UN-DAYLIGHTING THE IRIC

CALEB EHLY | ALEX BOW

LOCATION: THE INTEGRATED RESEARCH AND INNOVATION CENTER | PRESENTATION AND CIRCULATION SPACE | UI CAMPUS

BUILDING TYPE

The IRIC is defined as "… [hosting] **discovery-based or interdisciplinary research** across broad spectrums of science, engineering and other disciplines. The IRIC features flexible laboratories, office and meeting spaces that **can be adapted** for use by researchers from across the university. The building also includes a state-of-the-art visualization laboratory, as well as space for core research facilities, equipment, video conferencing and **other specialized needs.**"

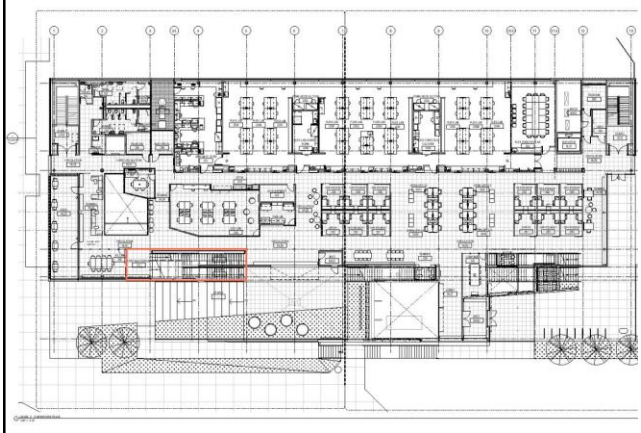
http://www.uidaho.edu/research/entities/iric

- Our space is an interesting one: it is **a hybrid vertical circulation/presentation/student space**. It uses large format "stairs" adjacent to a traditional staircase to provide seating for a small presentation area at the base of the stairs, against the West wall. When the space isn't being used for presentations, it's available for students to use as general seating.

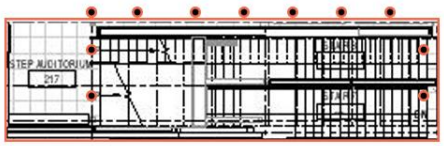
IN-PLACE DAYLIGHTING SYSTEMS

- The entire South Façade of the space is a **double-floor glazing wall**. The glazing has a permanent **perforated steel shading device** which filters the incoming southern sun. During the winter it feels comfortable even during the afternoon, but there is potential for problems with both **temperature and glare** during the **summer months**,
- Additionally, the program should be considered. Though the southern exposure may not be a problem for the **circulation and student lounge** activities, it *is* a problem during any **presentation**. Ideally the space should have the *capability* of being **dimly-lit** to create a successful **flexibility.**

ADEQUATE DAYLIGHTING?

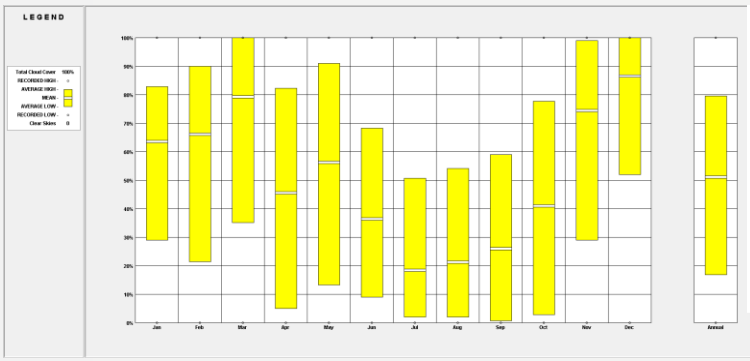


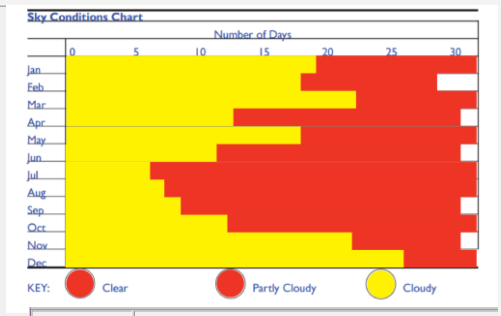
Measured in Footcandles
Perfectly Cloudy
2/5/17
3:50 pm

