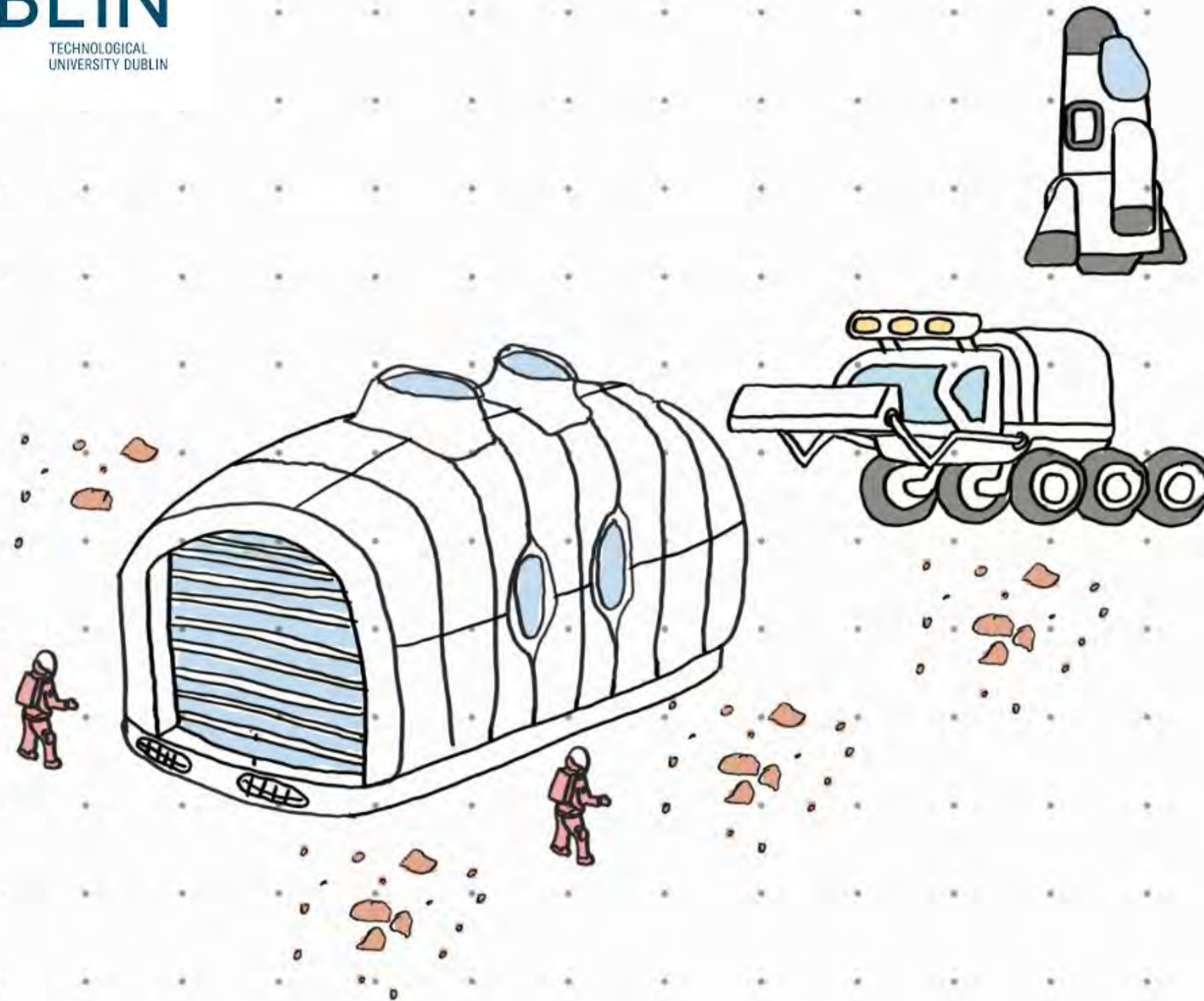


TDS - Assignment T5.1

Micro Thesis Research Documentation Esquisse



Liam Deguara
C17336913
DT175 04
24/03/2021

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HALLEY VI



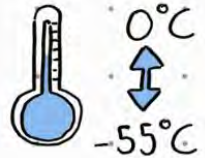
SNOW



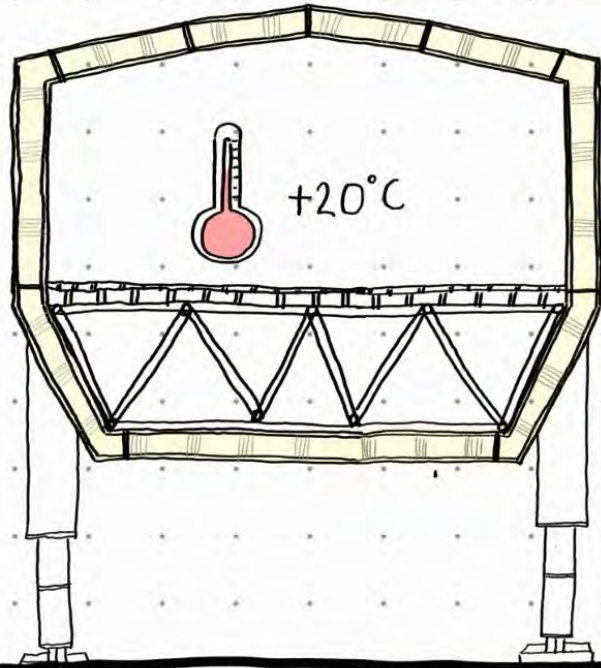
STRONG WIND



FREEZING TEMPERATURES



0°C
-55°C



+20°C

DRY AIR

MARTIAN HOUSE



FLUCTUATING FREEZING TEMPERATURES

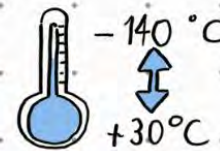


RADIATION

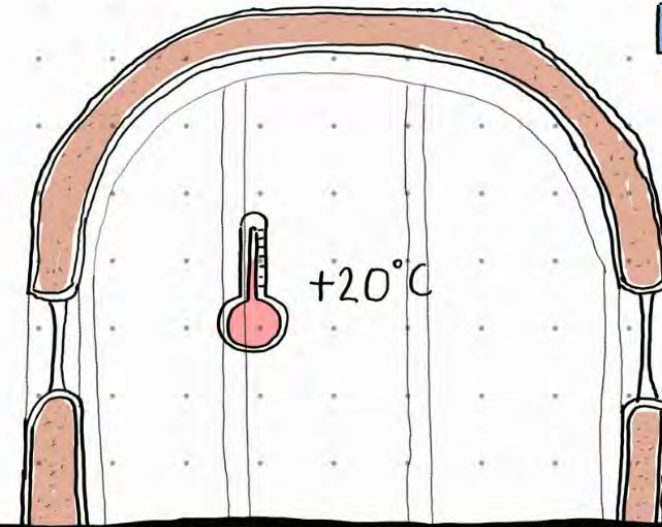


DUST STORMS

LOW PRESSURE



-140°C
+30°C

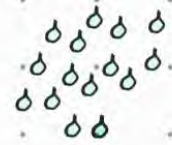


+20°C

BRUNT ICE SHELF, ANTARCTICA
 WEATHER DATA 27/02/2021 14:59 UTC:
 TEMPERATURE: -7.0°C HUMIDITY: 95%
 PRESSURE: 981.24 Pa
 WIND SPEED: 7 kts
 WIND DIRECTION: 101°
 MAX GUST: 8.4 kts
 IN LAST 10 MINS.

CURIOSITY ROVER:
 WEATHER DATA 24/02/2021:
 (SOL 3041)
 TEMPERATURE: -13 - -73°C
 PRESSURE: 828 Pa

TYPICAL HOUSE

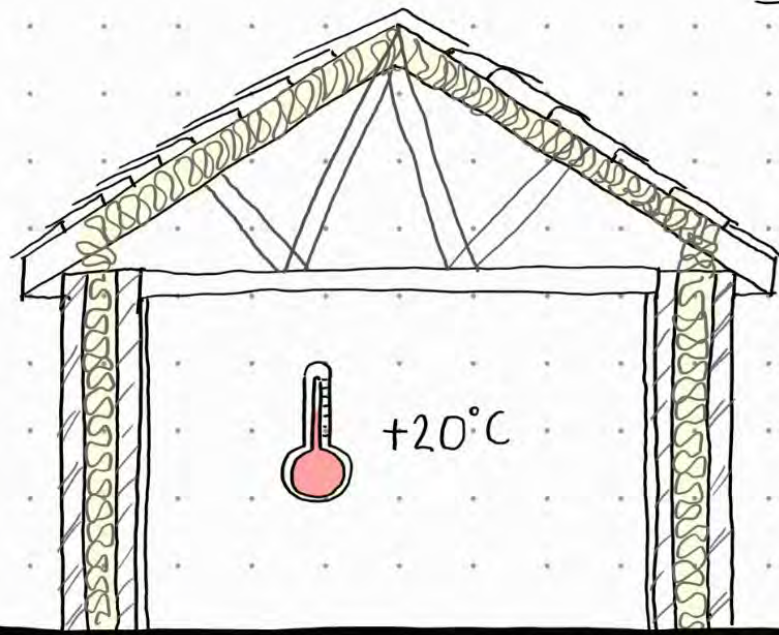



RAIN



COLD  HEAT
FREEZE ↔ THAW

 WIND



 +20°C
↕
+2°C

 +20°C

DUBLIN

WEATHER DATA 27/02/2021 15:00 GMT:

TEMPERATURE: 11.0°C HUMIDITY: 64%

PRESSURE: 1041 hPa

WIND SPEED: 3 kts

WIND DIRECTION: SW

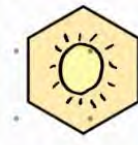
MAX GUST: —

(IN LAST 10 MINS)

OSOYOOS DESERT CENTRE, CANADA





COLD WINTER
TEMPERATURES

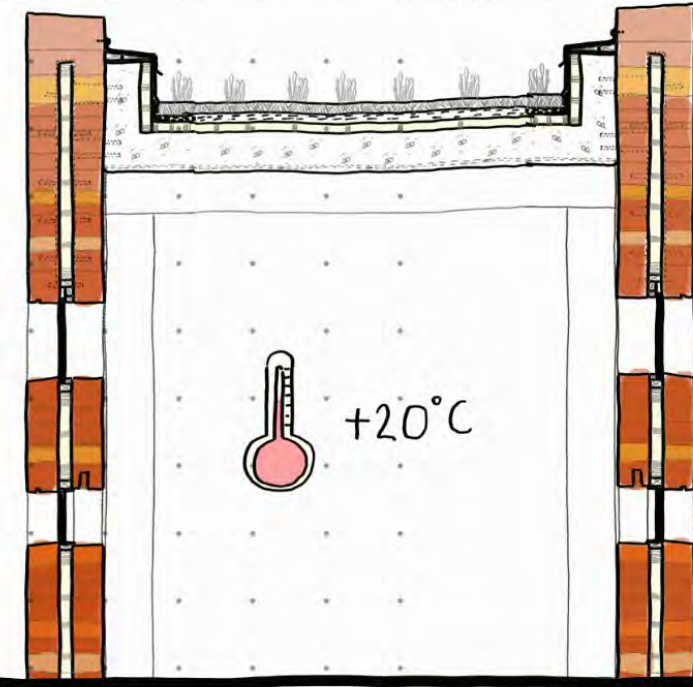


HOT SUMMER
TEMPERATURES

 STRONG WIND

 +30°C
↕
+1°C

 +20°C



OSOYOOS

WEATHER DATA 19/03/2021 10:00 GMT:

TEMPERATURE: 7.0°C HUMIDITY: 88%

PRESSURE: 1012 hPa

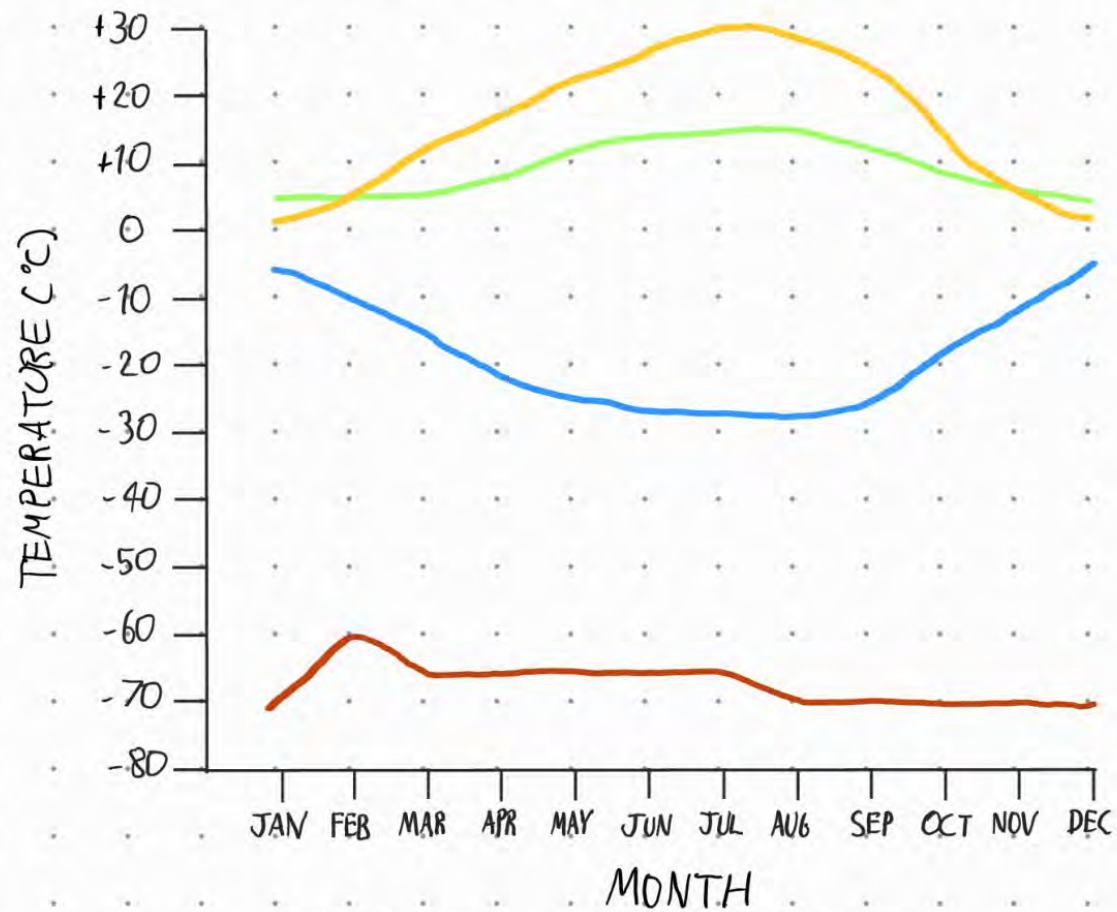
WIND SPEED: 4 kph

WIND DIRECTION: NW

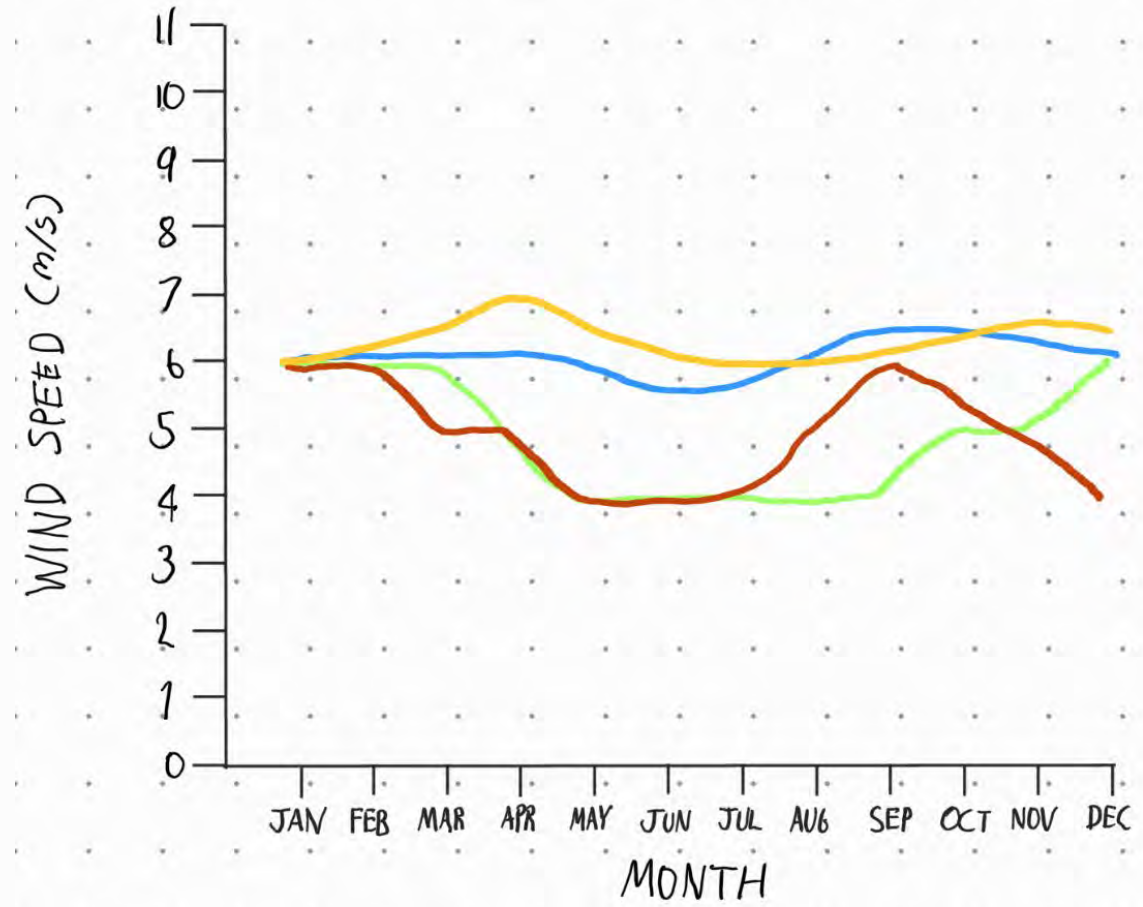
MAX GUST: —

(IN LAST 10 MINS)

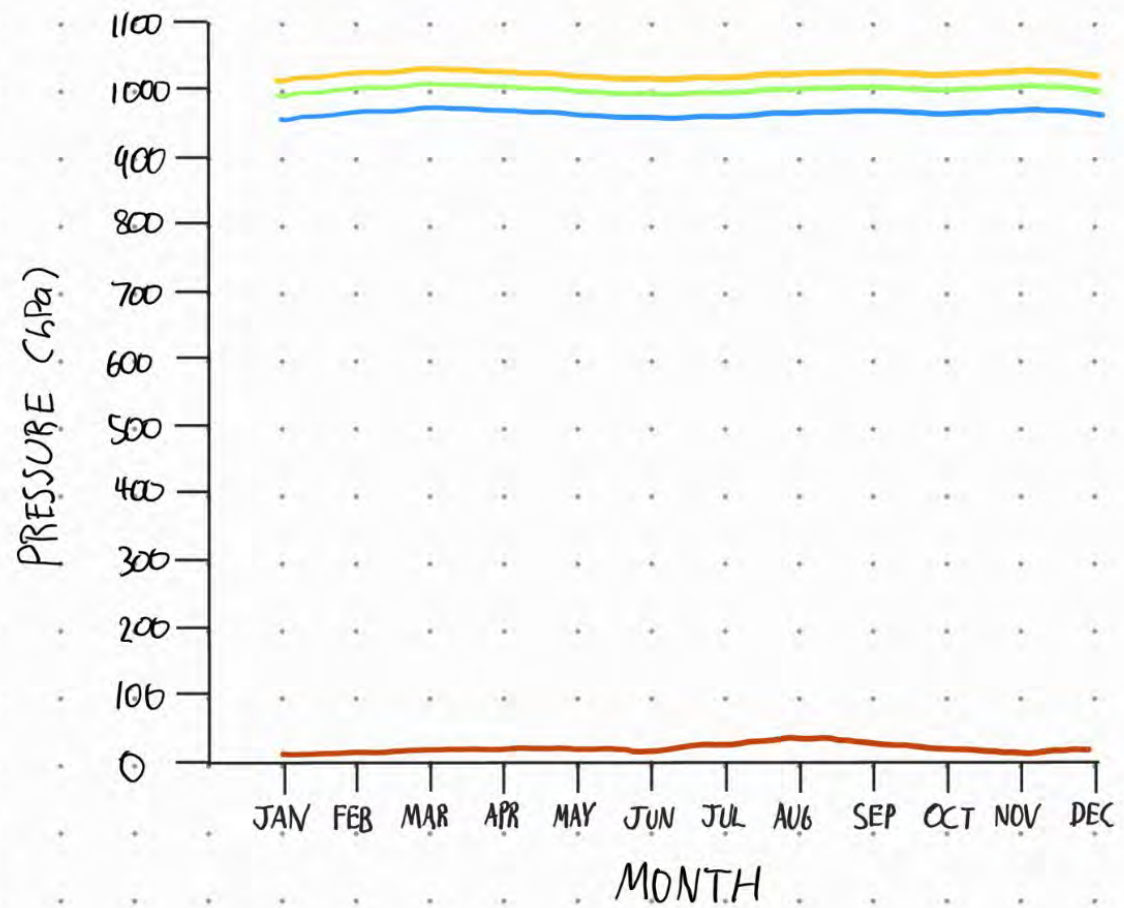
ANNUAL AVERAGE TEMPERATURE (2020)



