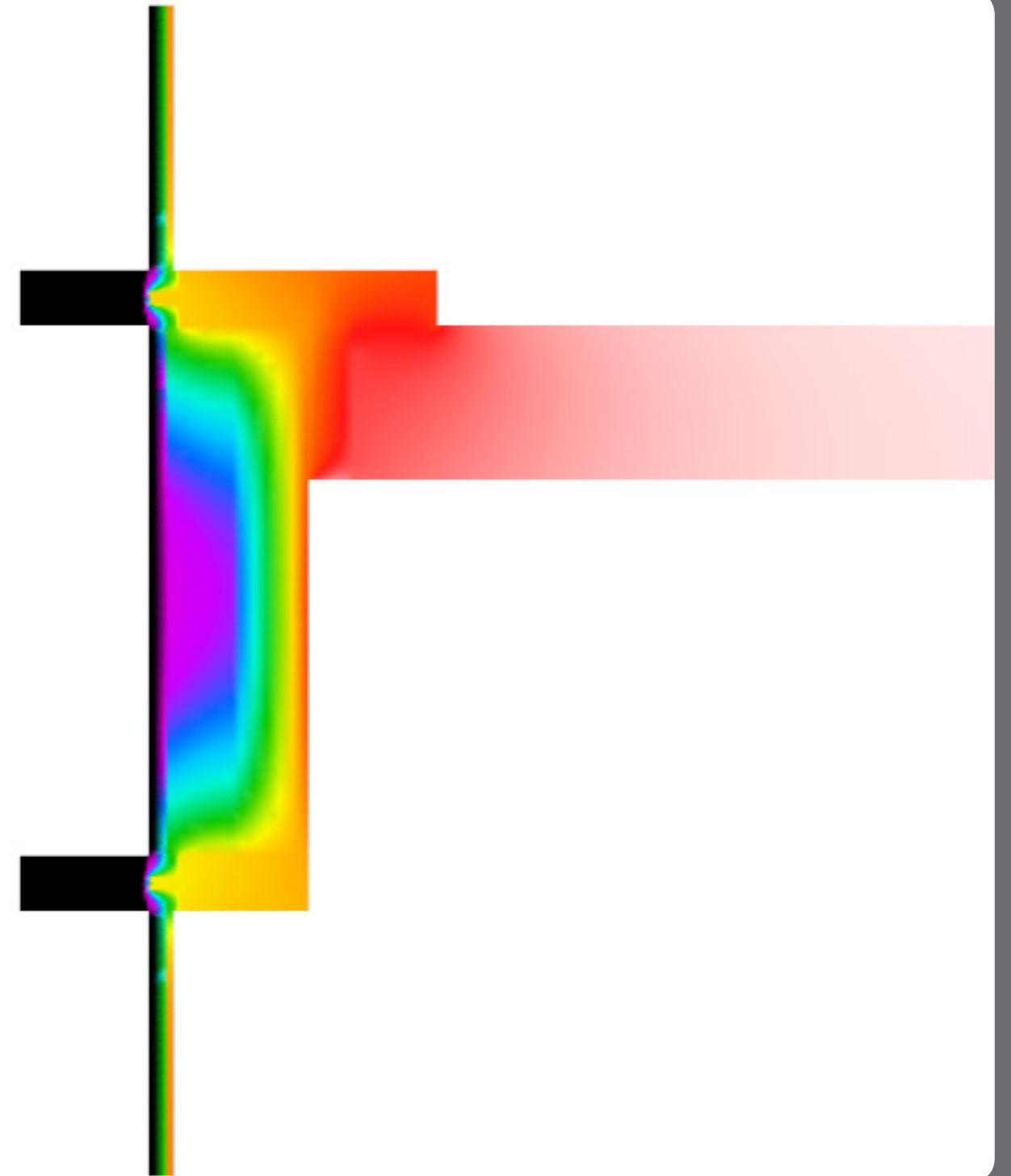
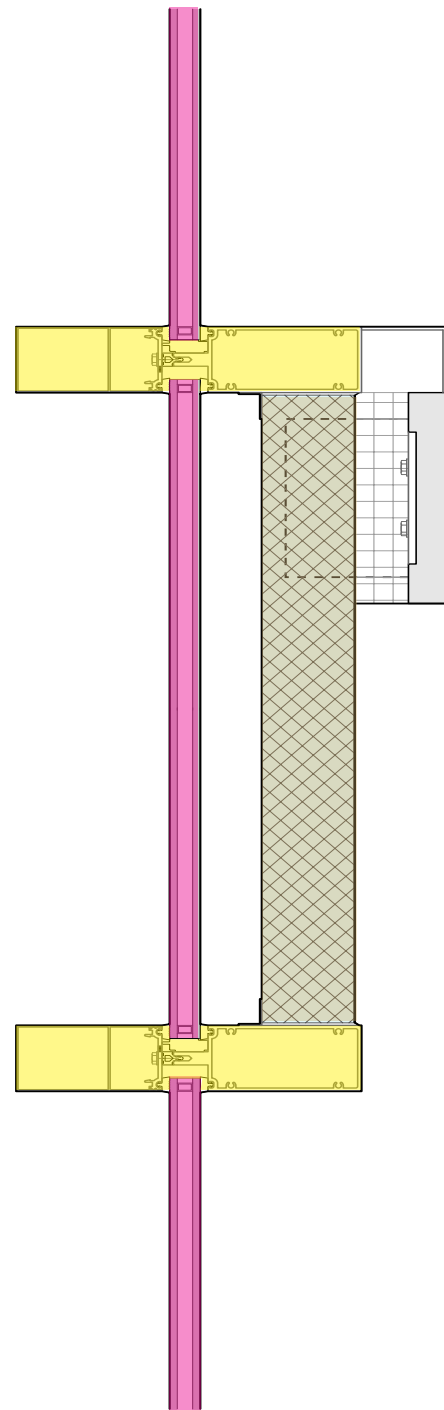
Temperature
THERM Simulation