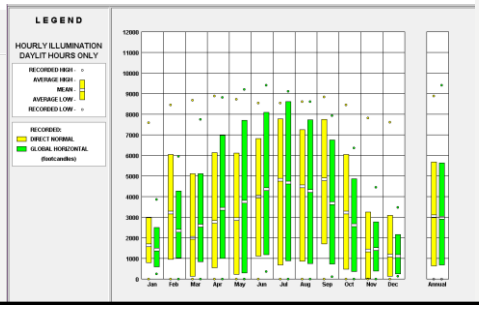


Because our space is a hybrid vertical-presentation space, we measured luminance in three spots, one at the base of the stairs, one at the midpoint of the stairs, and one at the top of the stairs. The total avg. FC equals 33.02, and decreases in a simple gradient pattern as one moves up the stairs.

SKY CONDITIONS



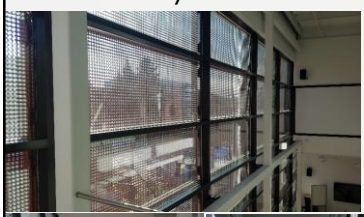




SEASONAL BREAKDOWN:
Spring (March-May): Predominately cloudy
Summer (June-August): Predominately clear
Fall (September-November): Predominately clear
Winter (December-February): Predominately cloudy
YEARLY: Predominately cloudy… barely