ANNUAL AVERAGE WIND SPEED (2020)

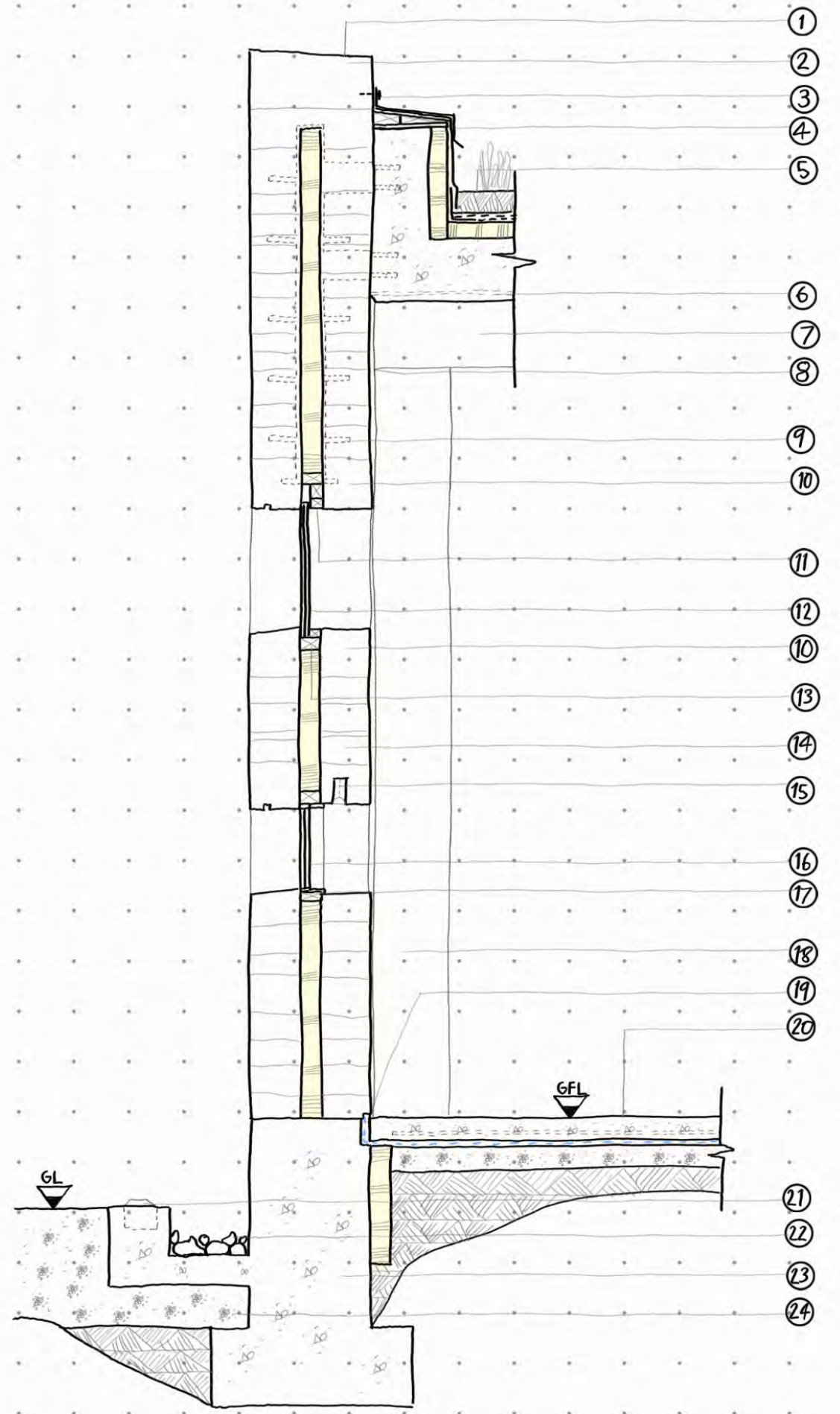
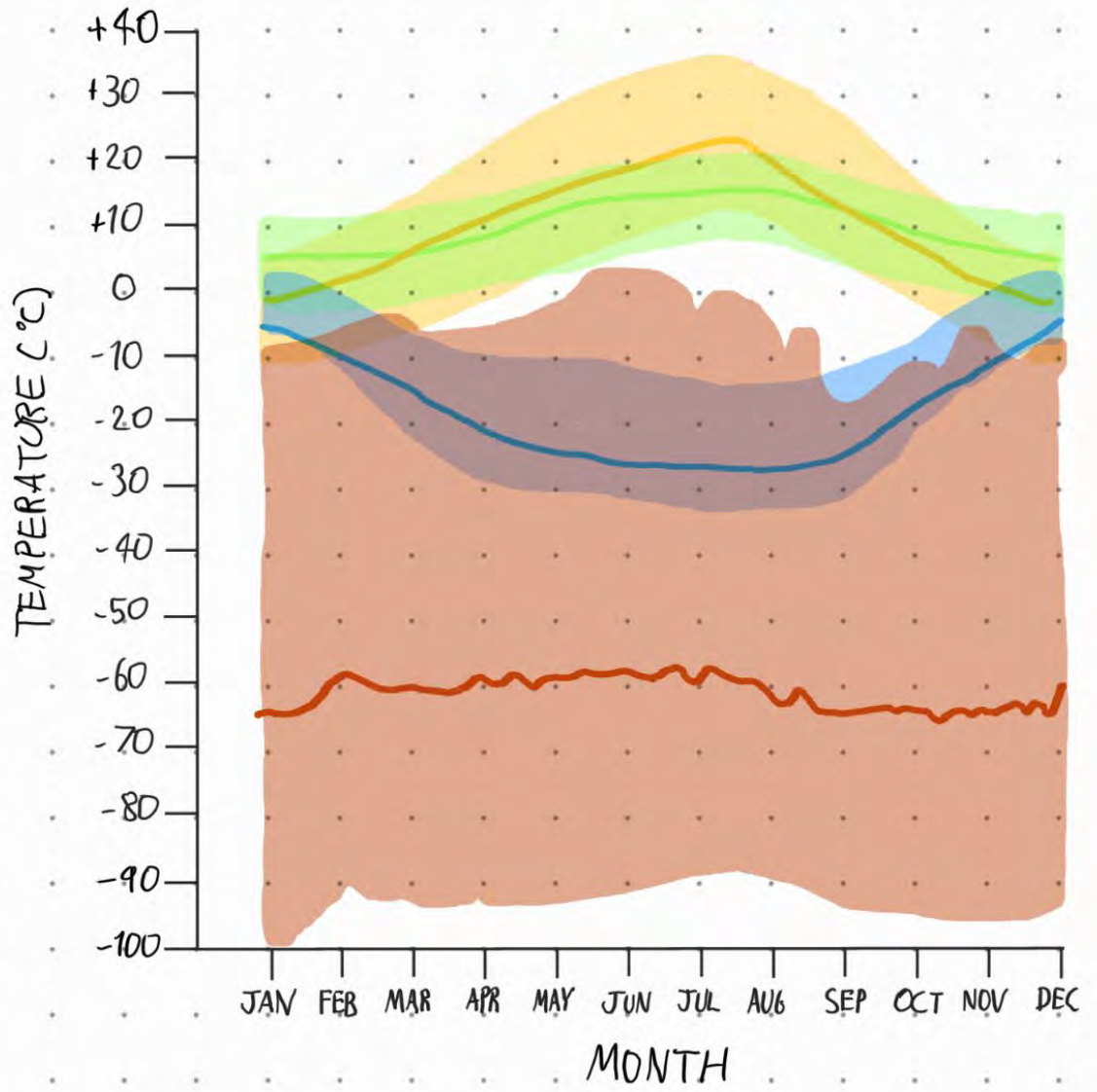


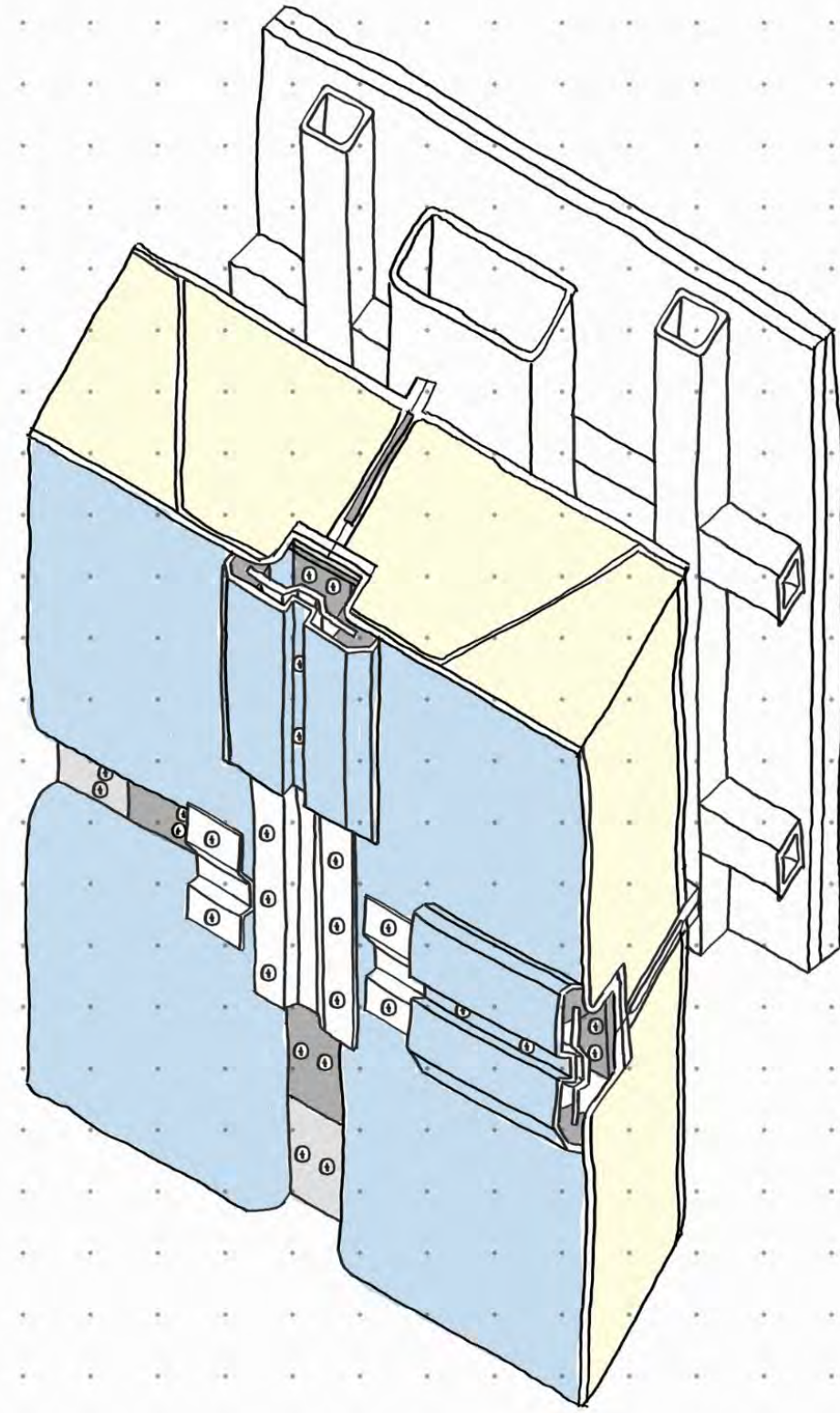
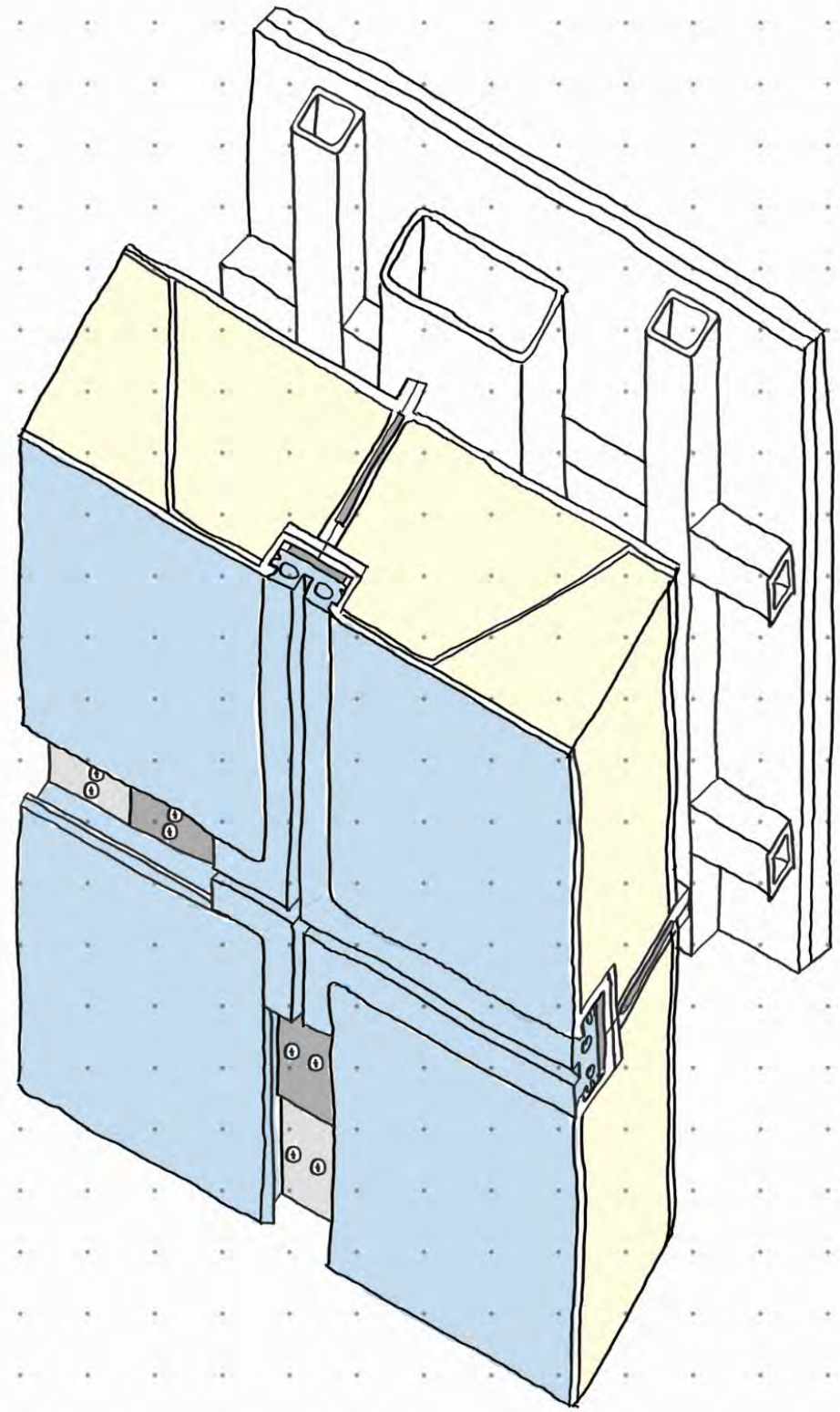
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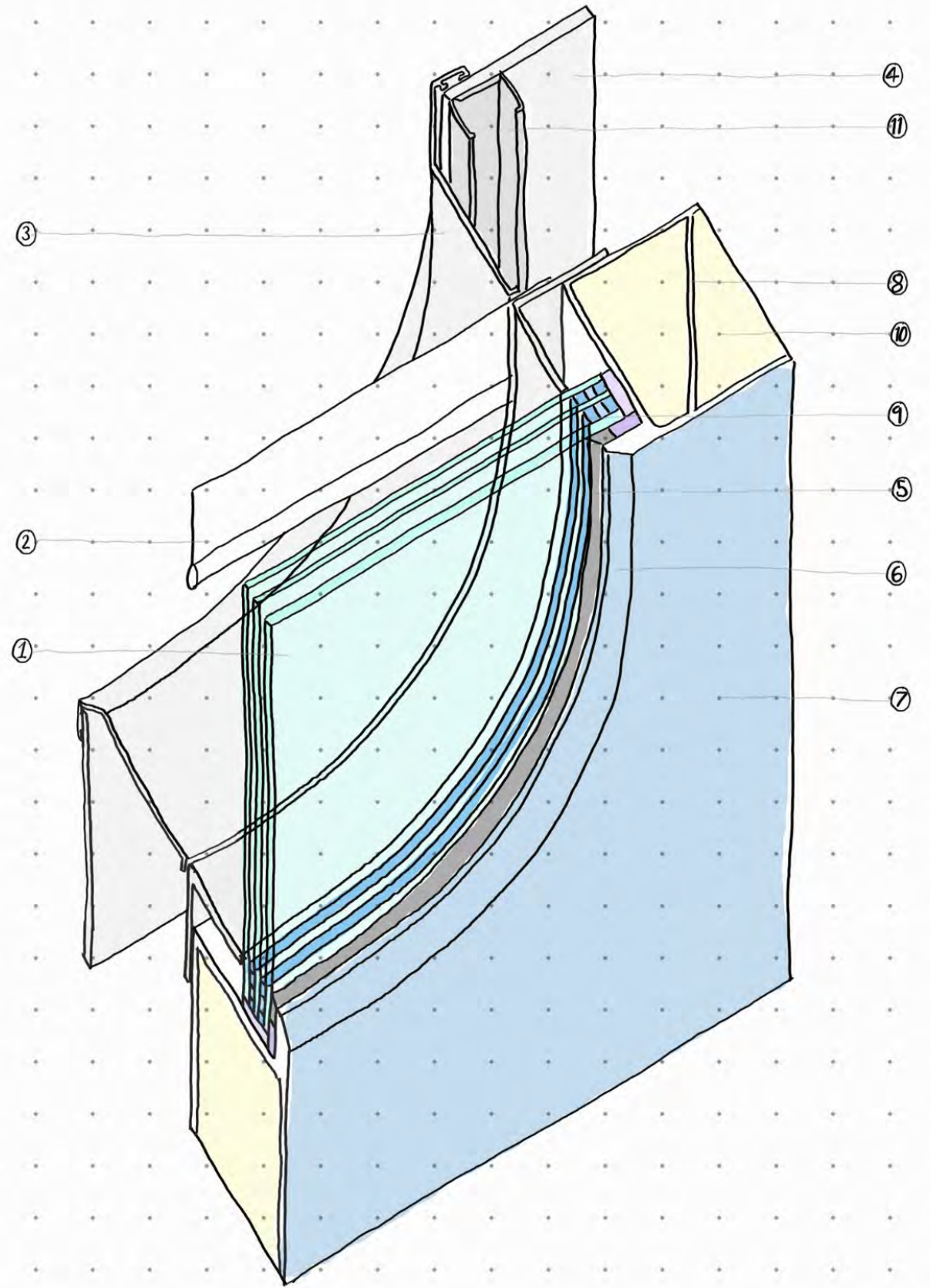
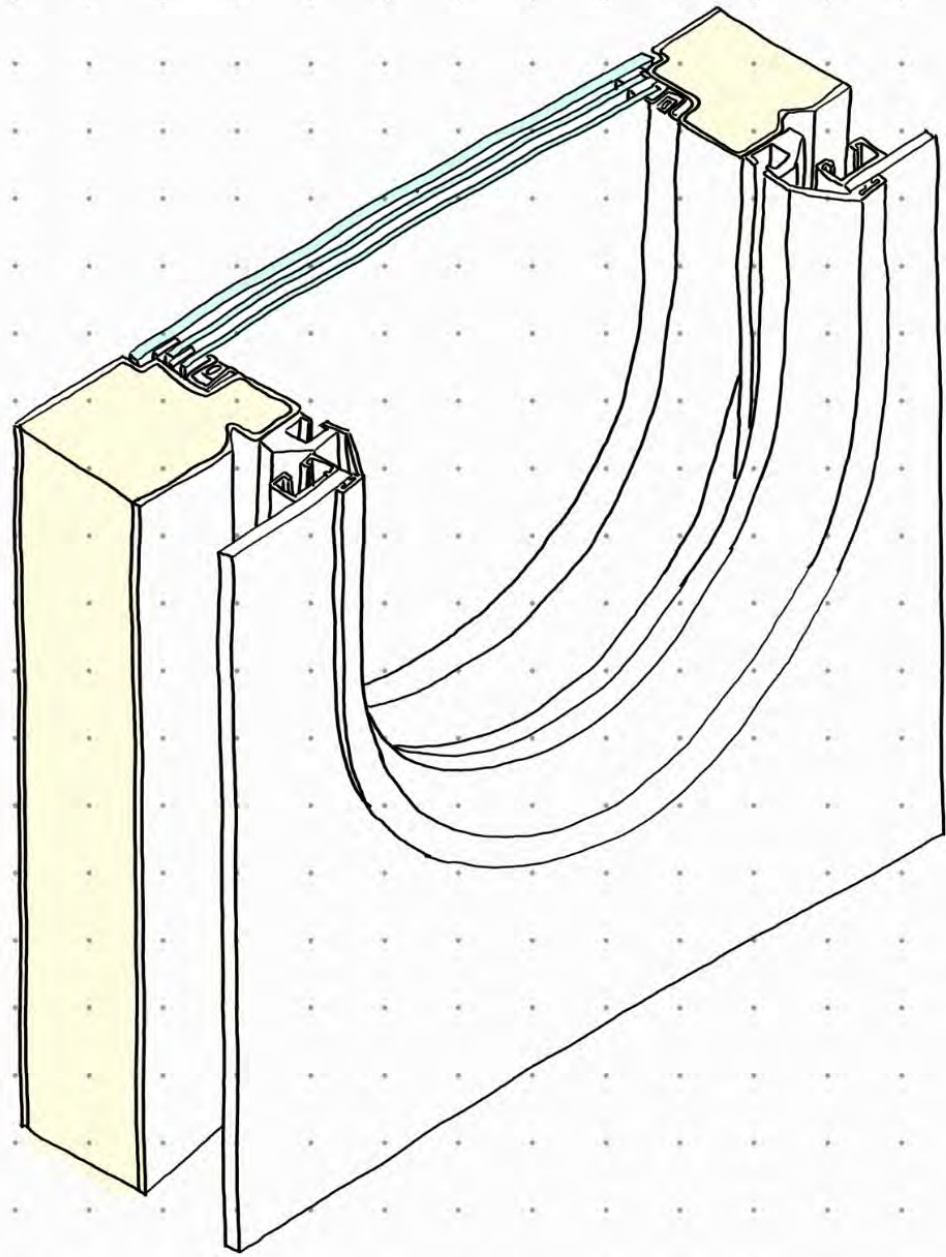