REFERENCE BUILDING

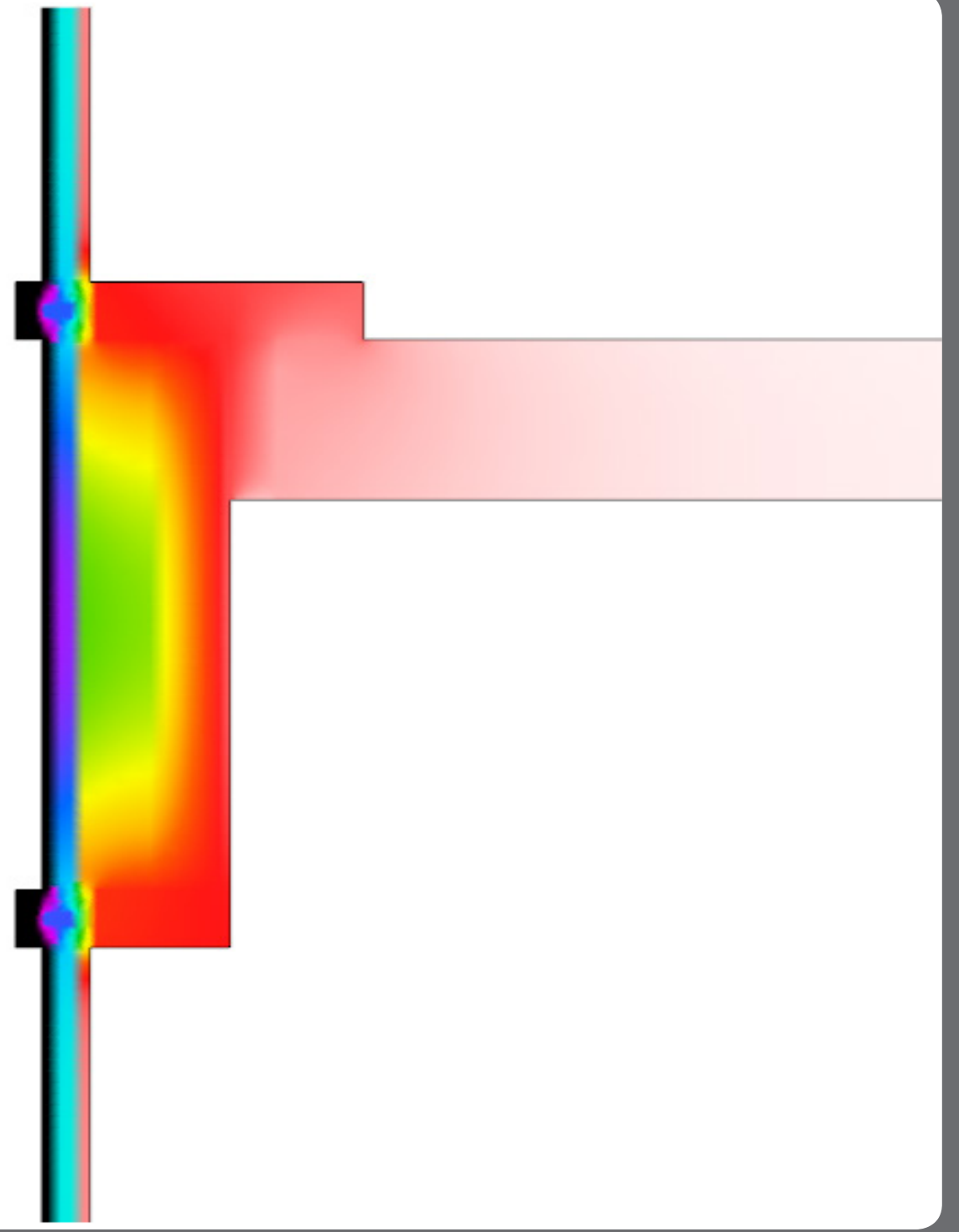