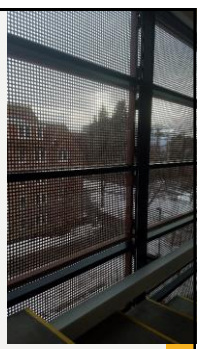
GLARE ANALYSIS

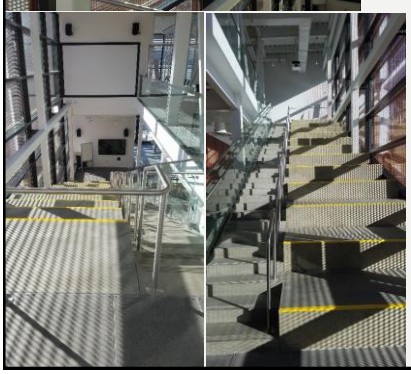
Perfectly Clear

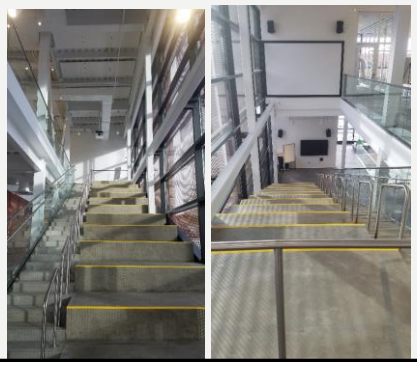


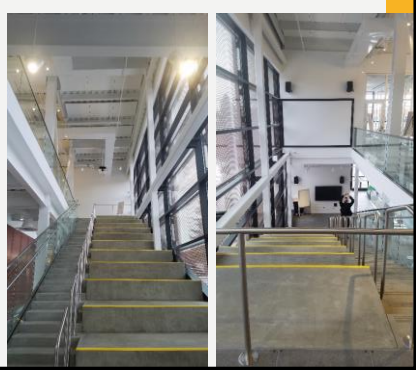
Partially Cloudy

Perfectly Cloudy



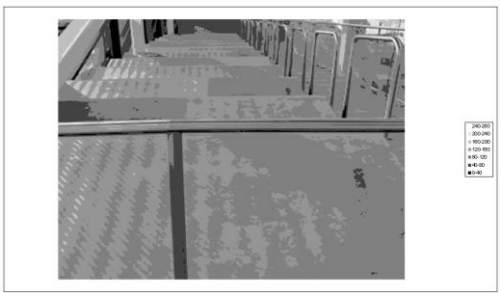


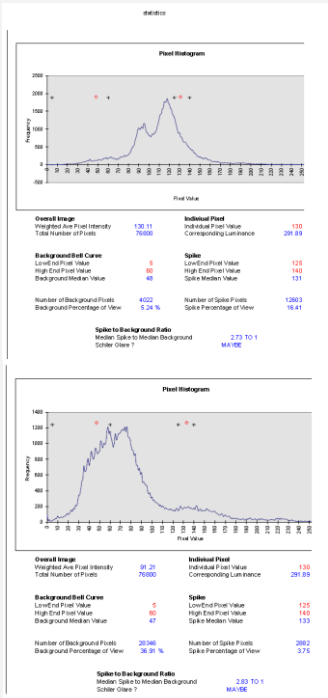




GLARE ANALYSIS

PARTLY CLOUDY DAY



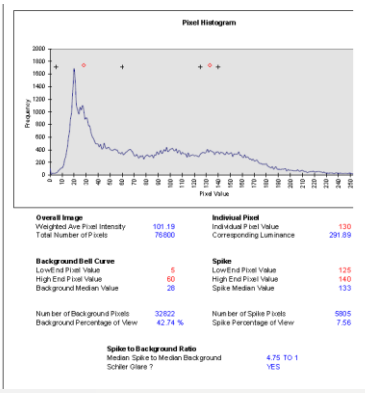


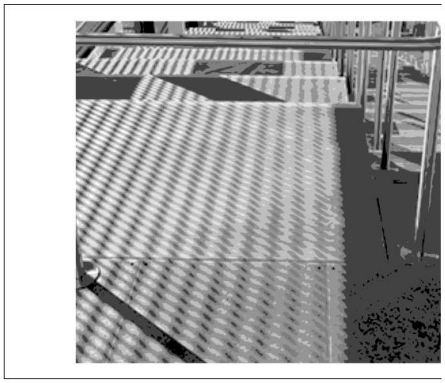
Cloudy days make for fairly diffuse lighting conditions, cutting down on any amount of glare. As the Histogram indicates, the light falls mainly in the **mean.**