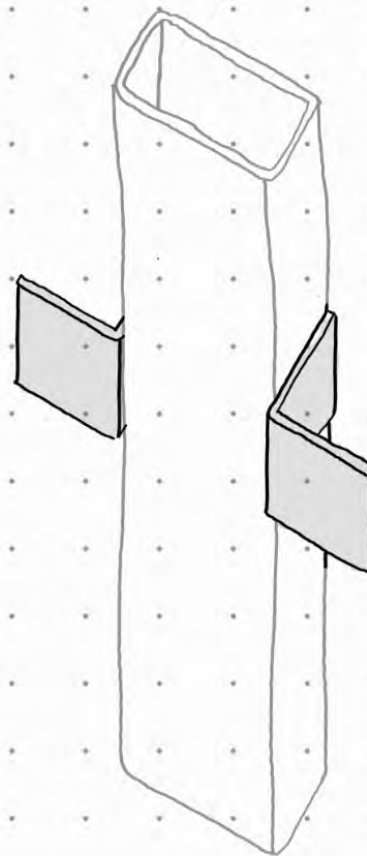
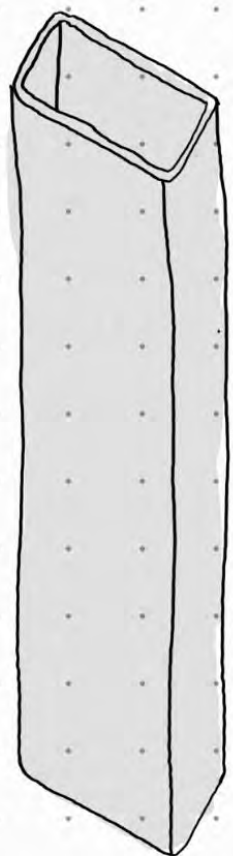
- OSOYDOS DESERT
- DUBLIN
- ANTARCTICA
- MARS

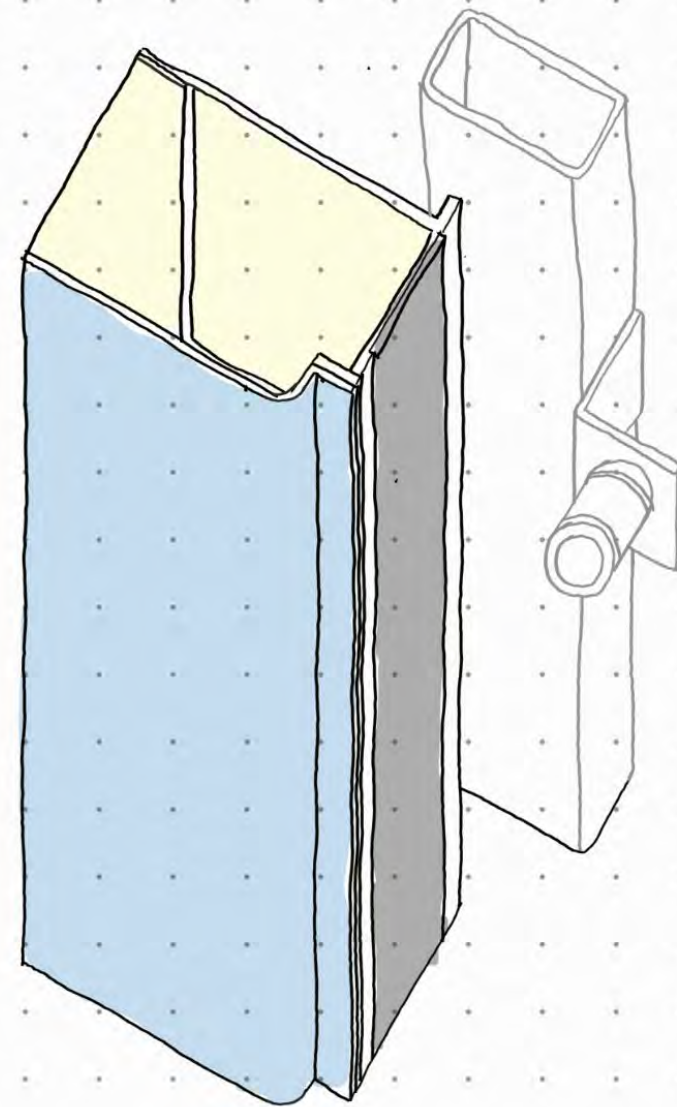
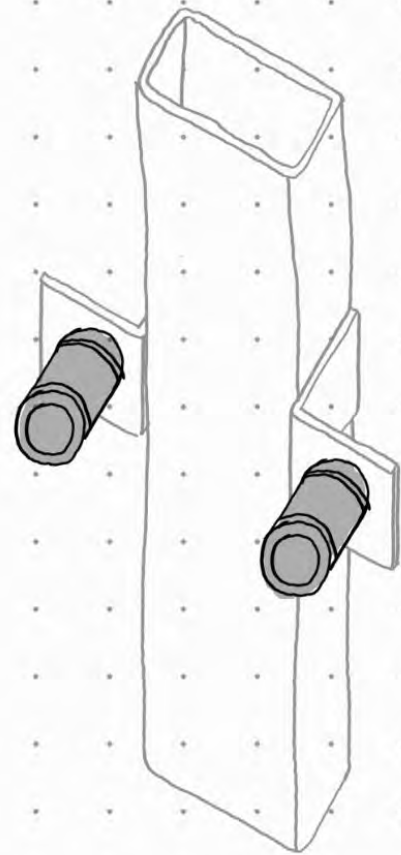
AVERAGE ANNUAL TEMPERATURE

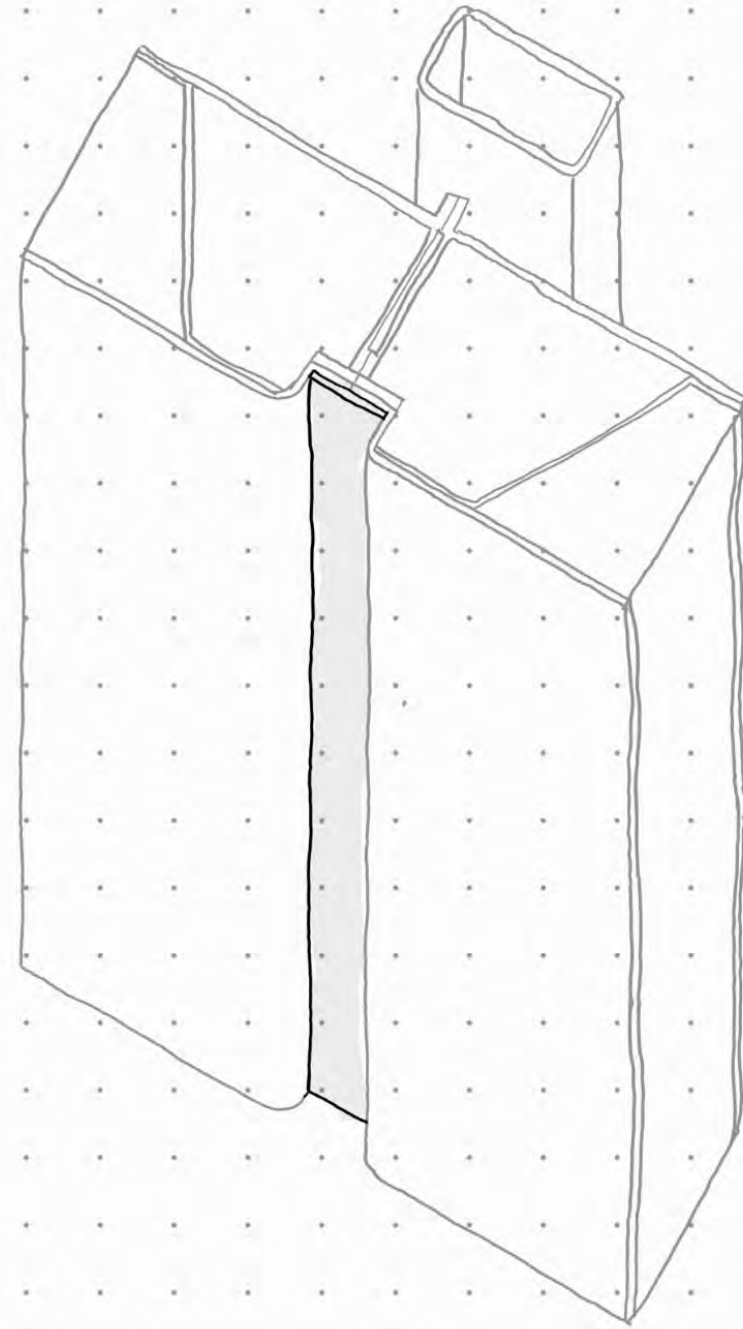
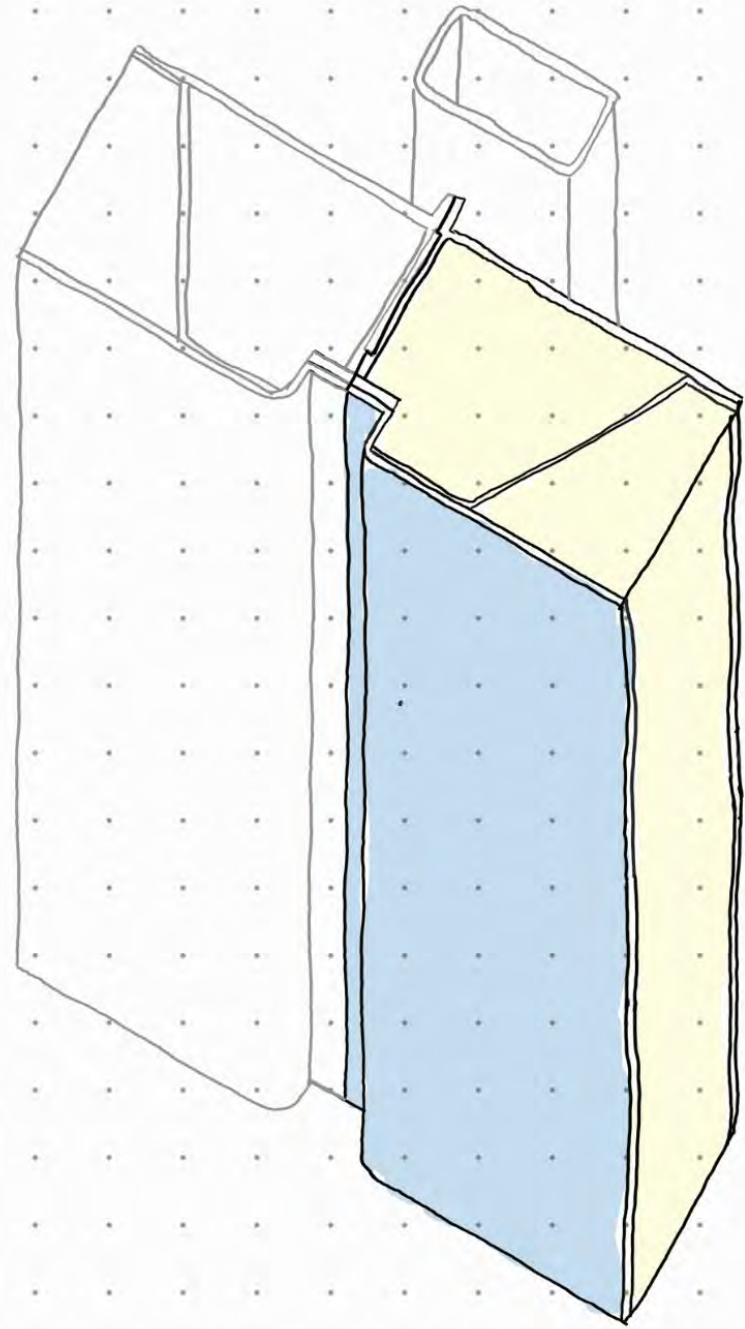


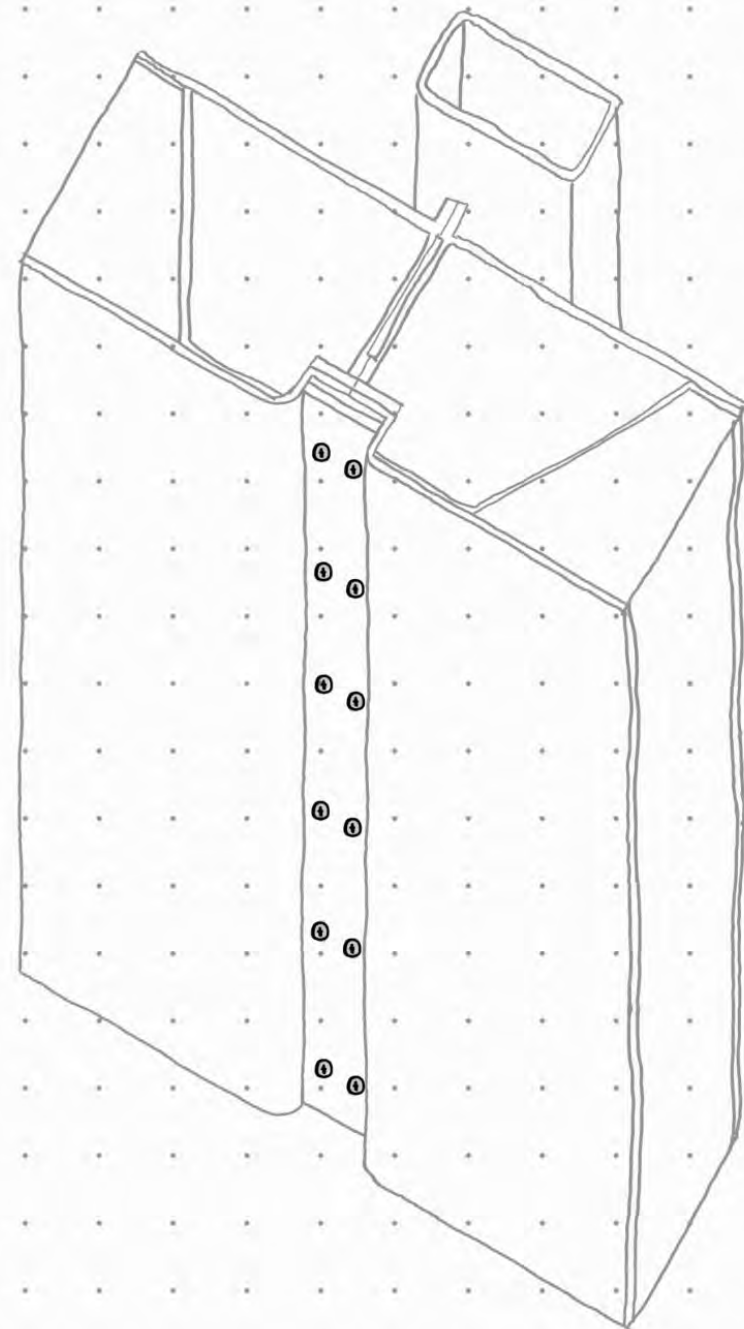
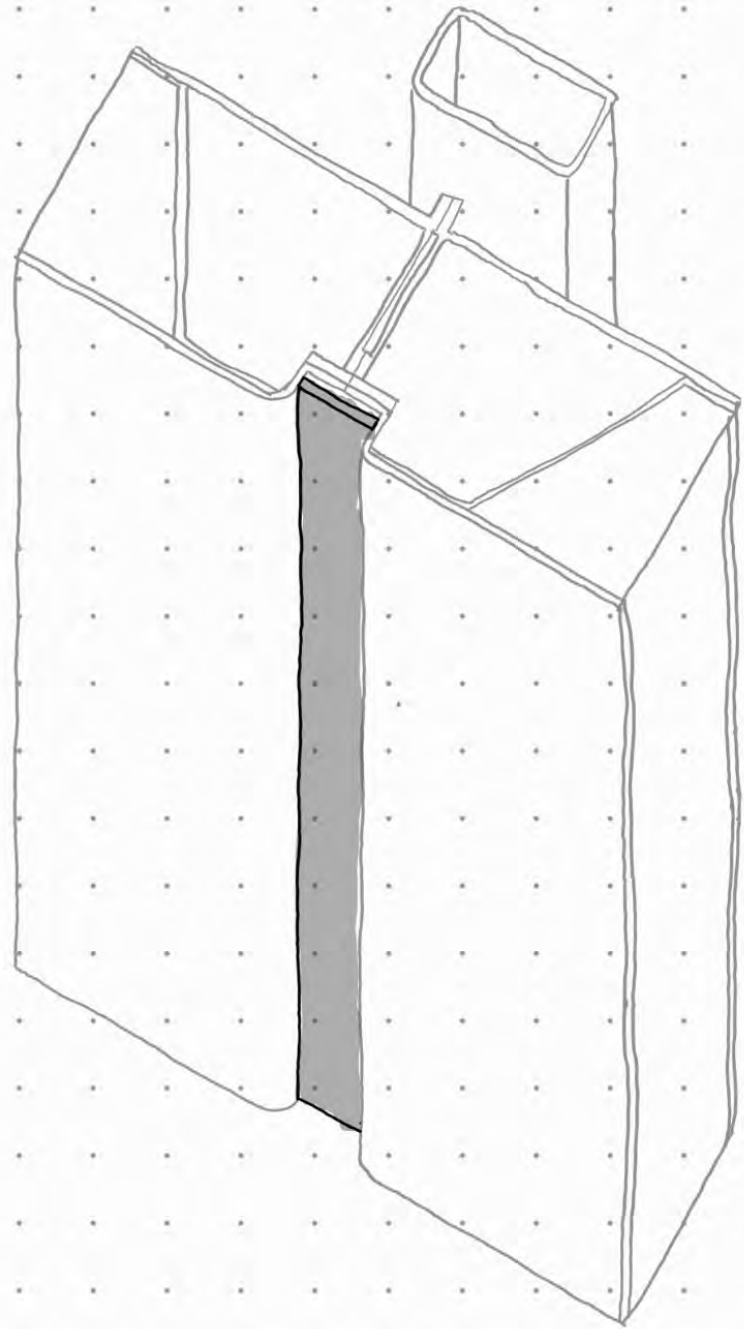