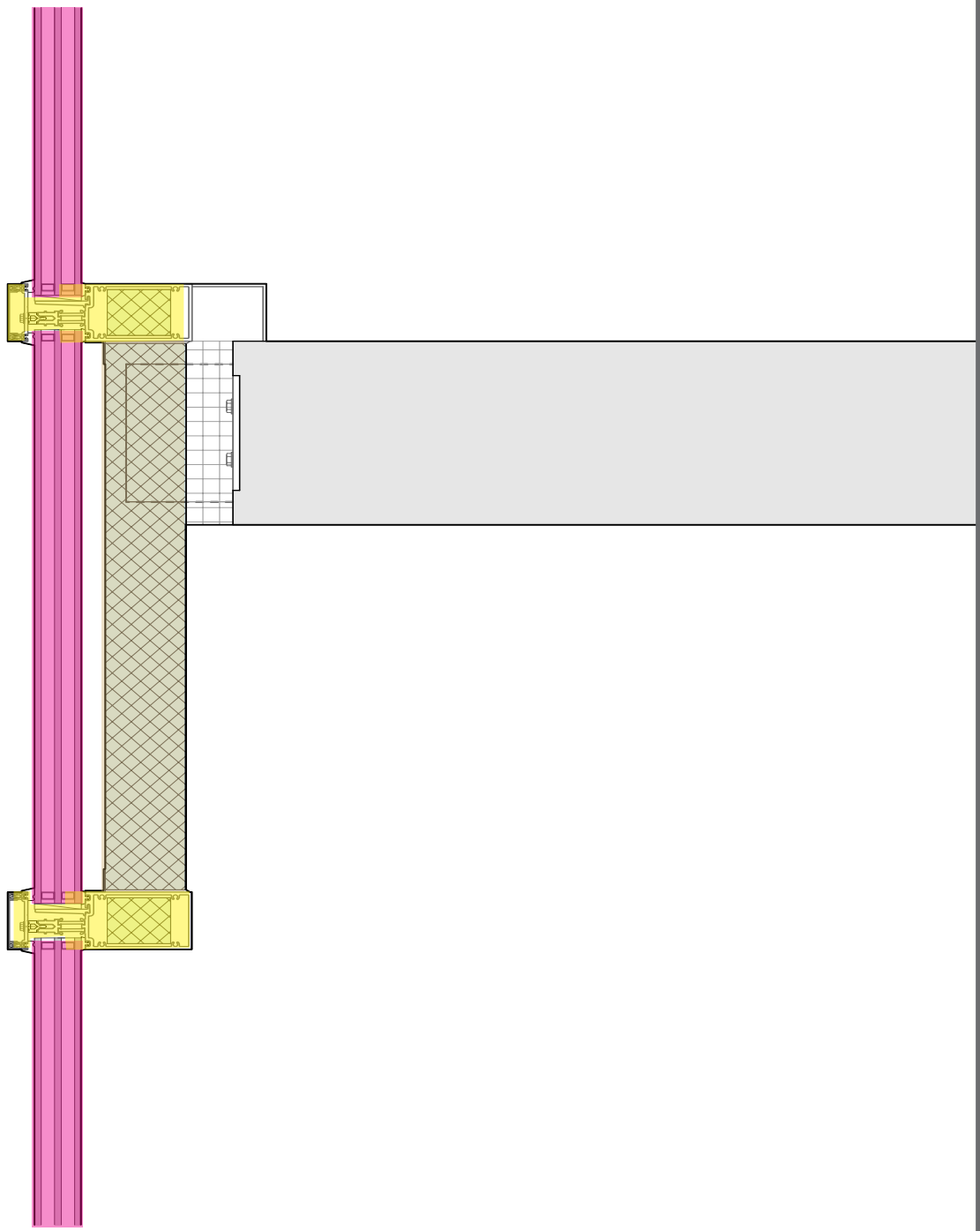