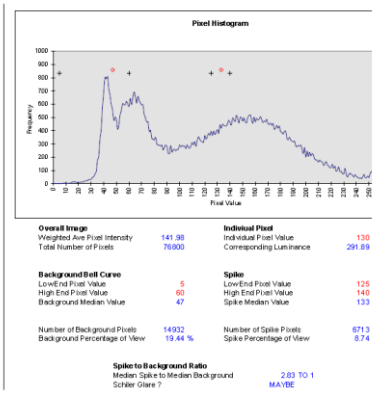
GLARE ANALYSIS

PERFECTLY CLEAR

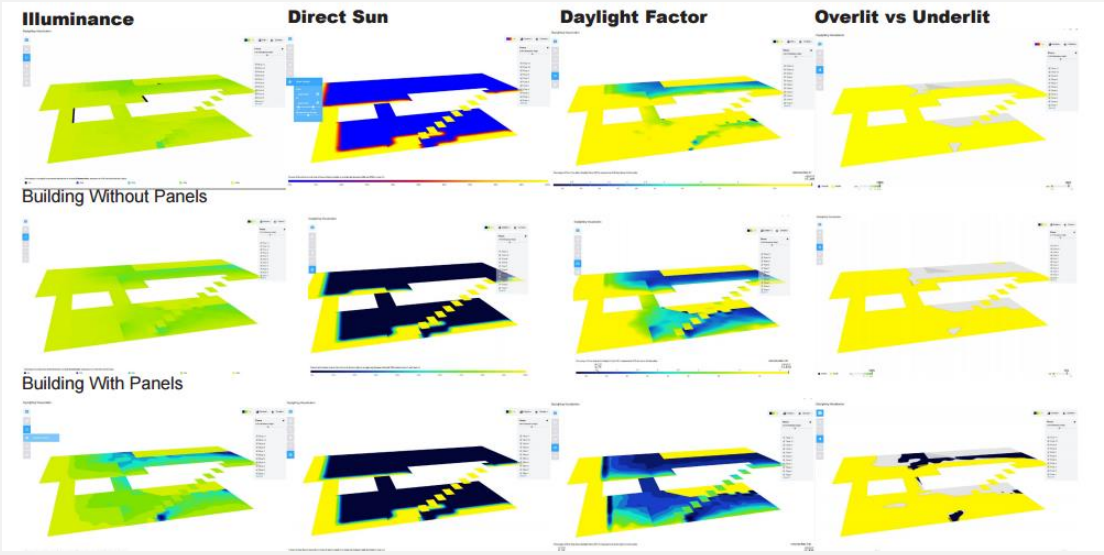
Perfectly clear days are more difficult for the program. Though the **perforated steel** does its best to shade, the result is an un-even and sometimes jarring glare condition. Though the **mean** of the condition falls in a perfectly acceptable **range**, the Histogram shows extremes outside a desired level.







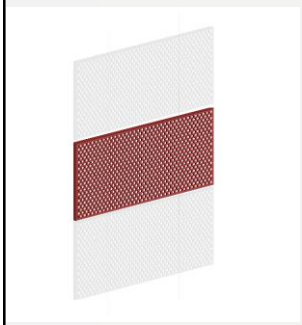
GLARE ANALYSIS



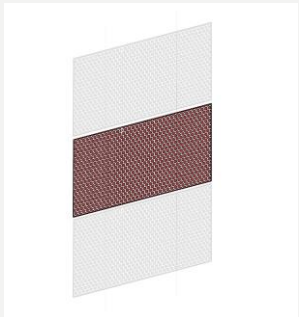
DESIGN SOLUTIONS

- From a pure **day-lighting** standpoint (meaning excluding possible temperature swings during the summer), the space is well lit for **2 of 3** programmatic requirements: **circulation and student lounging**. Where the space fails is in its use for **presentation**. Therefore, we need to **un-daylight** the space by providing some sort of additional, **user-controlled** shading system

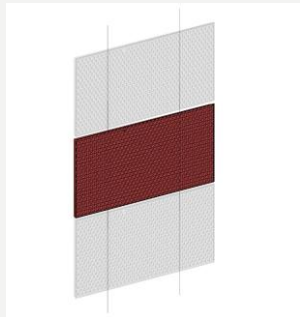
Existing Panel



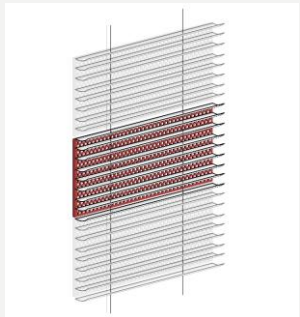
"Inverted" Panel



"Inverted" Panel Deployed



Louvre System



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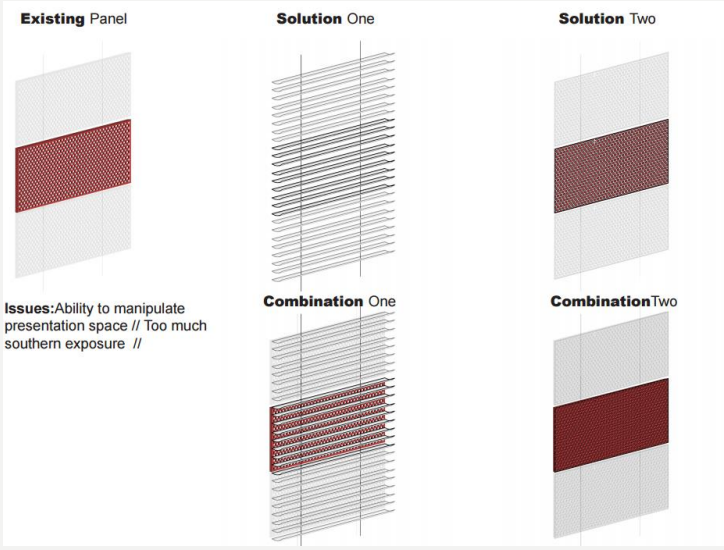