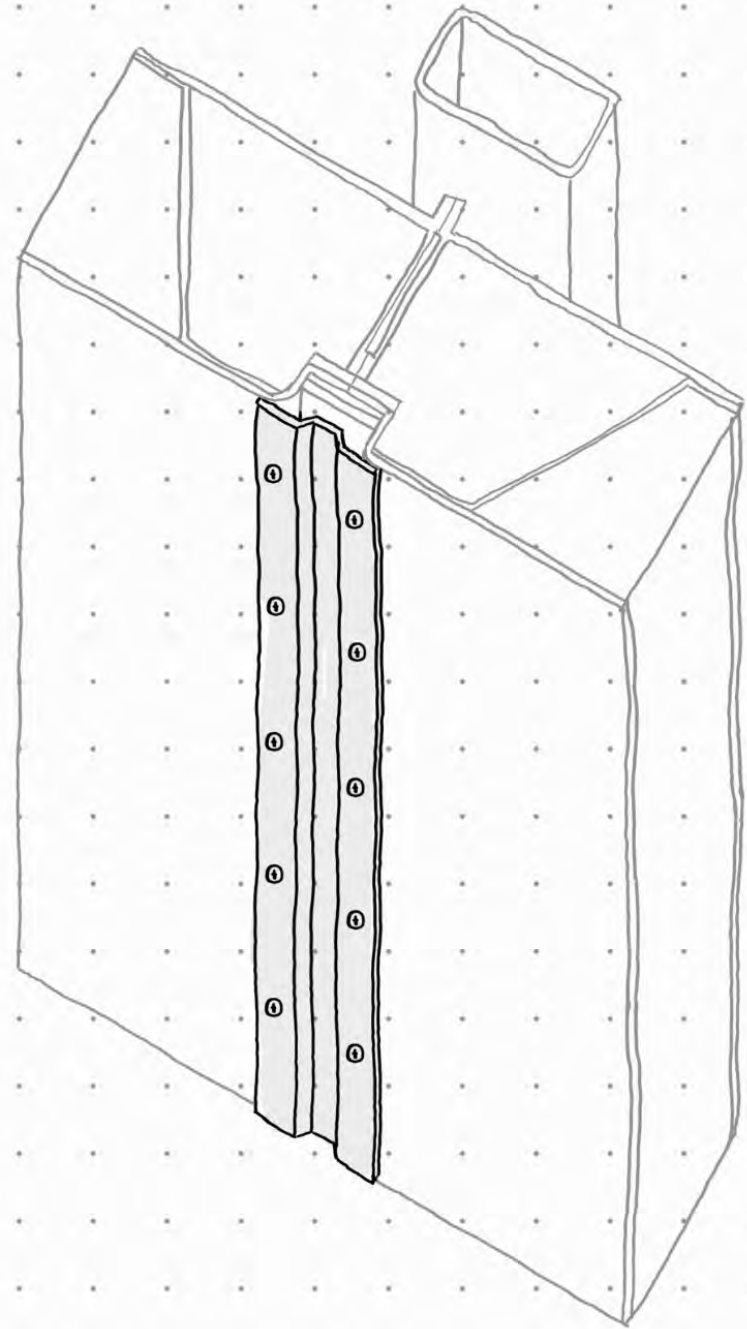


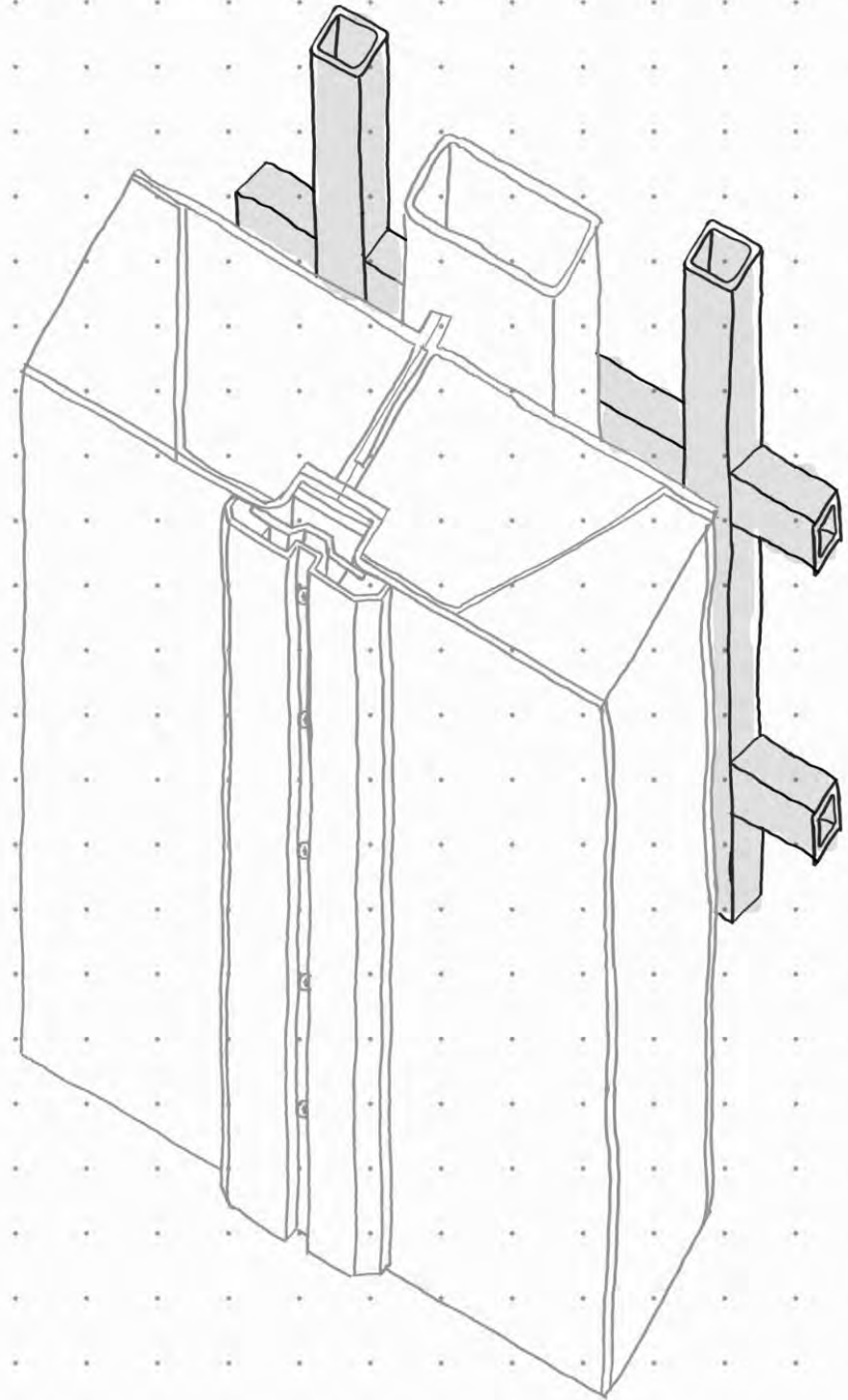
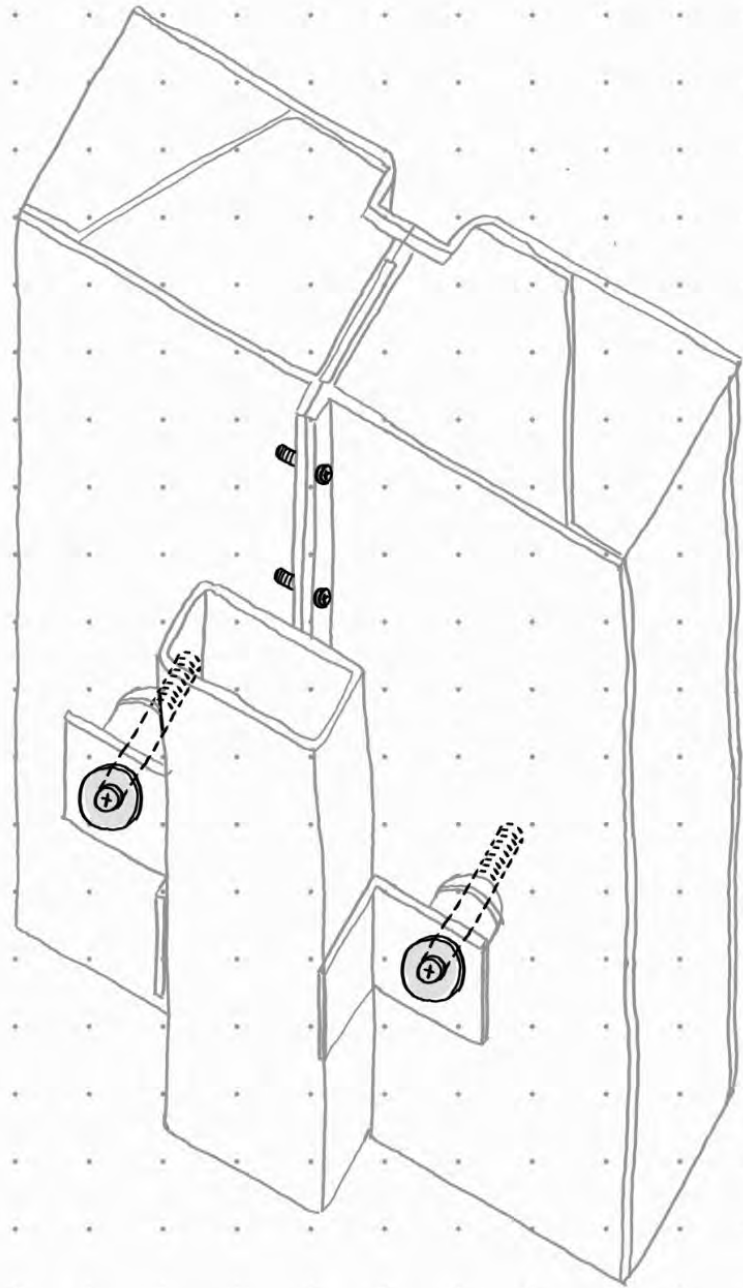


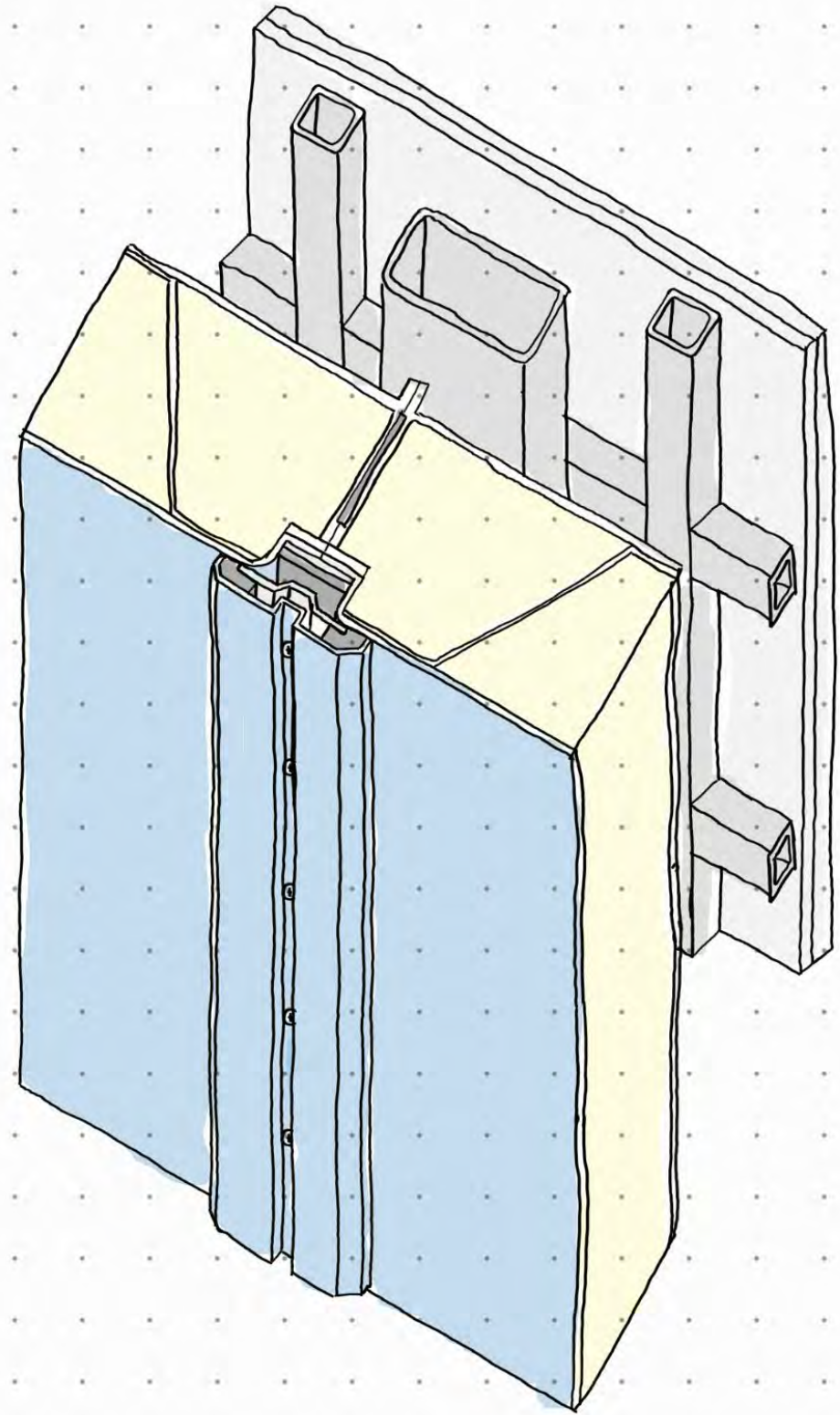
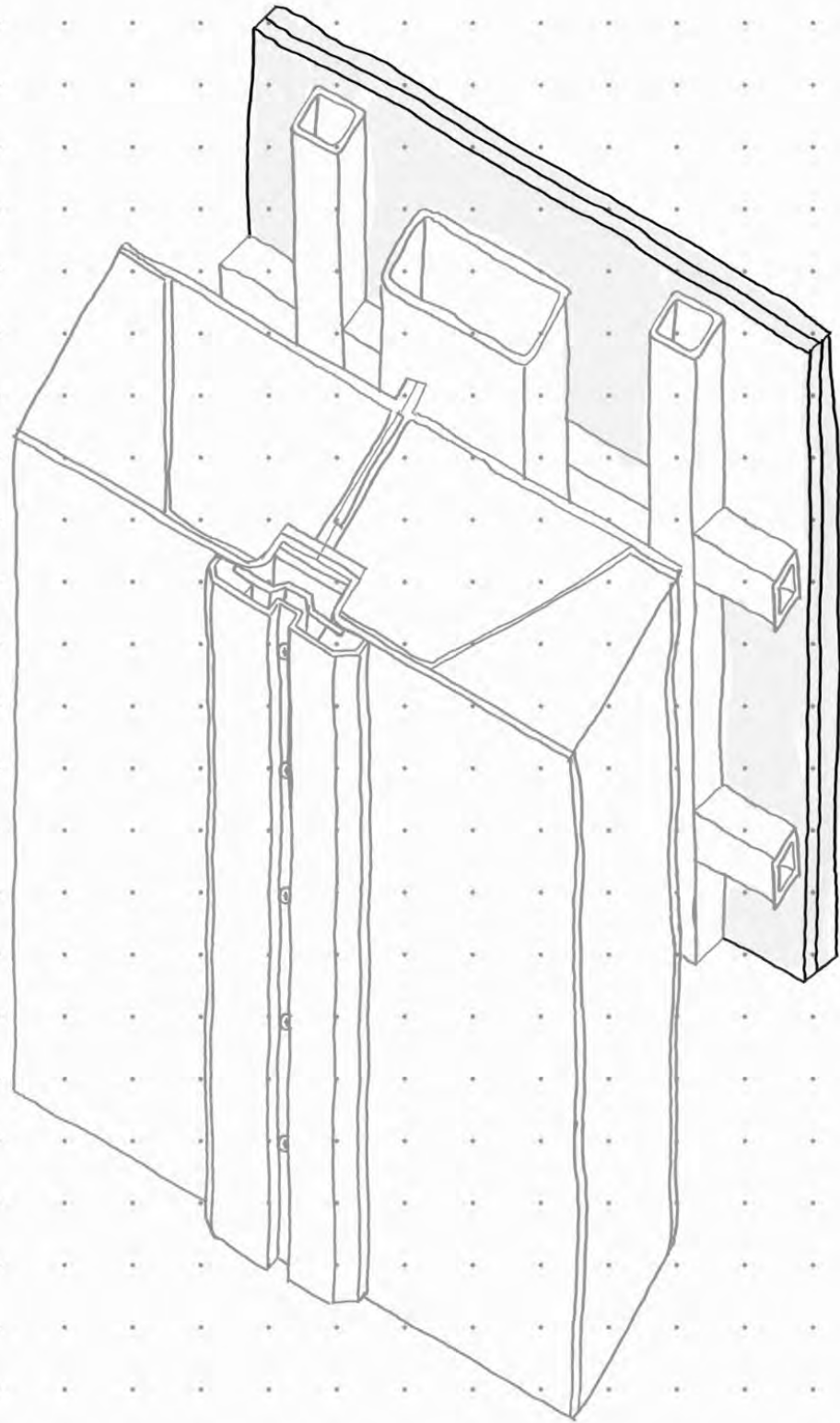


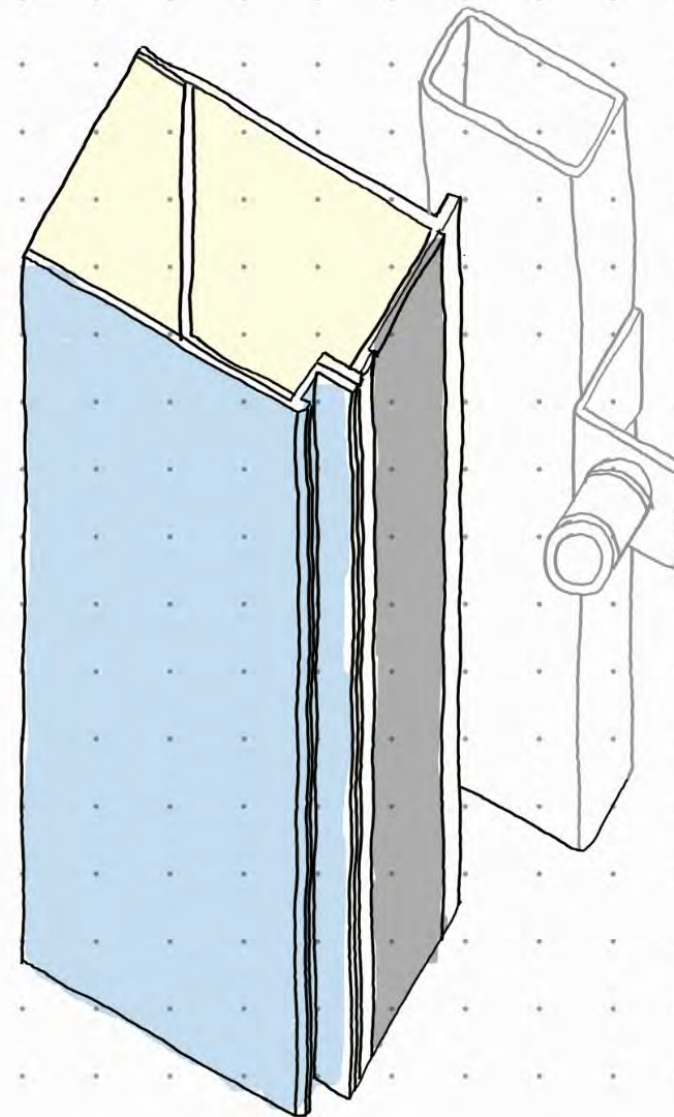
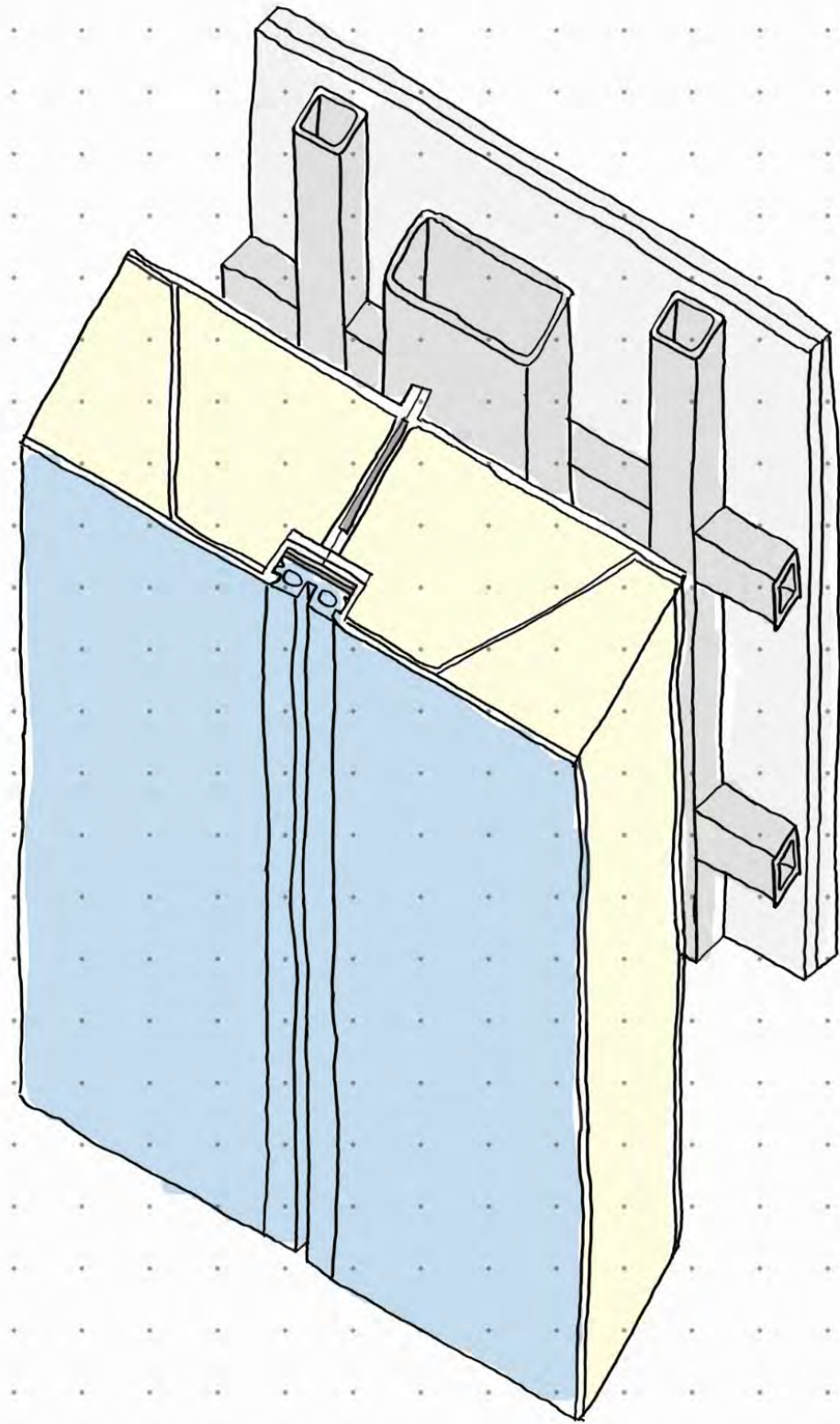


