Implementing Climate Ready Requirements Case Study: MacLeod Renewal UBC

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AGENDA

Presentation 10 minutes

- UBC context & policy
- UBC’s Climate Ready Building Requirements
- Case study: MacLeod Renewal

Discussion 15 minutes

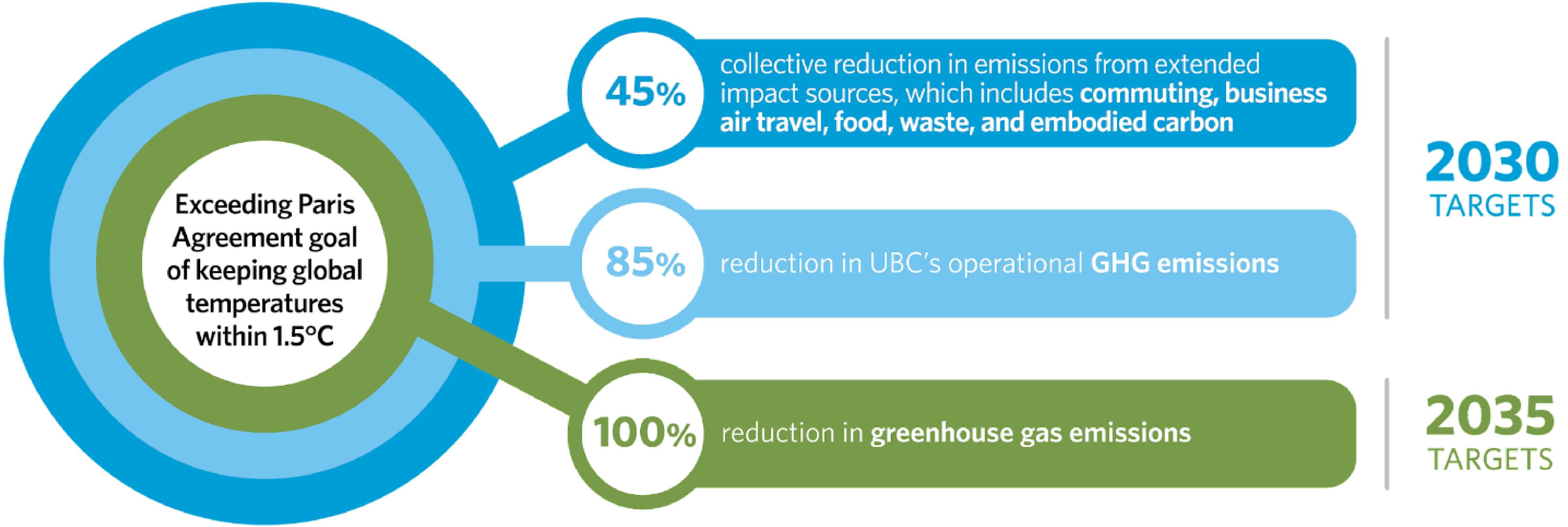
UBC CLIMATE EMERGENCY DECLARATION

9

Strategic

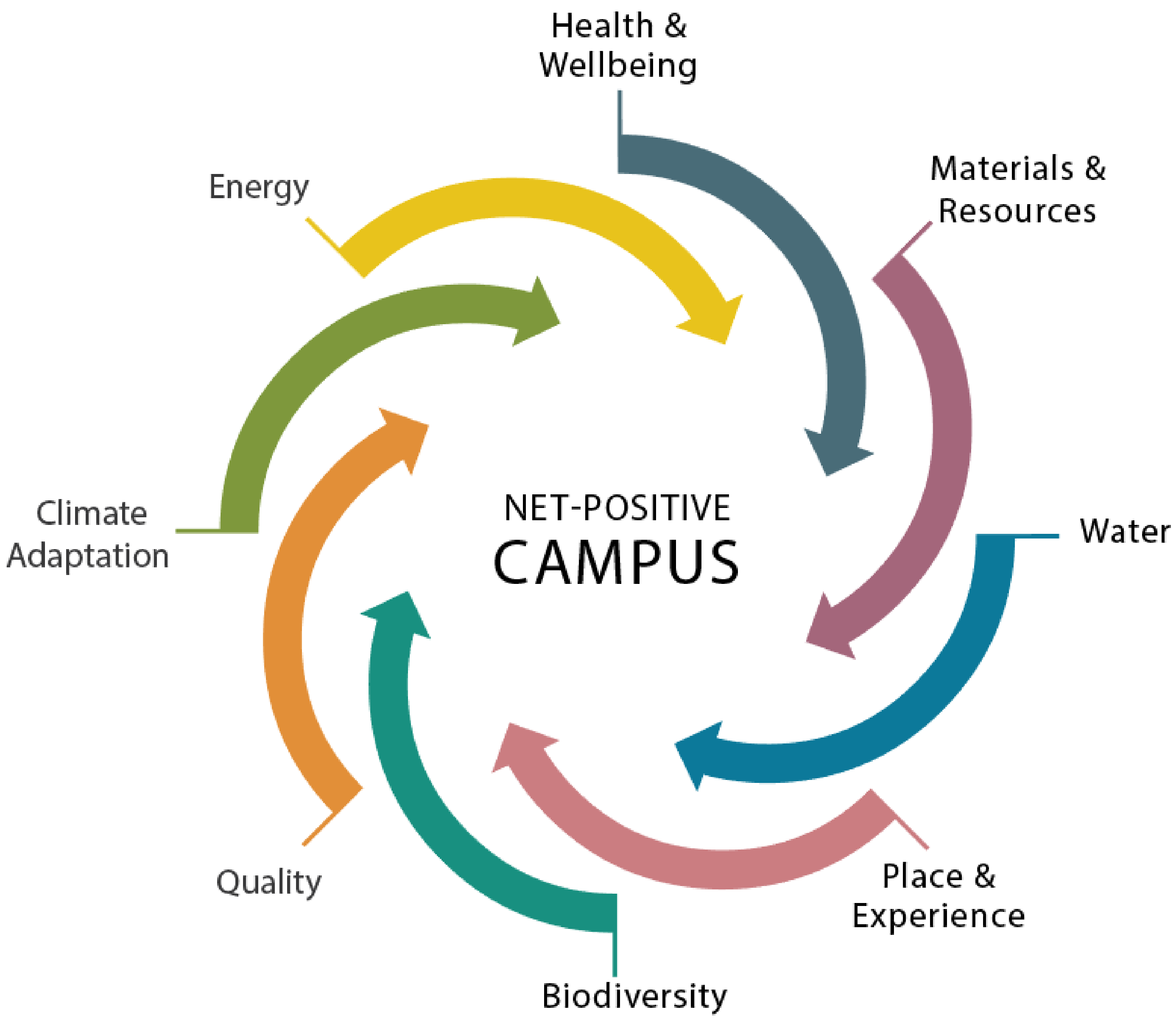
Directions

UBC CLIMATE ACTION PLAN 2030



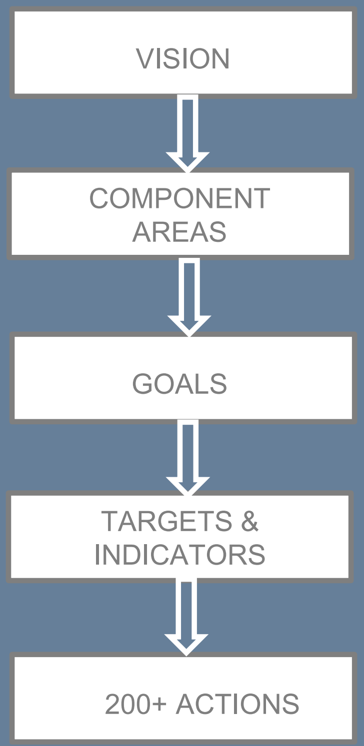
https://planning.ubc.ca/cap2030

UBC GREEN BUILDING ACTION PLAN



Vision

By 2035, UBC's buildings will make net positive contributions to human and natural systems.



UBC'S CLIMATE READY BUILDING REQUIREMENTS (UPDATED IN 2020)

Objective: incorporate key design strategies to reduce risk and life cycle costs of the university's buildings due to predicted climate change in our region		
Category	**Requirement**	**Strategy**
Thermal comfort	Design for 2050 temperatures	• Use 2050 weather files • Achieve UBC's Indoor Thermal Environment requirements • Size equipment for 31 degrees • Use a passive first approach
Rainwater management	Adaptable to 2100 rainfall pattern	• Use predicted 2100 moderate rainfall patterns (IDF curves) • Provide pathway of future strategies that ensure the building can manage future rainfall