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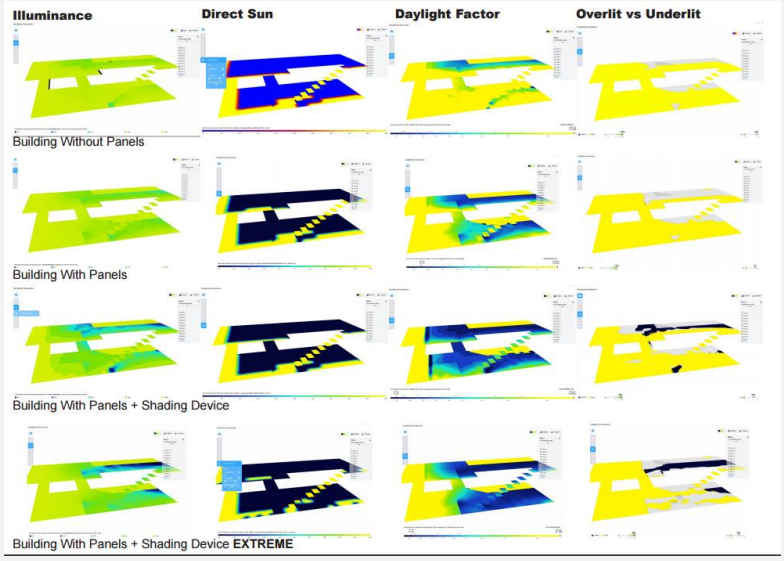

ENERGY SAVINGS

- Our space within the IRIC uses **4 LED spotlights** within the space, and **6 LED spotlights** along the periphery of the space.
  - Each **LED spotlight** uses about **.01 Kw/hr**, compared to **.06 Kw/hr** used by an **incandescent bulb**.
  - .01(kw/hr) x 10 (total LEDs) = **.1 total kw/hr** used in the space for artificial lighting.
  - For 50,000 hours of use, this comes out to $35.95 per bulb, or $359.50.
    - In comparison, using incandescent bulbs would total **$525.50** for 50,000 hours of use, and would need to be replaced **42 times *each*, = 420 bulbs** compared the **10 bulbs** used by LEDs.

- However, during the day the space is well lit enough that **no artificial lighting** is needed. If there was an automatic (or even a smart user) system to turn off the lights when not needed (sun-up to sun-down), there would be a savings of
- .1kw/hr @ .007 cents/hr x 4467.12 yearly daylight hours = **$32.11/year**, or **$183.02** over the life of the bulbs.
- 50,000 hours/ number of hours in a year(8,760) = **5.7 years of use.**
- **Finally**, this would be a lifetime efficiency increase of **11.2%**