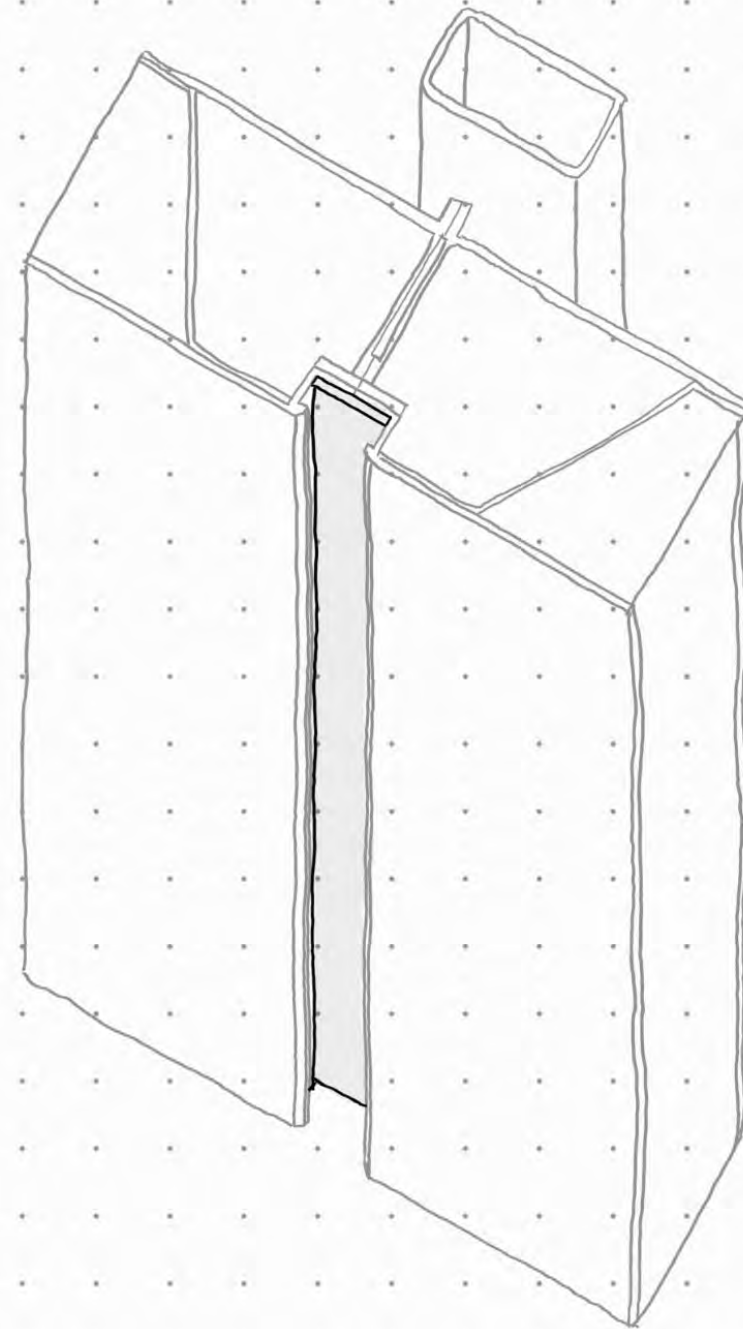
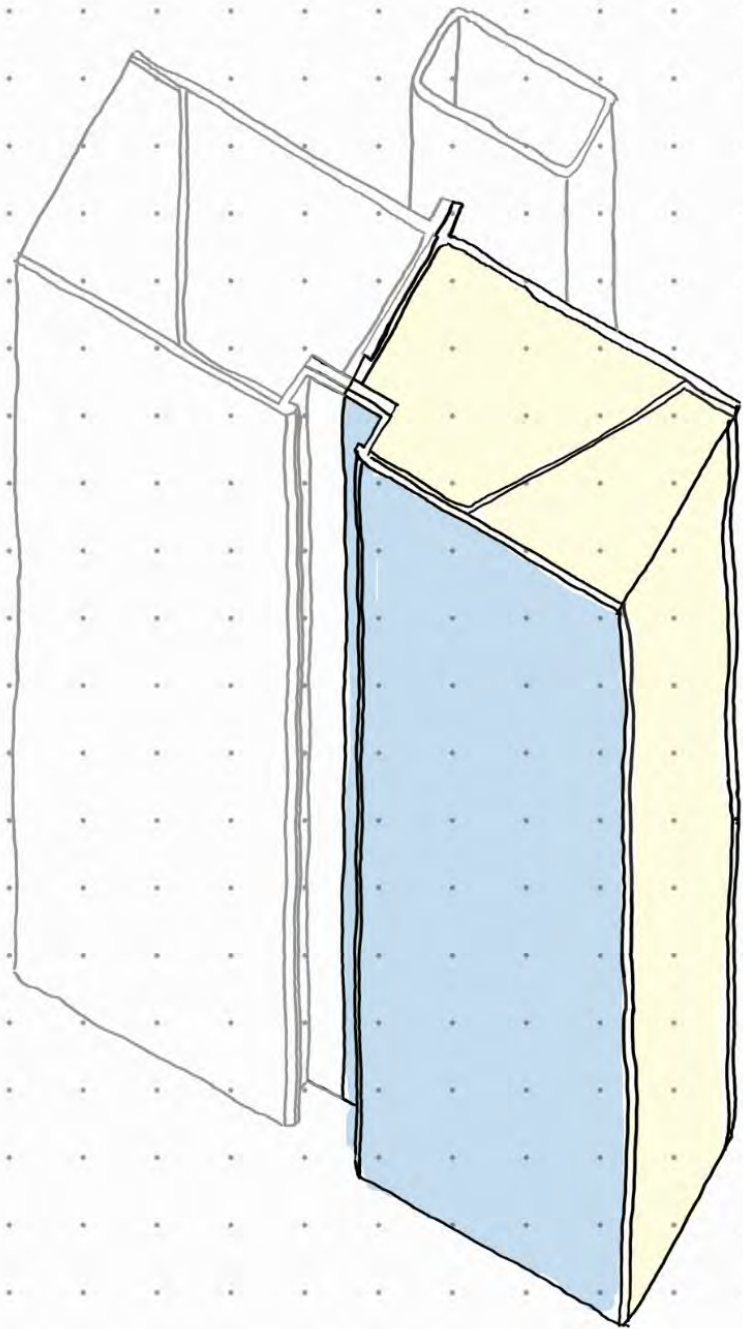


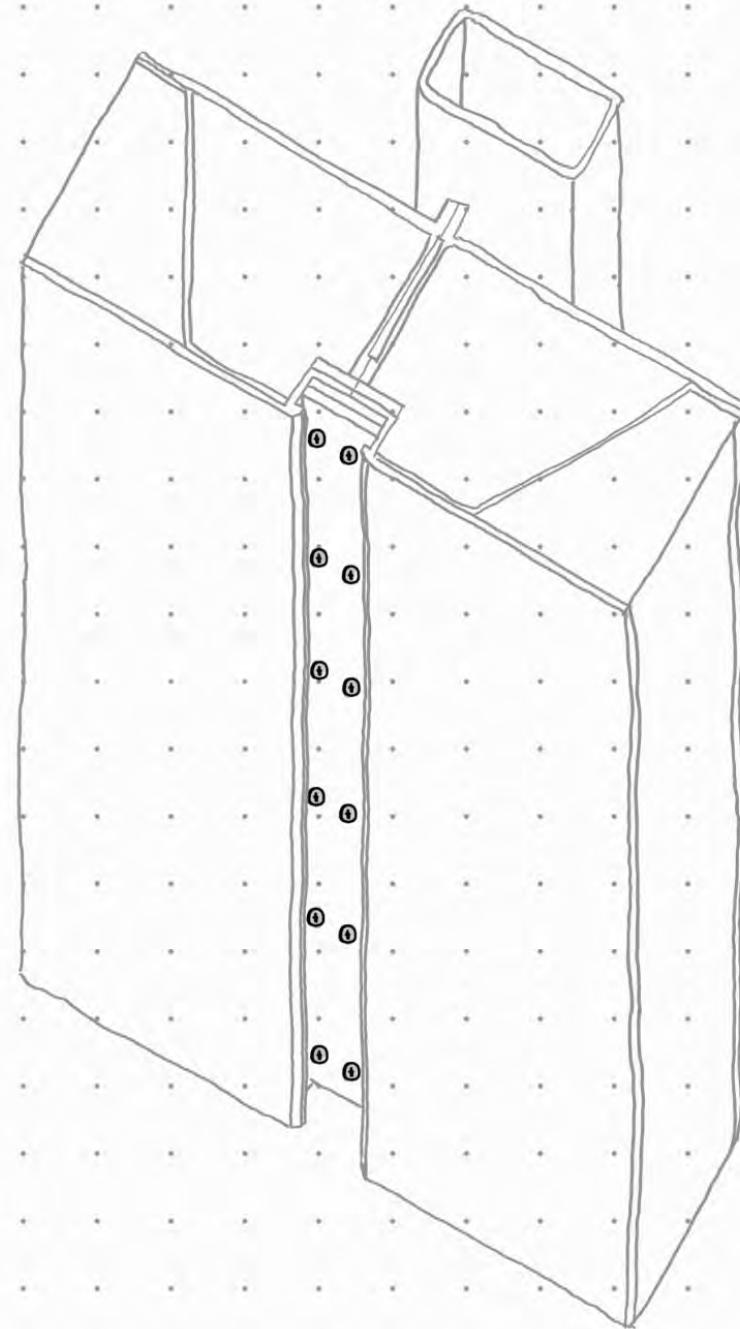
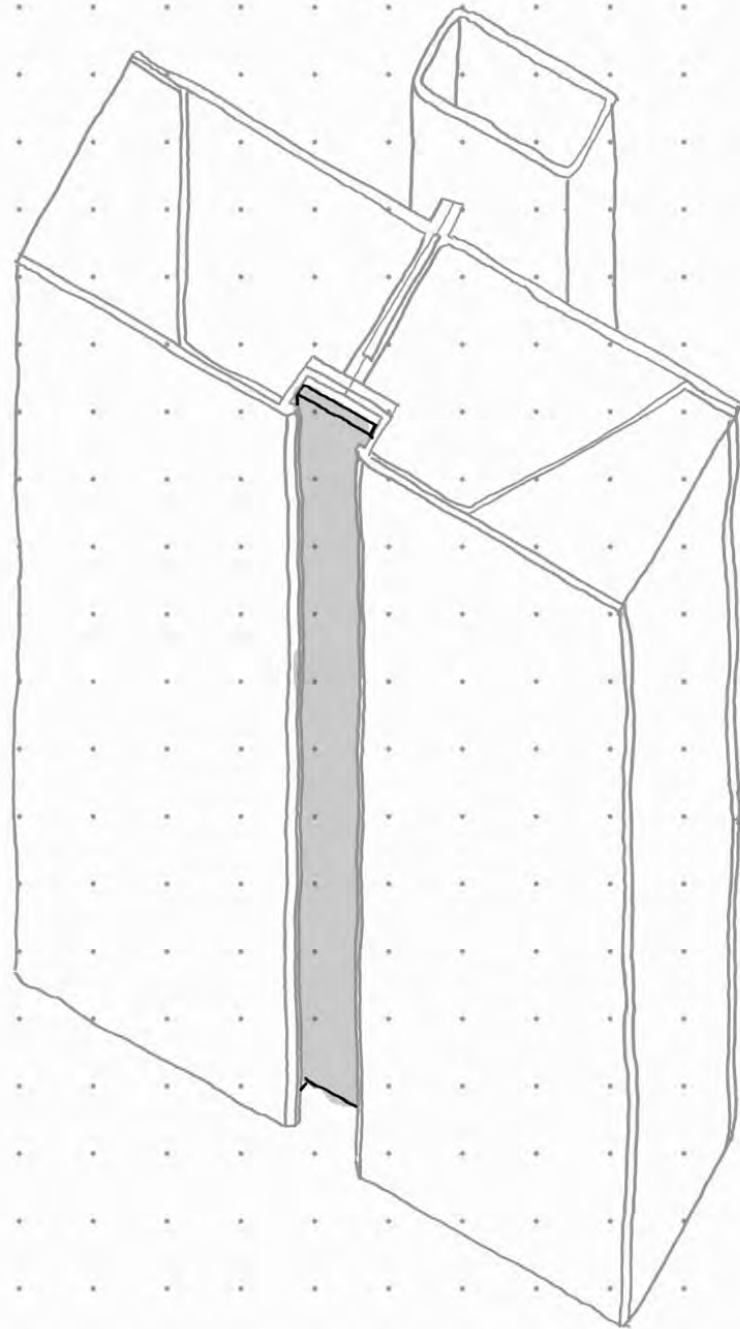


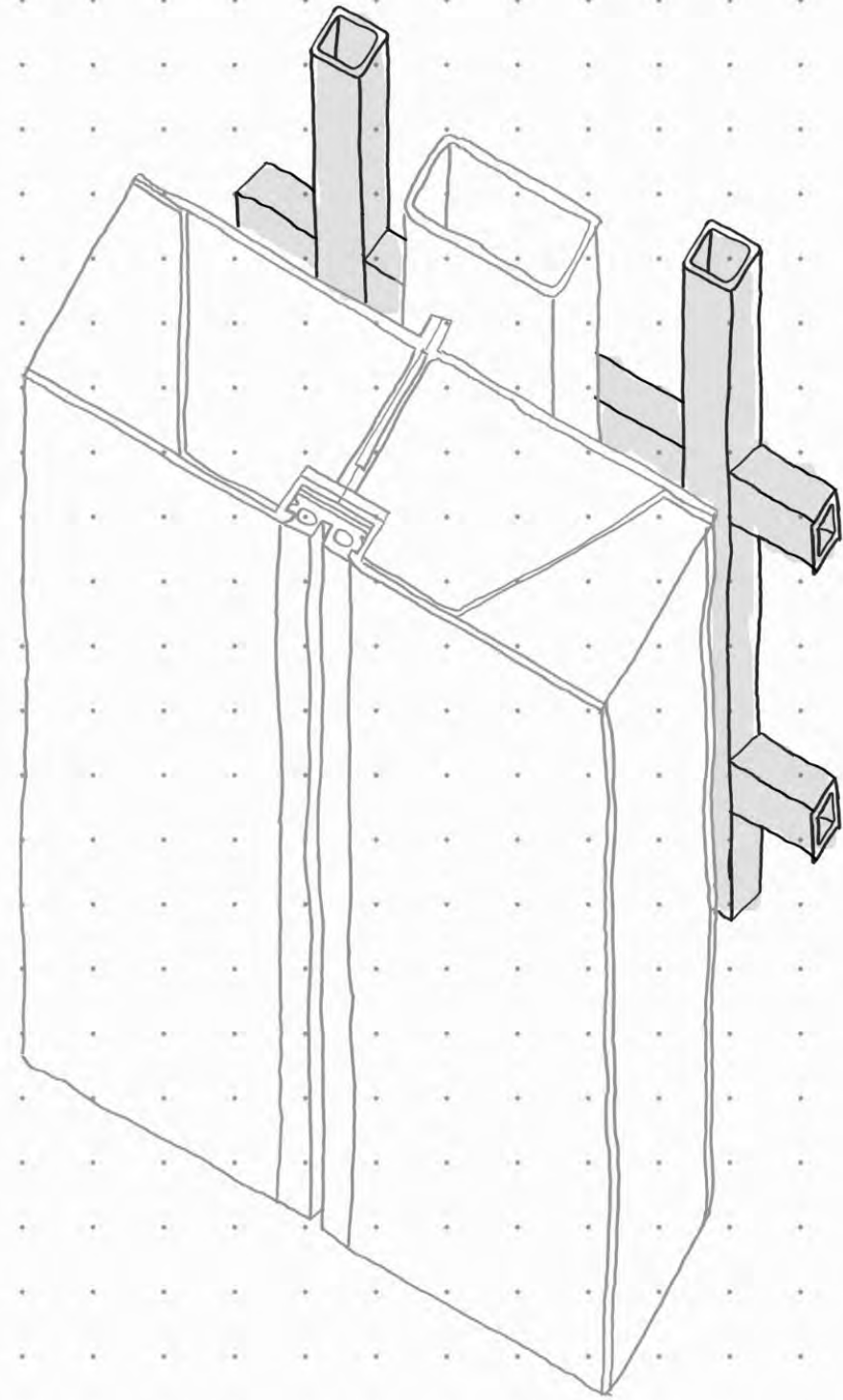
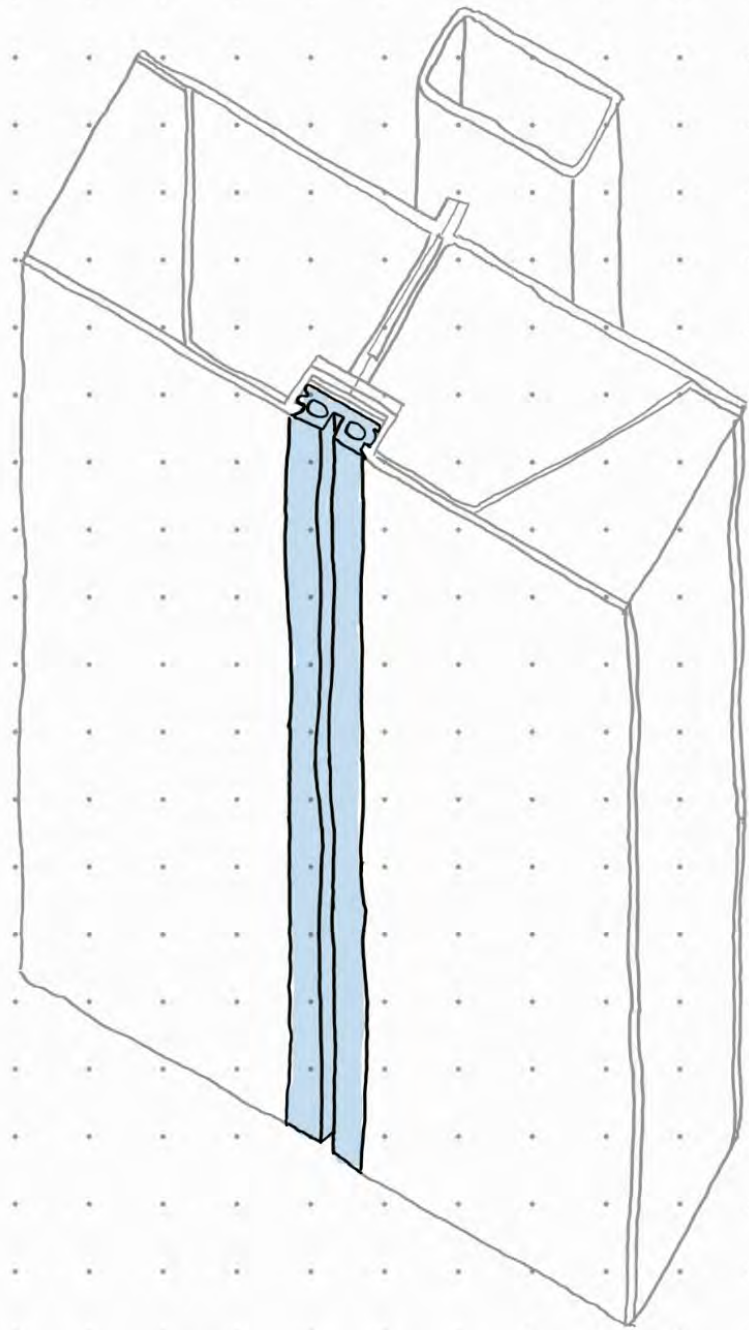