Temperature
THERM Simulation

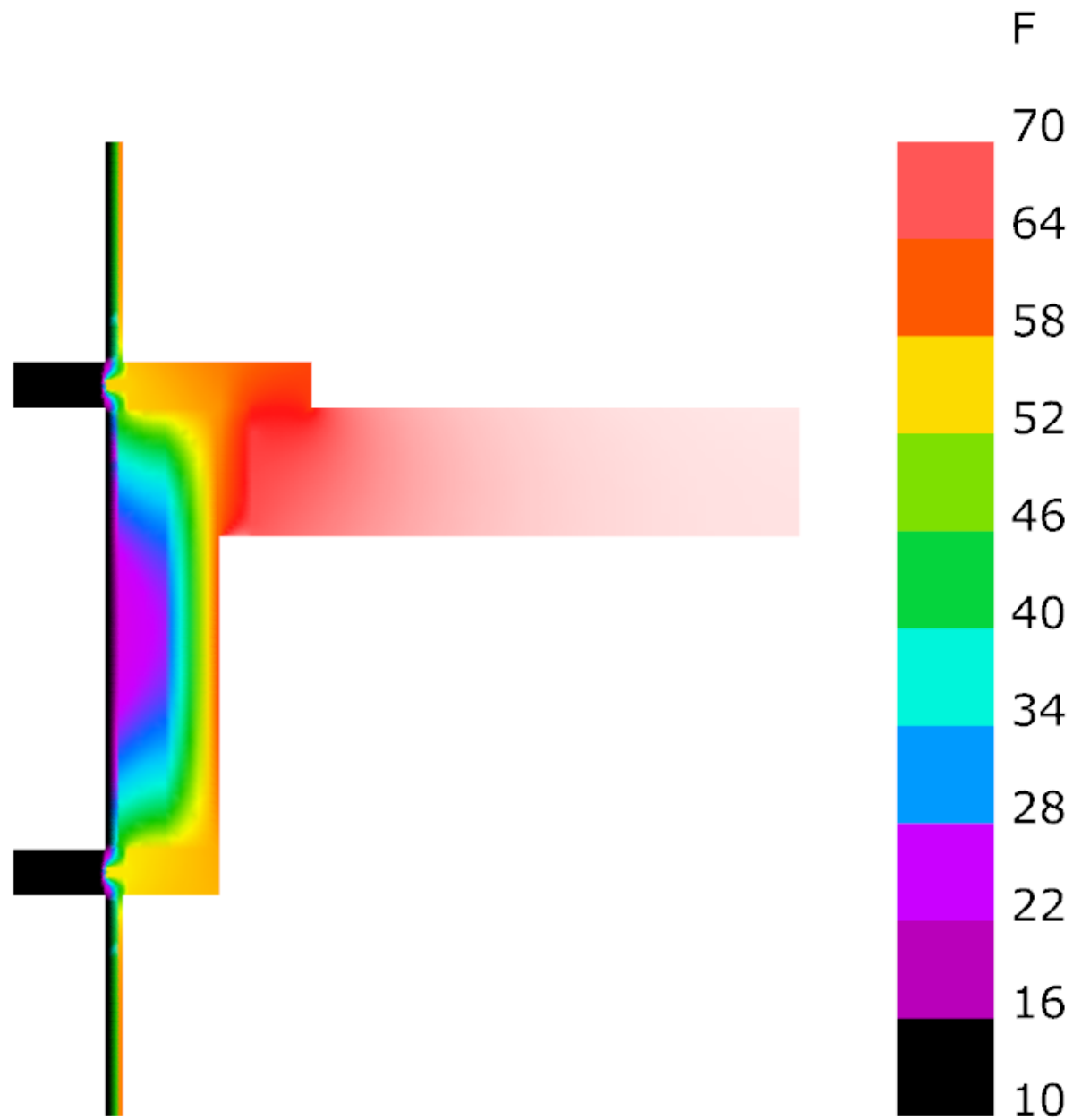
IMPROVED



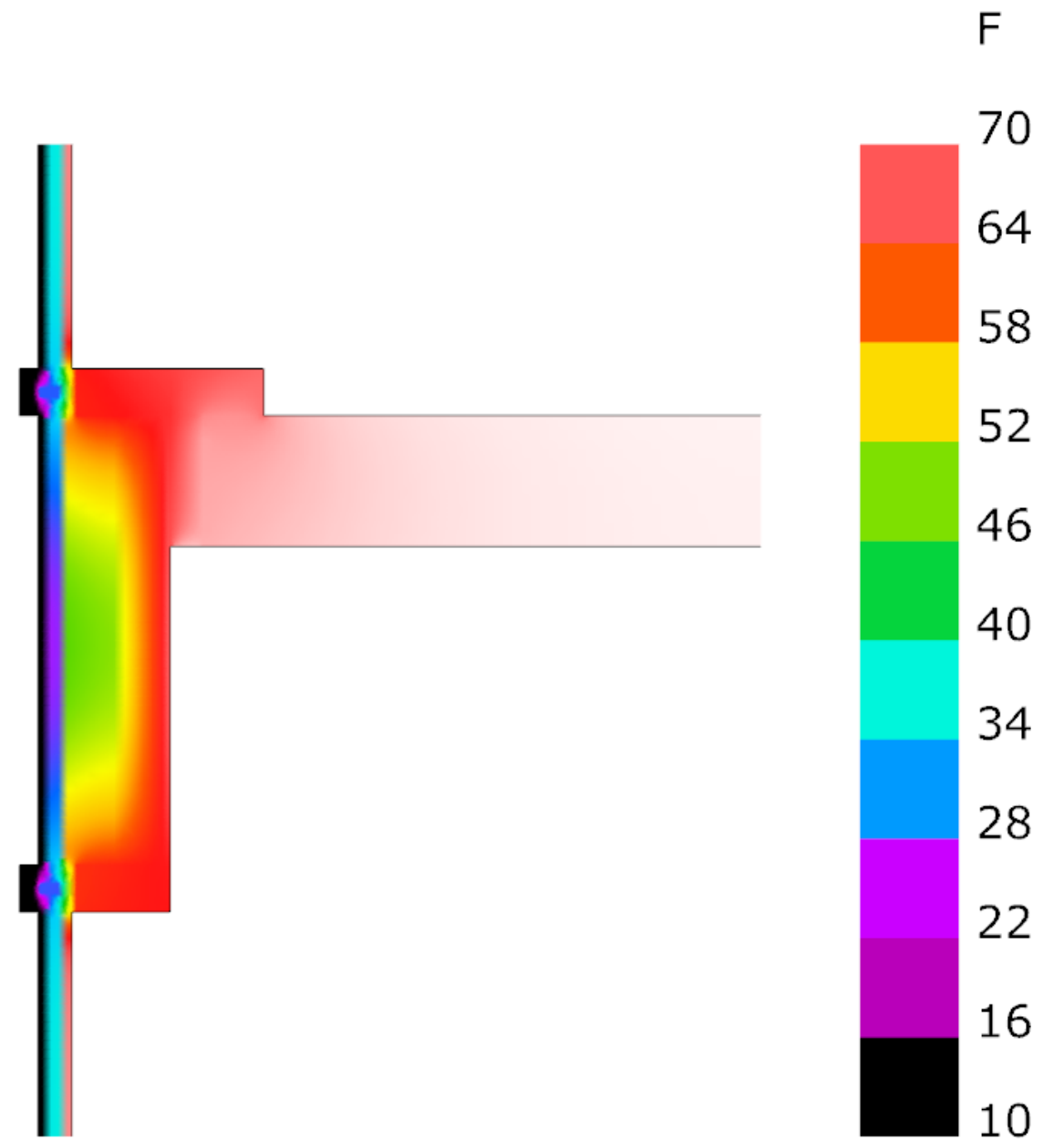
**REFERENCE BUILDING
SPANDREL**



IMPROVED SPANDREL



Temperature
THERM Simulation



Temperature
THERM Simulation

REFERENCE BUILDING

IMPROVED

SUMMARY



LOW GLASS % (40%)

+ SLIGHTLY BETTER
WINDOW (U0.30)

OR

HIGH GLASS % (>45%)

+ REALLY GOOD
WINDOW (<U0.20)

FENESTRATION

LOW GLASS % (40%) +
GOOD SHGC (0.30)

OR

HIGH GLASS % (>45%)
+ SHADING OR LOW
SHGC (< 0.25)

GLASS/SHADING



AGRESSIVE LPD
REDUCTIONS
TARGET **0.50** WATTS/SF
90.1 2013 = 0.82

LIGHTING



ALL ENERGY
STAR EQUIPMENT
& APPLIANCES + PLUG