CALCULATING HOURS OF DAYLIGHT/YEAR…

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1	0.36	0.40	0.46	0.54	0.60	0.65	0.66	0.62	0.55	0.49	0.42	0.37		
2	0.36	0.40	0.47	0.54	0.60	0.65	0.66	0.62	0.55	0.48	0.42	0.37		
3	0.36	0.41	0.47	0.54	0.60	0.65	0.66	0.61	0.55	0.48	0.41	0.37		
4	0.36	0.41	0.47	0.54	0.61	0.65	0.66	0.61	0.55	0.48	0.41	0.36		
5	0.36	0.41	0.47	0.54	0.61	0.65	0.65	0.61	0.55	0.48	0.41	0.36		
6	0.36	0.41	0.48	0.55	0.61	0.65	0.65	0.61	0.54	0.47	0.41	0.36		
7	0.37	0.42	0.48	0.55	0.61	0.66	0.65	0.61	0.54	0.47	0.41	0.36		
8	0.37	0.42	0.48	0.55	0.61	0.66	0.65	0.60	0.54	0.47	0.40	0.36		
9	0.37	0.42	0.48	0.55	0.62	0.66	0.65	0.60	0.54	0.47	0.40	0.36		
10	0.37	0.42	0.48	0.56	0.62	0.66	0.65	0.60	0.53	0.47	0.40	0.36		
11	0.37	0.42	0.49	0.56	0.62	0.66	0.65	0.60	0.53	0.46	0.40	0.36		
12	0.37	0.43	0.49	0.56	0.62	0.66	0.65	0.60	0.53	0.46	0.40	0.36		
13	0.37	0.43	0.49	0.56	0.62	0.66	0.65	0.60	0.53	0.46	0.39	0.36		
14	0.37	0.43	0.49	0.57	0.63	0.66	0.65	0.59	0.53	0.46	0.39	0.36		
15	0.37	0.43	0.50	0.57	0.63	0.66	0.64	0.59	0.52	0.45	0.39	0.36		
16	0.38	0.43	0.50	0.57	0.63	0.66	0.64	0.59	0.52	0.45	0.39	0.36		
17	0.38	0.44	0.50	0.57	0.63	0.66	0.64	0.59	0.52	0.45	0.39	0.36		
18	0.38	0.44	0.50	0.57	0.63	0.66	0.64	0.58	0.52	0.45	0.39	0.36		
19	0.38	0.44	0.51	0.58	0.63	0.66	0.64	0.58	0.51	0.45	0.38	0.36		
20	0.38	0.44	0.51	0.58	0.64	0.66	0.64	0.58	0.51	0.44	0.38	0.36		
21	0.38	0.45	0.51	0.58	0.64	0.66	0.64	0.58	0.51	0.44	0.38	0.36		
22	0.39	0.45	0.51	0.58	0.64	0.66	0.63	0.58	0.51	0.44	0.38	0.36		
23	0.39	0.45	0.51	0.58	0.64	0.66	0.63	0.57	0.50	0.44	0.38	0.36		
24	0.39	0.45	0.52	0.59	0.64	0.66	0.63	0.57	0.50	0.43	0.38	0.36		
25	0.39	0.45	0.52	0.59	0.64	0.66	0.63	0.57	0.50	0.43	0.38	0.36		
26	0.39	0.46	0.52	0.59	0.64	0.66	0.63	0.57	0.50	0.43	0.37	0.36		
27	0.39	0.46	0.52	0.59	0.65	0.66	0.63	0.57	0.50	0.43	0.37	0.36		
28	0.40	0.46	0.53	0.60	0.65	0.66	0.63	0.56	0.49	0.43	0.37	0.36		
29	0.40		0.53	0.60	0.65	0.66	0.62	0.56	0.49	0.42	0.37	0.36		
30	0.40		0.53	0.60	0.65	0.66	0.62	0.56	0.49	0.42	0.37	0.36		
31	0.40		0.53		0.65		0.62	0.56		0.42		0.36	DAYS OF SUNLIGHT	HOURS OF SUNLIGHT
TOTAL HOURS:	11.70	12.08	15.45	17.04	19.46	19.74	19.89	18.24	15.64	14.02	11.73	11.13	186.13	4467.12

CONCLUSIONS

- By adding some a**ctive system to disable the artificial lights during daylight hours**, our space along the southern edge of the building will remain perfectly **well lit for its program**, and gain an efficiency of **11.25% per year**.
- Additionally, by adding an additional, **user-controlled shading device**, the space can adapt to be suitable for its **non-daylit needs**.