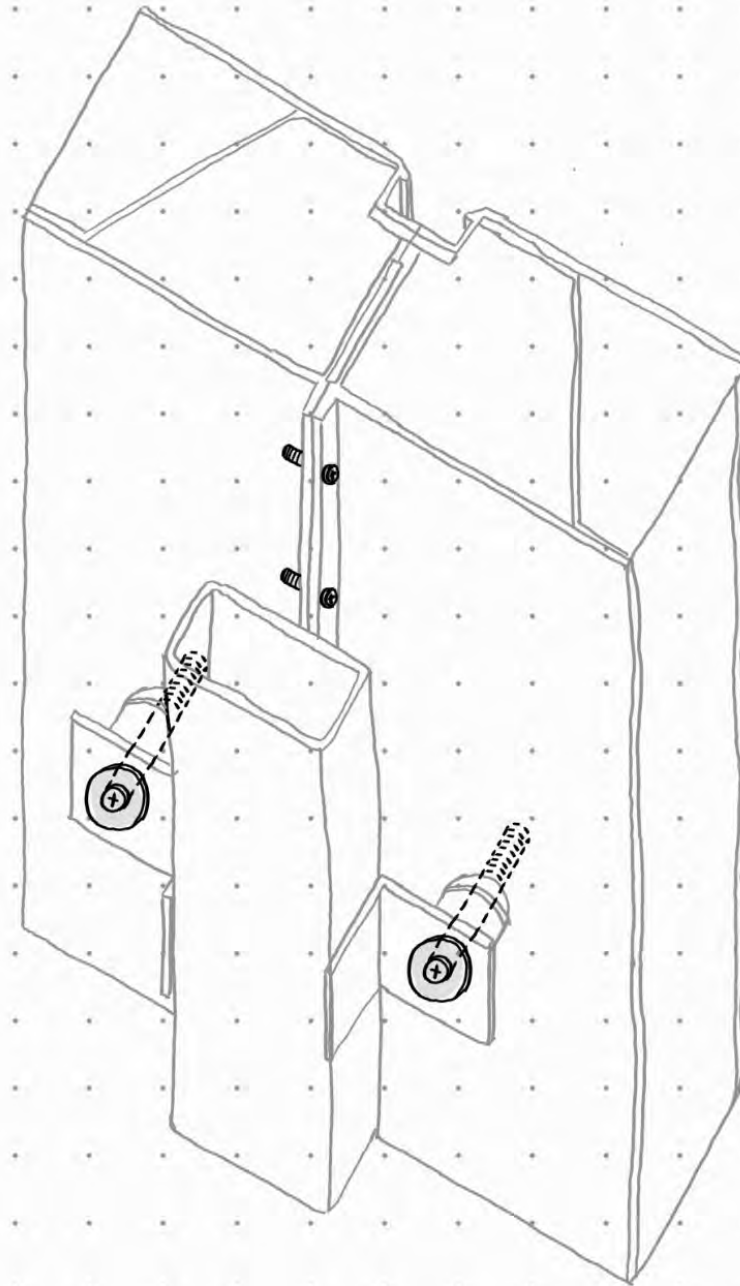
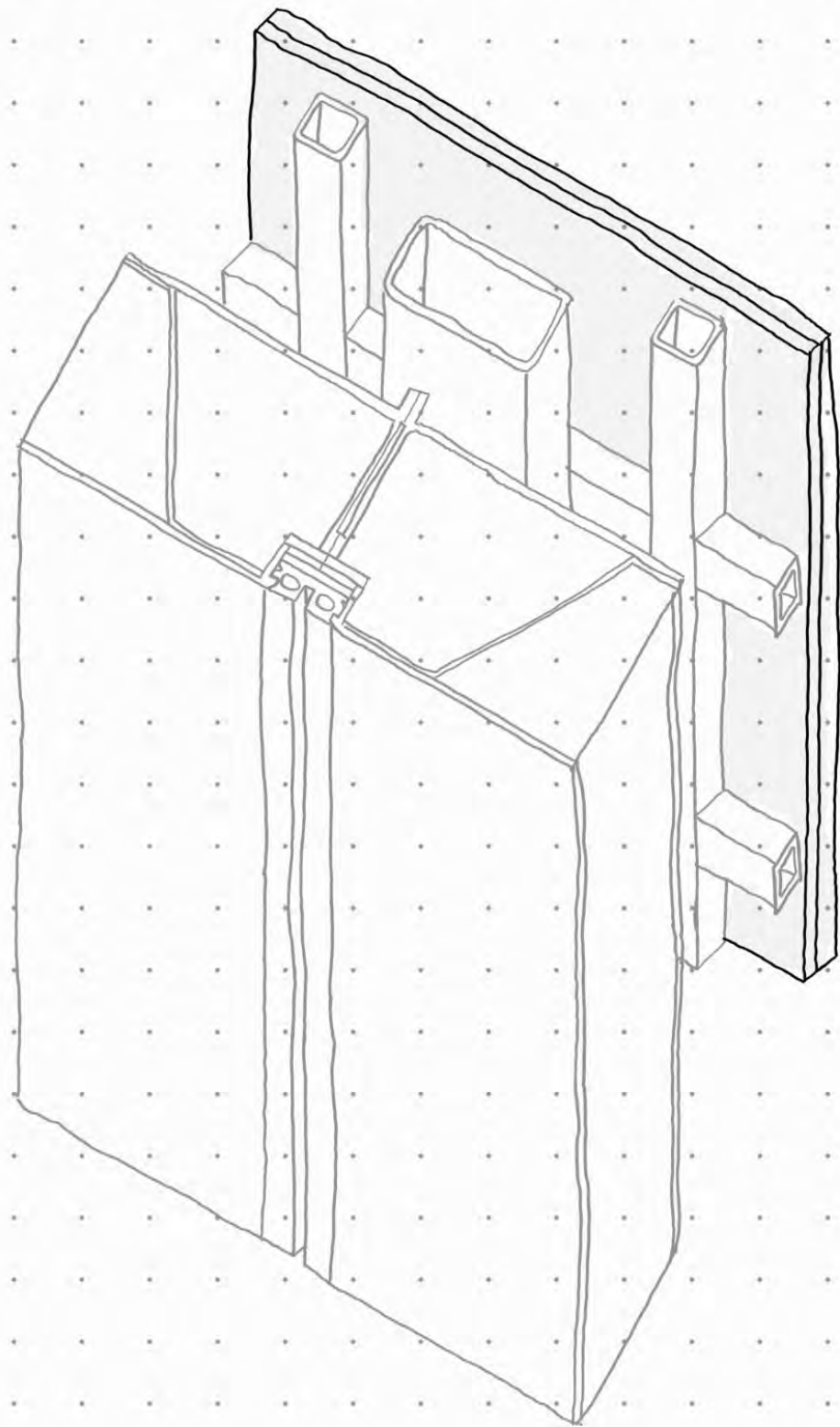




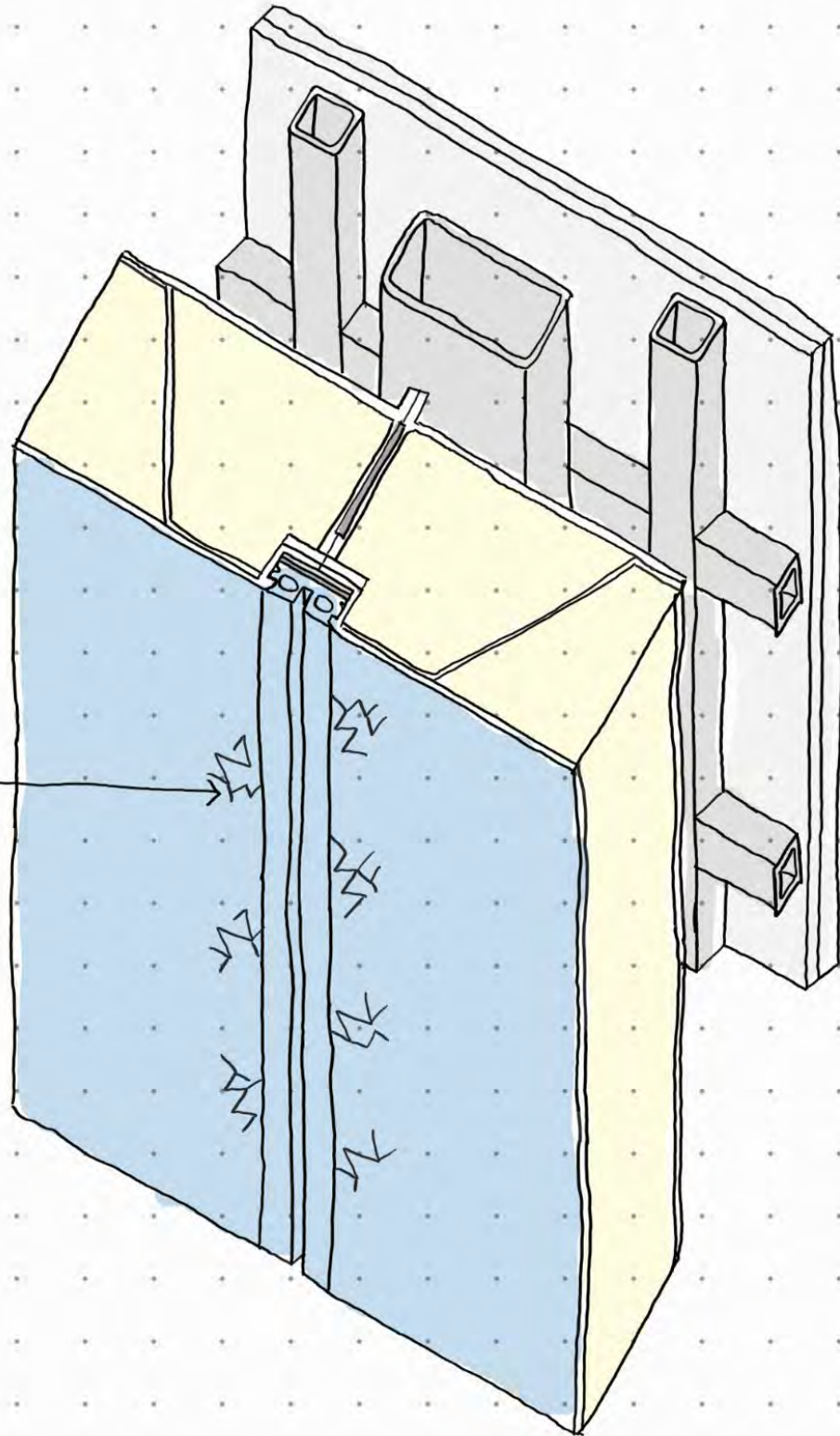








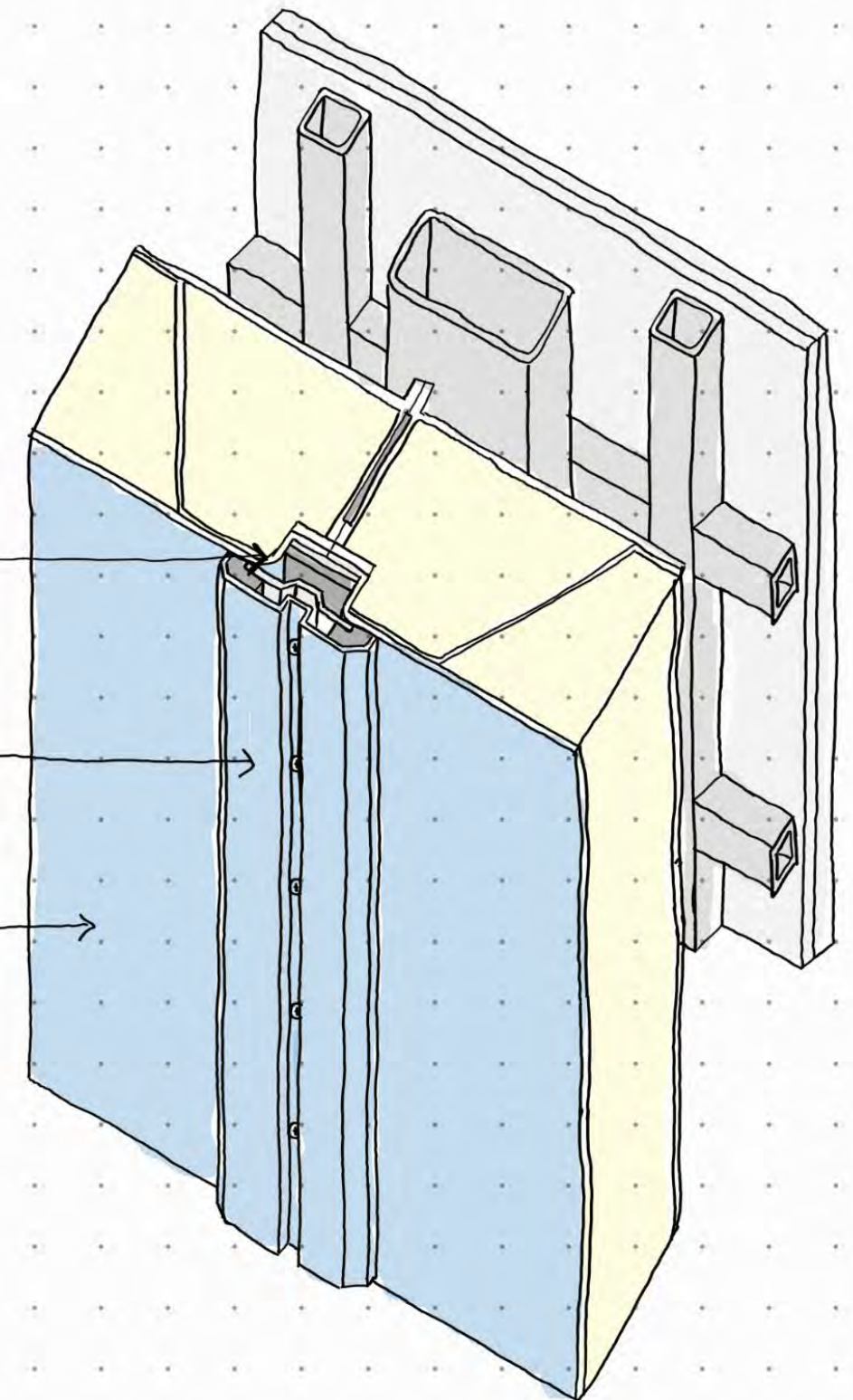
SURFACE CRACKS
AT PANEL JOINTS

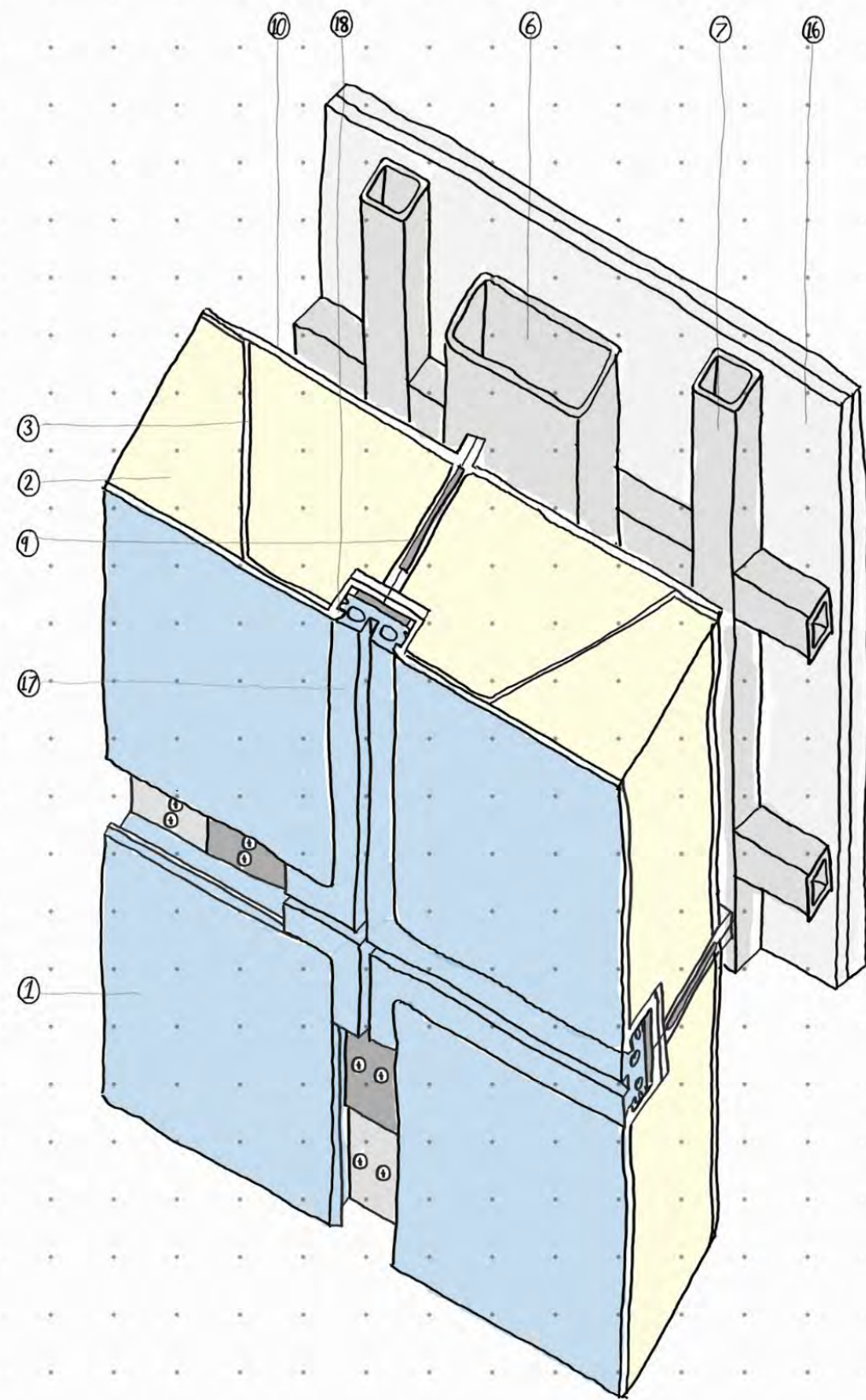
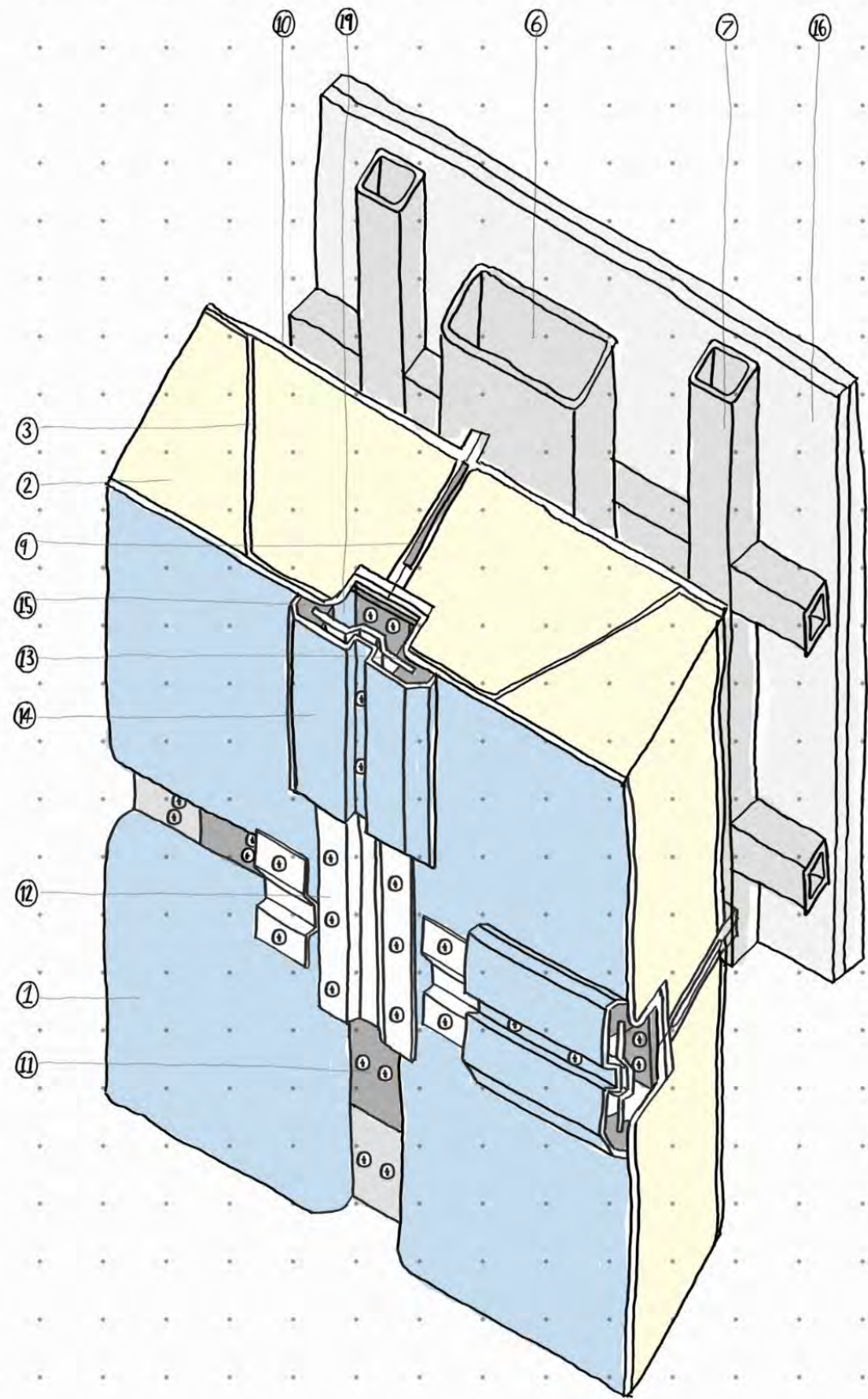