LOAD CONTROLS

PLUG LOAD

PLAN FOR **ROOFTOP PV**

- STRUCTURE
- ELECTRICAL
- ROOF AREA
- COST

RENEWABLES



IN DESIGN STUDIES
CONSIDER **WINDOW**
PLACEMENT IN WALL
SECTION CAREFULLY

THERMAL BRIDGES

- 
- STARTING POINT IS DOAS + VRF
 - GSHP FOR PARTIAL CAPACITY WORTH LOOKING AT

MECHANICAL

An aerial photograph of a sandpit with a green wooden border. The sandpit is filled with sand and various colorful plastic toys, including buckets, shovels, and molds. A semi-transparent yellow rectangular box is overlaid on the center of the sandpit, containing white text. The background is a dark, textured surface, possibly asphalt or concrete.

**COMMERCIAL
CONSTRUCTION +
ASSEMBLY VALUES OF
WINDOWS**

AIR TIGHTNESS

A close-up photograph of a network switch or patch panel. The device is silver and has several rows of ports. In the foreground, several blue Ethernet cables are plugged into the ports. To the left, a bundle of red and yellow cables is visible. On the right side of the panel, there are four status LEDs labeled 1, 2, 3, and 4. LED 1 is lit green. Above the ports, there are some markings including '23', '12', and '24' with small triangles. The word 'STATUS' is overlaid in large white letters in the center of the image.

STATUS

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