PANEL EDGES GROUND
DOWN TO BE LESS
SHARP

GASKET REPLACED
WITH ALUMINIUM
COVER PLATE

PANEL SURFACE RE-
SKINED WITH RESIN
WITHOUT FILLER

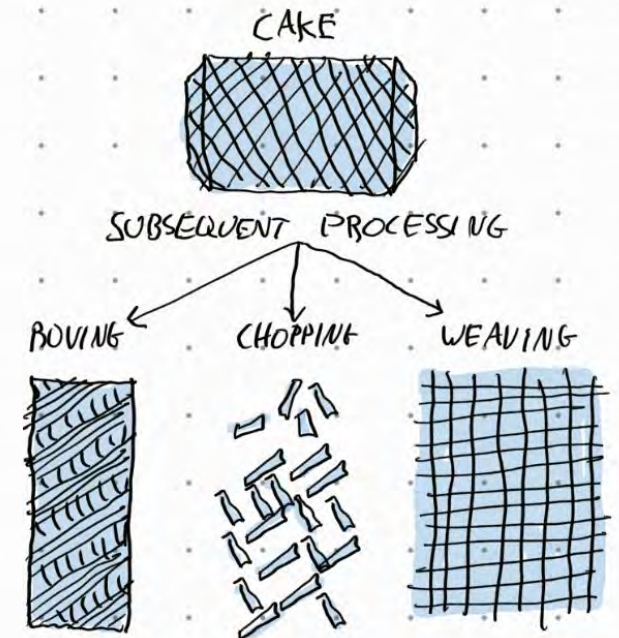
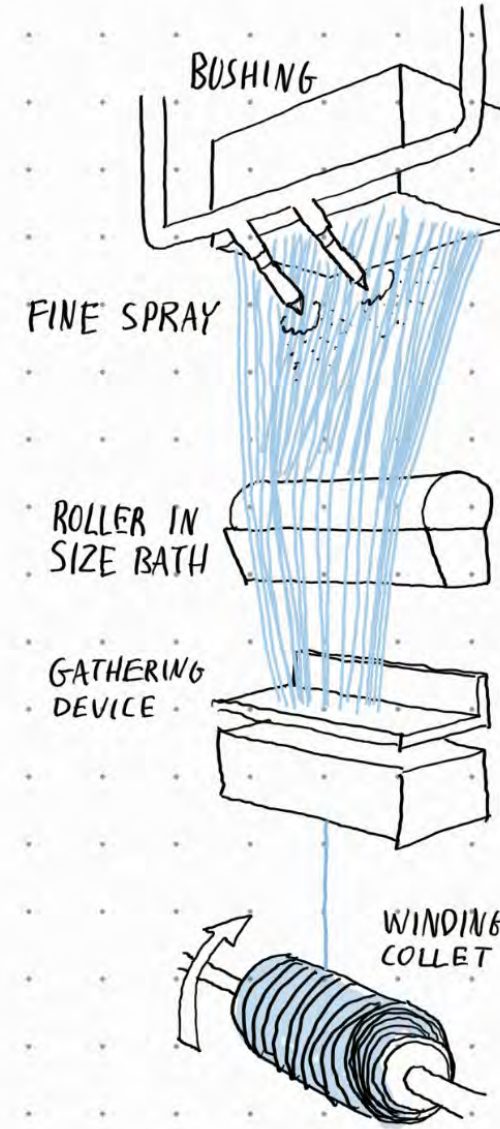
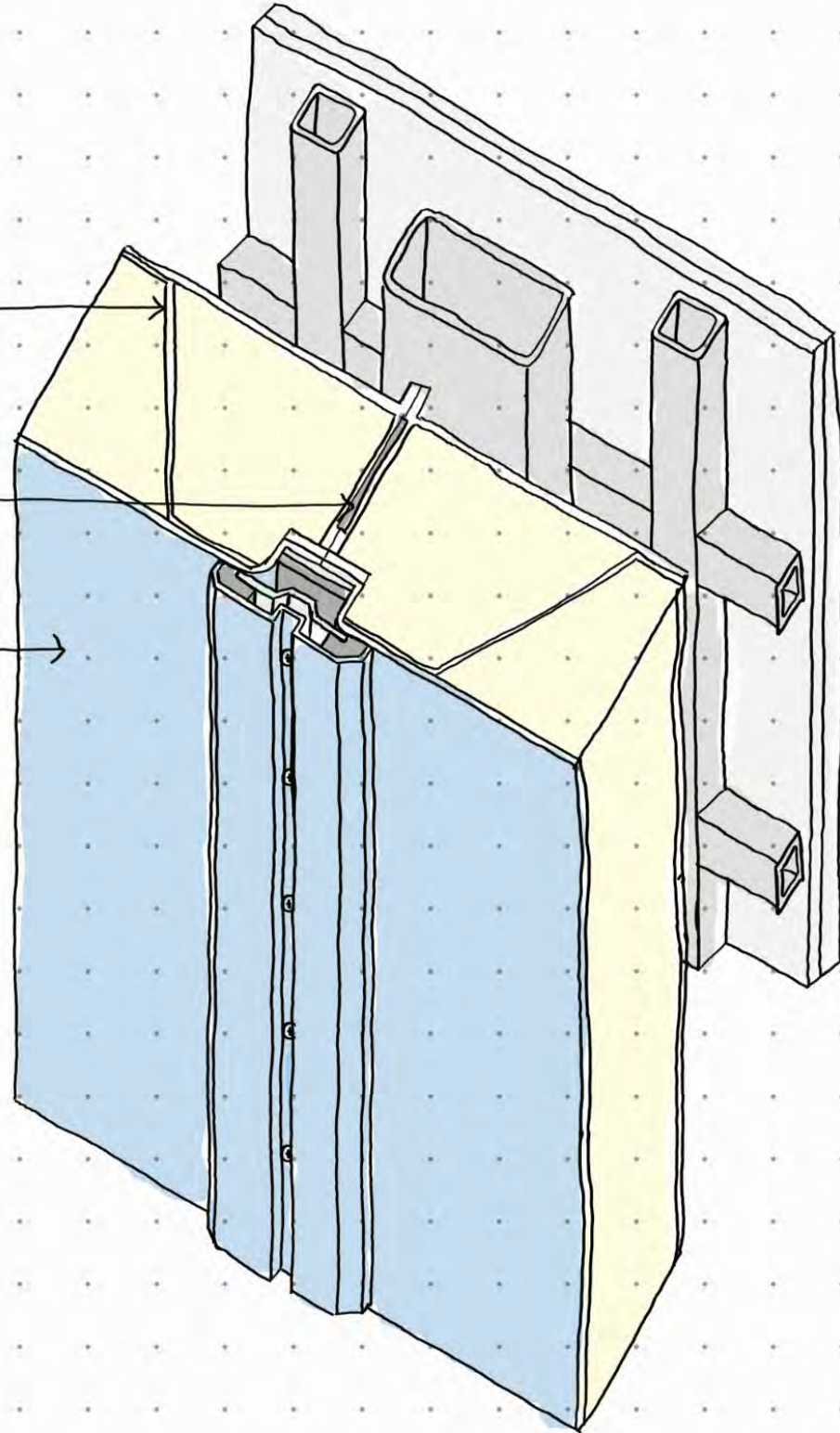




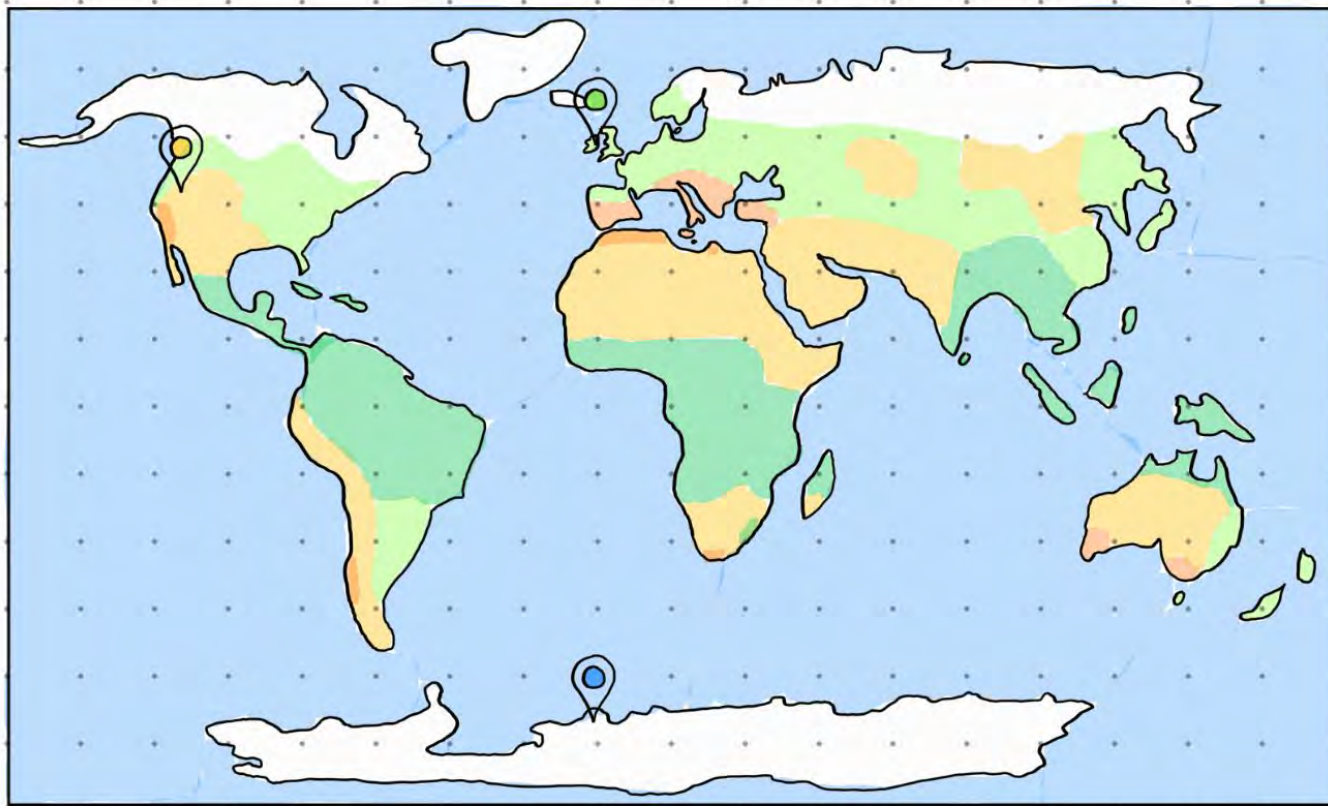
CROSSFIBRES PREVENT DELAMINATION OF GRP SKIN FROM INSULATION

NEOPRENE INSULATION AVOIDS COLD BRIDGING AT THE PANEL JOINTS

SINGLE SKIN PANEL SYSTEM ALLOWS FOR A FAST CONSTRUCTION PROCESS TO AVOID LONG PERIODS OF EXPOSURE TO THE EXTREME WEATHER CONDITIONS



HALLEY VI PANEL HEAT LOSS



- POLAR
 - TROPICAL
 - TEMPERATE
 - MEDITERRANEAN
 - ARID
- HALLEY VI, ANTARCTICA
 - OSOYDOS DESERT, CANADA
 - DUBLIN

$$\text{AREA (m}^2\text{)} \times \text{U-VALUE (W/m}^2\text{K)} \times \text{TEMPERATURE DIFFERENCE (}^{\circ}\text{C)} = \text{HEAT LOSS (W)}$$

SUMMER

FABRIC

$$7.91 \times 0.113 \times (20 - 0) = 7.91 \times 0.113 \times 20 = 17.88 \text{ W}$$

WINDOW

$$0.81 \times 1.0 \times 20 = 16.2 \text{ W}$$

$$17.88 + 16.2 = \boxed{34.08 \text{ W}}$$

WINTER

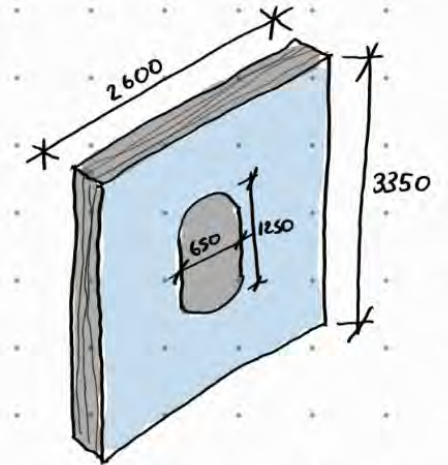
FABRIC

$$7.91 \times 0.113 \times (20 - (-28)) = 7.91 \times 0.113 \times 48 = 42.9 \text{ W}$$

WINDOW

$$0.81 \times 1.0 \times 48 = 38.88 \text{ W}$$

$$42.9 + 38.88 = \boxed{81.78 \text{ W}}$$



AREA
 TOTAL AREA = 8.72 m^2
 WINDOW AREA = 0.81 m^2
 PANEL AREA = 7.91 m^2

TEMPERATURE
 OUT = 0°C (HIGH) -28°C (LOW)
 IN = 20°C

U-VALUE
 WINDOW = $1 \text{ W/m}^2\text{K}$
 PANEL = $0.113 \text{ W/m}^2\text{K}$

DOUBLIN HEAT LOSS

SUMMER

FABRIC

$$7.91 \times 0.18 \times (20-19) =$$

$$7.91 \times 0.18 \times 1 = 1.42 \text{ W}$$

WINDOW

$$0.81 \times 1.4 \times 1 = 1.13 \text{ W}$$

$$1.13 + 1.42 = \boxed{2.55 \text{ W}}$$

WINTER

FABRIC

$$7.91 \times 0.18 \times (20-3) =$$

$$7.91 \times 0.18 \times 17 = 24.2 \text{ W}$$

WINDOW

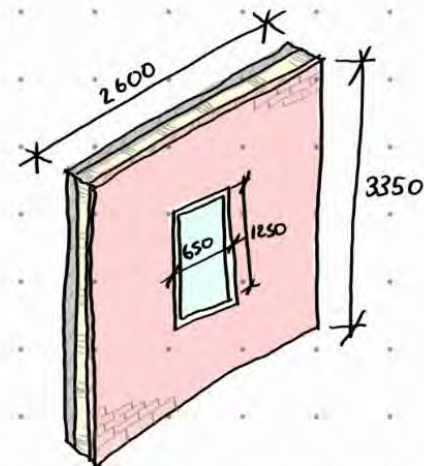
$$0.81 \times 1.4 \times 17 = 19.28 \text{ W}$$

$$19.28 + 24.2 = \boxed{43.48 \text{ W}}$$

AREA
 TOTAL AREA = 8.72 m^2
 WINDOW AREA = 0.81 m^2
 PANEL AREA = 7.91 m^2

TEMPERATURE
 OUT = 19°C (HIGH) 3°C (LOW)
 IN = 20°C

U-VALUE
 WINDOW = $7.4 \text{ W/m}^2\text{K}$
 PANEL = $0.18 \text{ W/m}^2\text{K}$



OSDYOOS HEAT LOSS

SUMMER

FABRIC

$$7.91 \times 0.21 \times (20-32) =$$

$$7.91 \times 0.21 \times 12 = 19.93 \text{ W}$$

WINDOW

$$0.81 \times 1.2 \times 12 = 11.66 \text{ W}$$

$$19.93 + 11.66 = \boxed{31.59 \text{ W}}$$

WINTER

FABRIC

$$7.91 \times 0.21 \times (20-4) =$$

$$7.91 \times 0.21 \times 24 = 39.87 \text{ W}$$

WINDOW

$$0.81 \times 1.2 \times 24 = 23.33 \text{ W}$$

$$23.33 + 39.87 = \boxed{63.2 \text{ W}}$$

AREA
 TOTAL AREA = 8.72 m^2
 WINDOW AREA = 0.81 m^2
 PANEL AREA = 7.91 m^2

TEMPERATURE
 OUT = 32°C (HIGH) -4°C (LOW)
 IN = 20°C

U-VALUE
 WINDOW = $1.2 \text{ W/m}^2\text{K}$
 PANEL = $0.21 \text{ W/m}^2\text{K}$

RAMMED EARTH CONDUCTIVITY = 1.25 W/mK

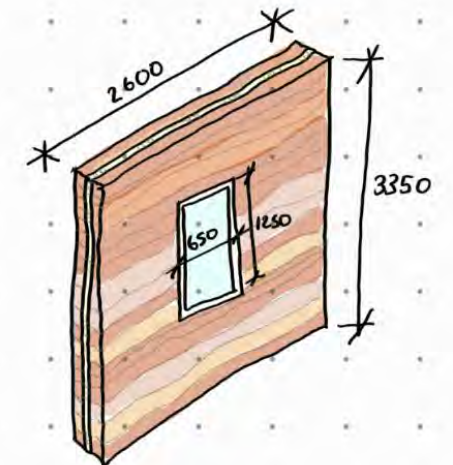
$$0.250 \div 1.25 = 0.2$$

$$0.100 \div 0.023 = 4.35$$

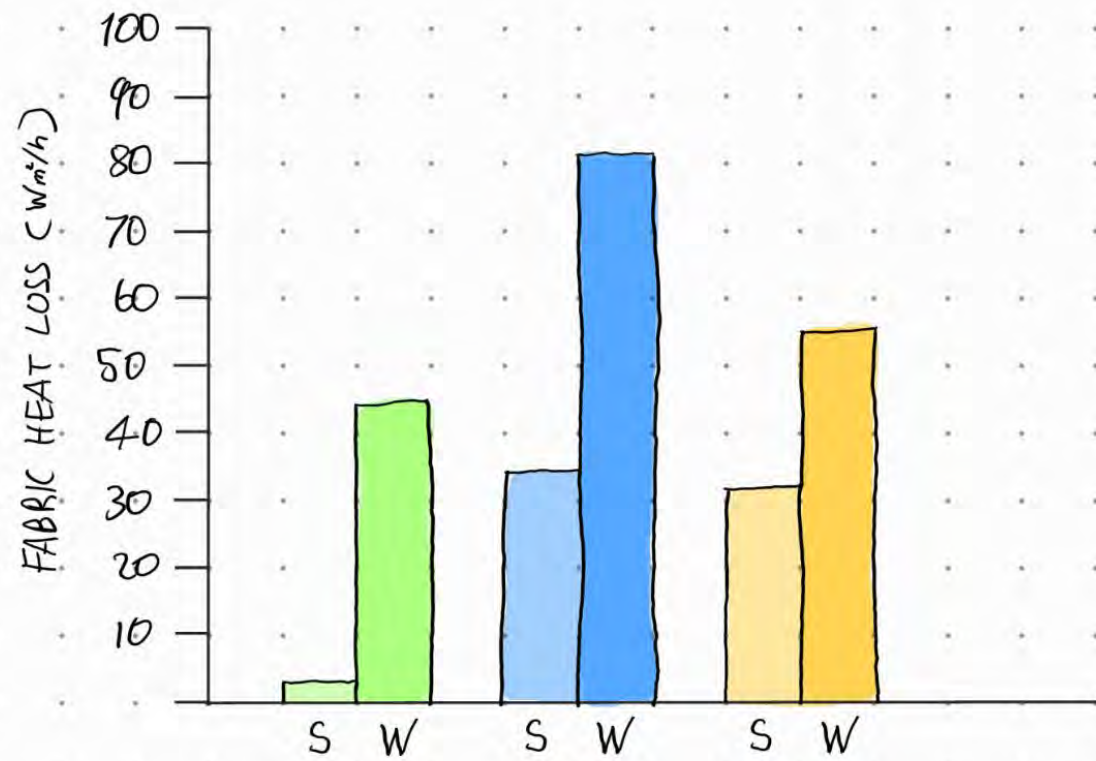
$$0.250 \div 1.25 = 0.2$$

$$4.75$$

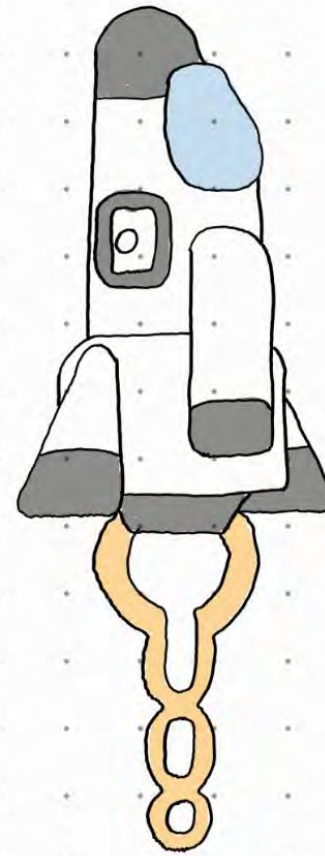
$$\frac{1}{4.75} = \boxed{0.21 \text{ W/m}^2\text{K}}$$

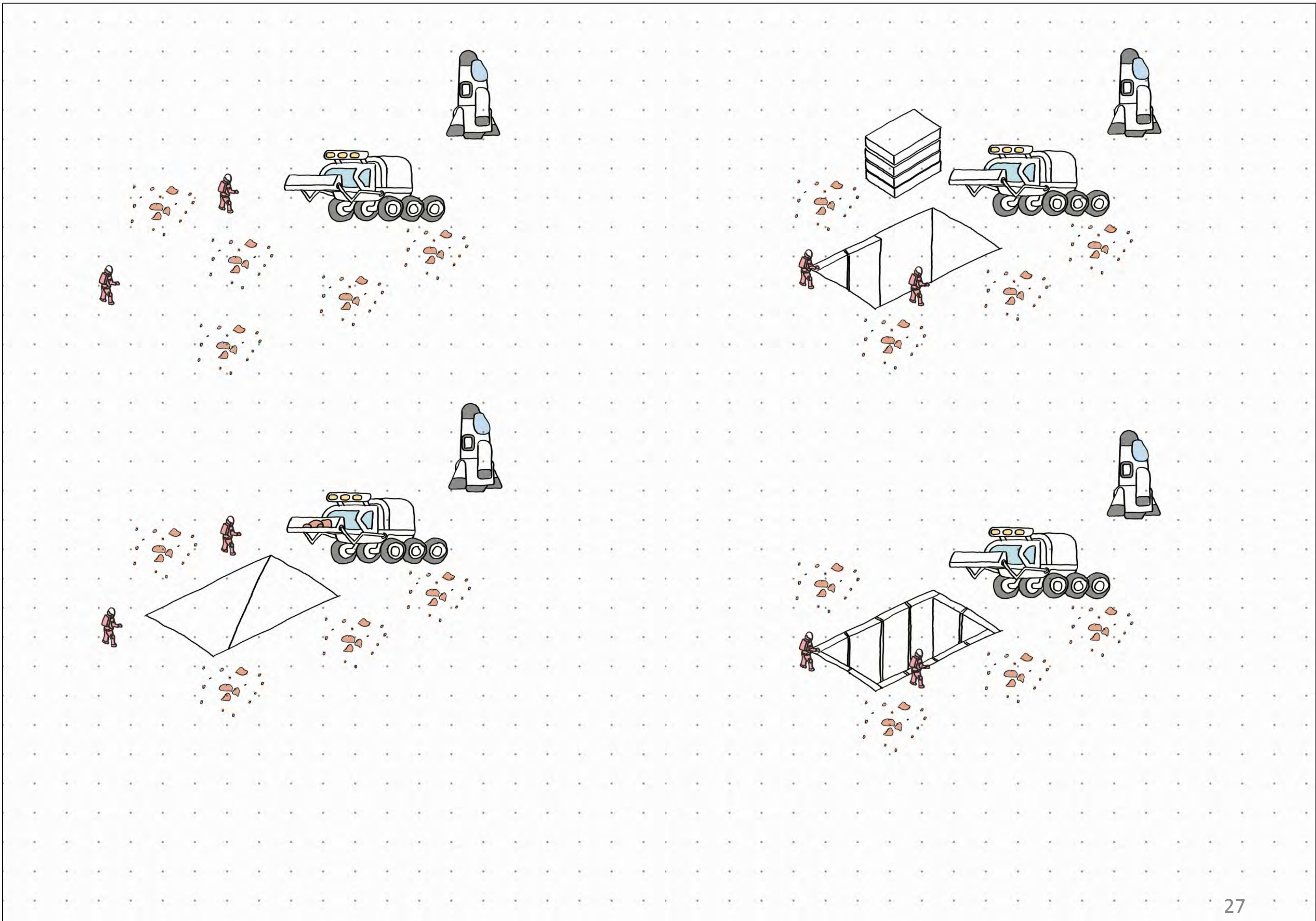


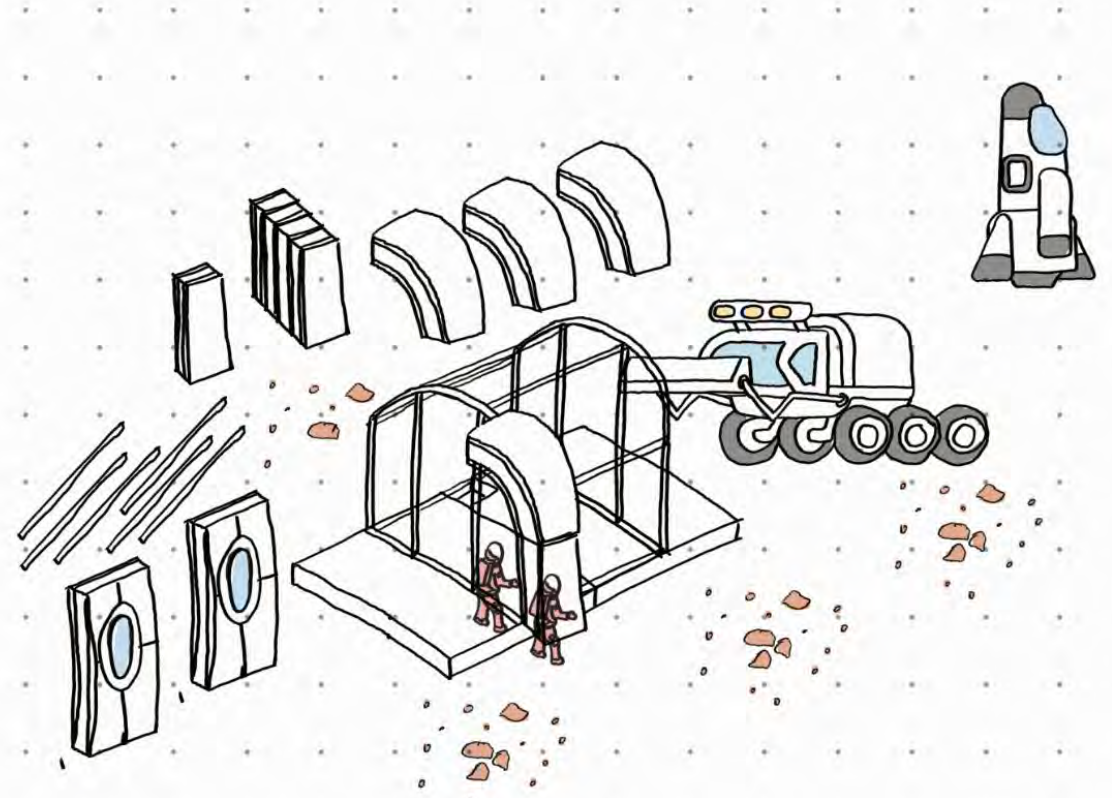
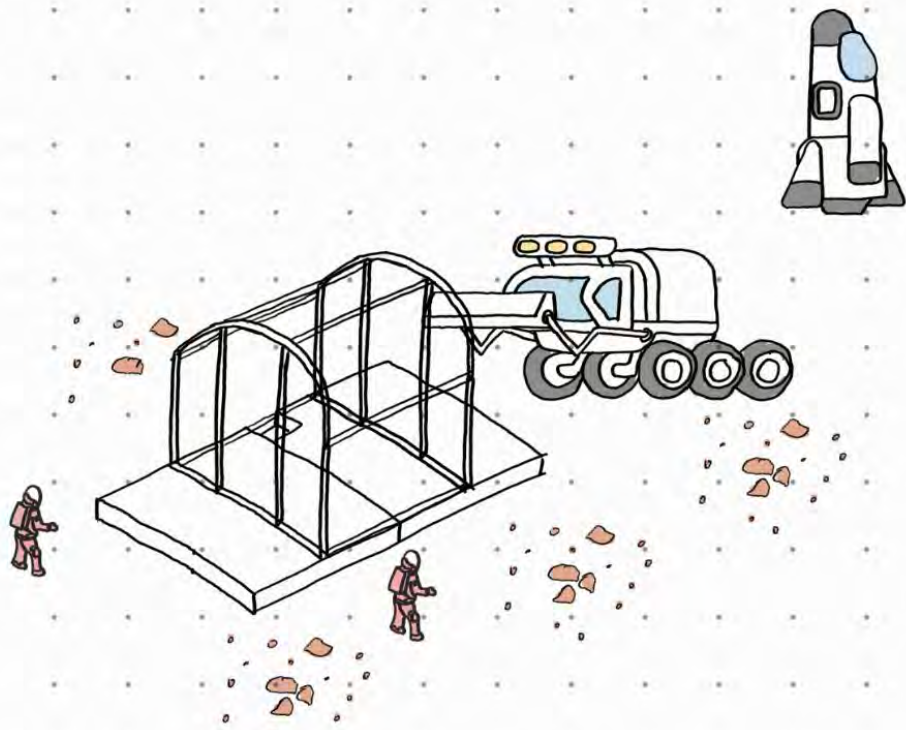
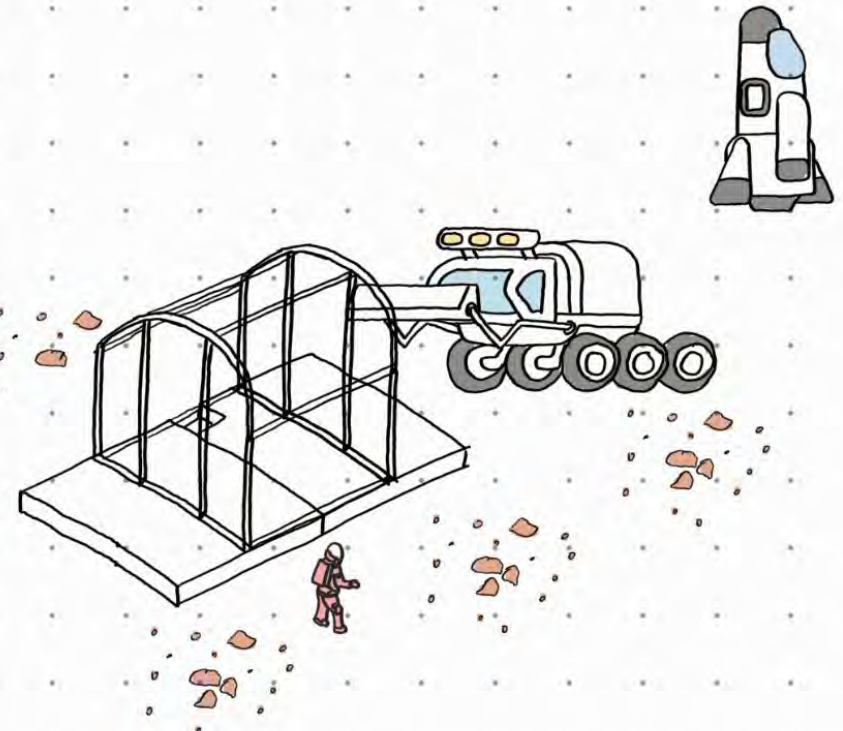
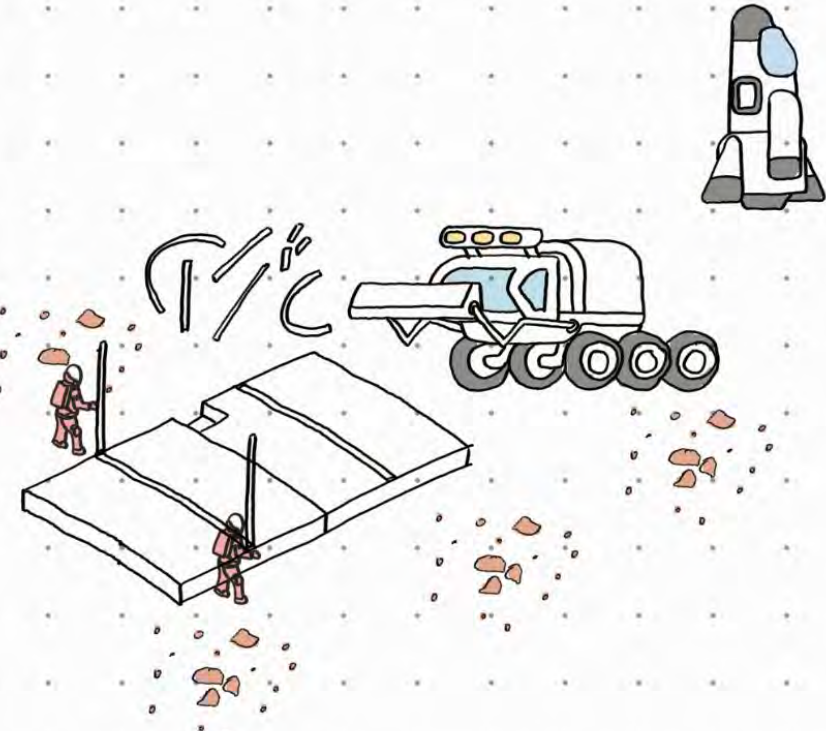
FABRIC HEAT LOSS

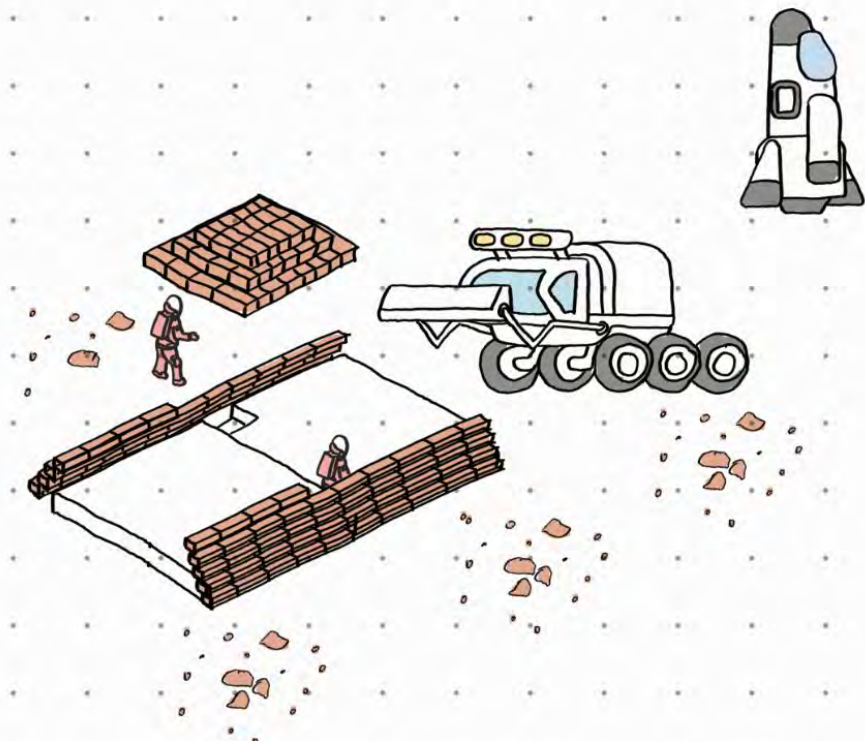
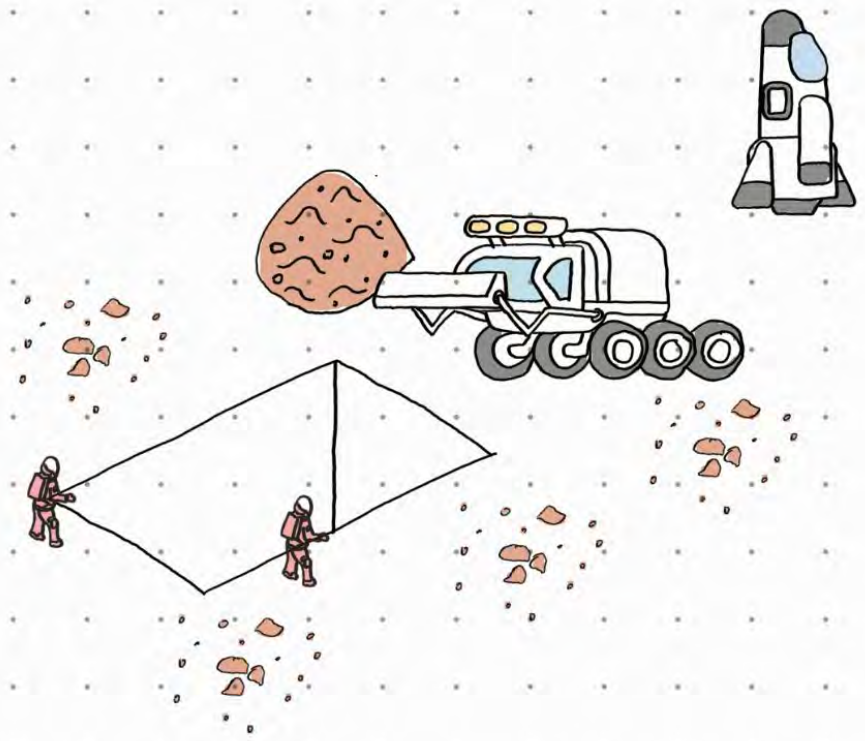
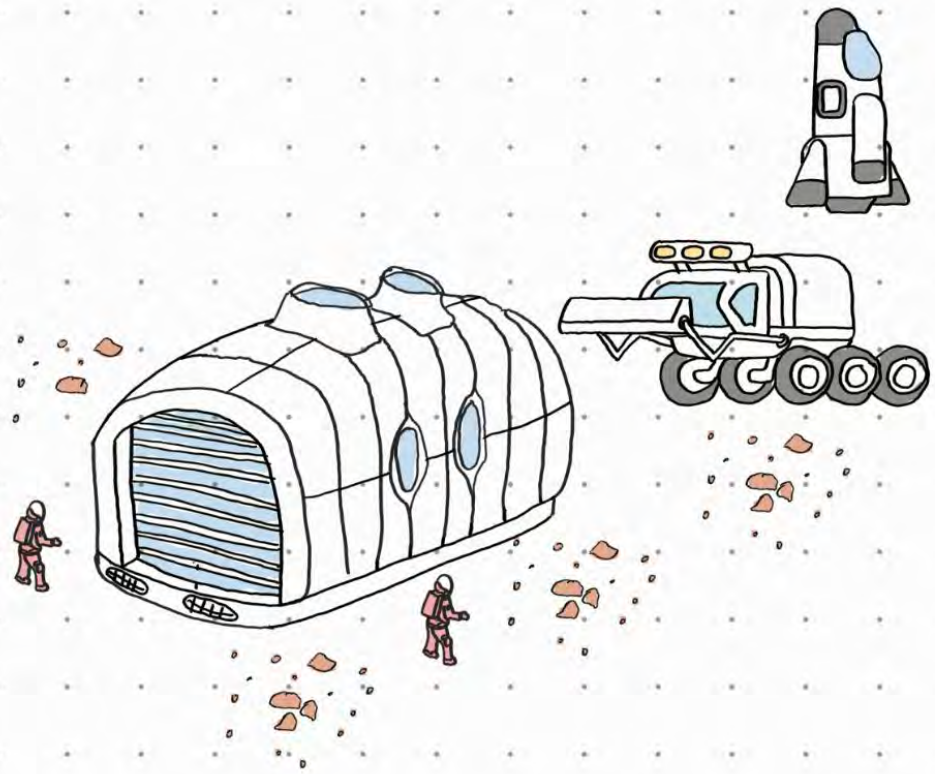


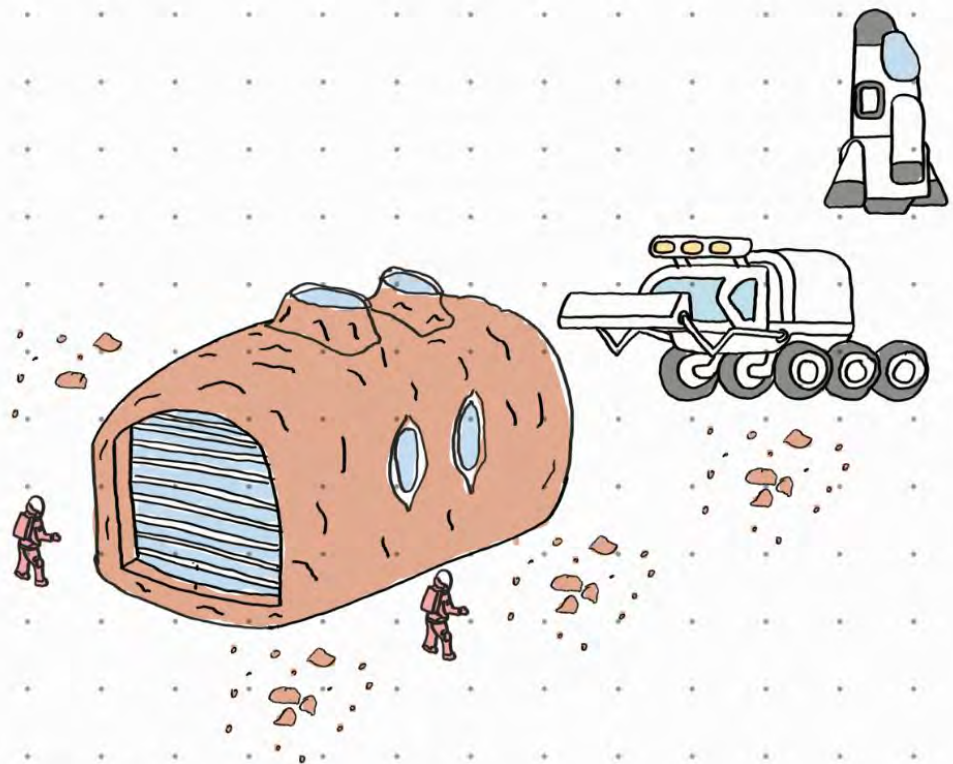
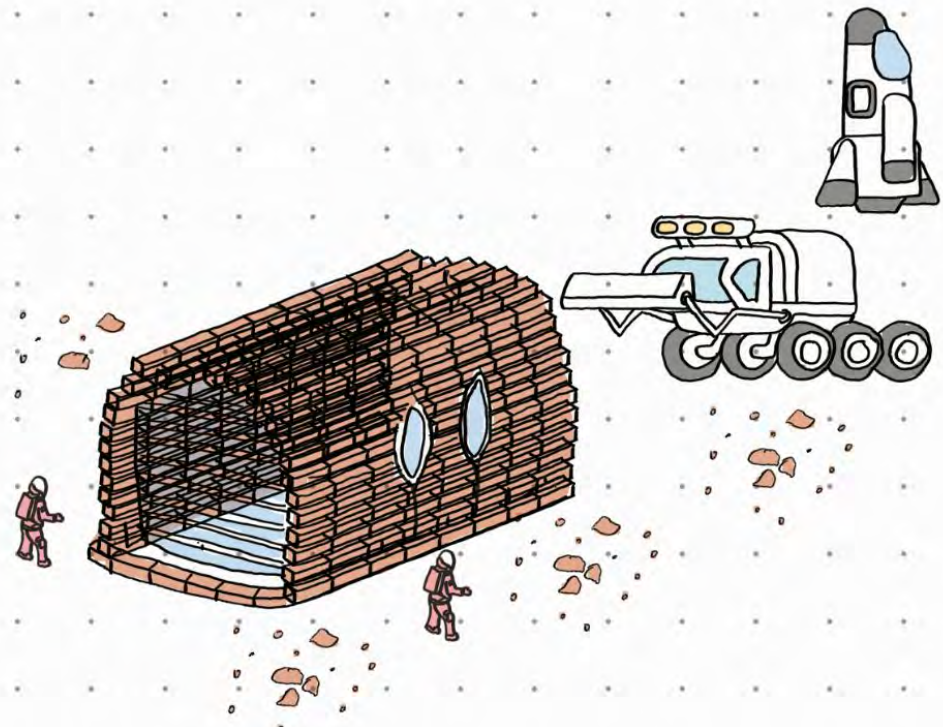
- DUBLIN AVERAGE SUMMER HIGH TEMPERATURE
- DUBLIN AVERAGE WINTER LOW TEMPERATURE
- ANTARCTICA AVERAGE SUMMER HIGH TEMPERATURE
- ANTARCTICA AVERAGE WINTER LOW TEMPERATURE
- OSOYODS AVERAGE SUMMER HIGH TEMPERATURE
- OSOYODS AVERAGE WINTER LOW TEMPERATURE











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