Indoor air quality	2050 ready	• Provide strategies for the university to consider in regard to indoor air quality (smoke) • MERV 13 filters required
Water reduction	2050 ready	• Design for a climate-adaptive landscape with resiliency to drought and watering

CASE STUDY : MACLEOD RENEWAL

Architect: Proscenium Architecture & Interiors in partnership with Teeple Architects
Location: UBC
Developer: UBC Project Services
Funding: Routine capital

Project Size: 7282 gsm
Budget: $51 million
Occupancy: Summer 2022
Certifications Targeted: LEED gold

No. of stories: 4
Key features: Glazing and Envelope Replacement, system replacement, seismic upgrade, layout to suit pedagogical changes, interior visual transparency

CASE STUDY : MACLEOD RENEWAL

Courtesy: Teeple Architects & Proscenium

CASE STUDY : MACLEOD BUILDING

APPROACH TO SUSTAINABILITY

EXTERNAL SHADING STUDIES

- Numerous louvers studied to idenfity optimal configuration


Vertical Louvers


Vertical Louvers


Vertical Louvers


Vertical Louvers


Horizontal & Vertical Louvers


Horizontal & Vertical Louvers


Narrow Horizontal Louvers


Horizontal Louvers


Narrow Horizontal & Vertical Louvers


Horizontal & Vertical Louvers


Metal Grate Solar Shade


Narrow Horizontal Louvers


Narrow Horizontal Louvers


Metal Grate Solar Shade


Horizontal & Vertical Louvers

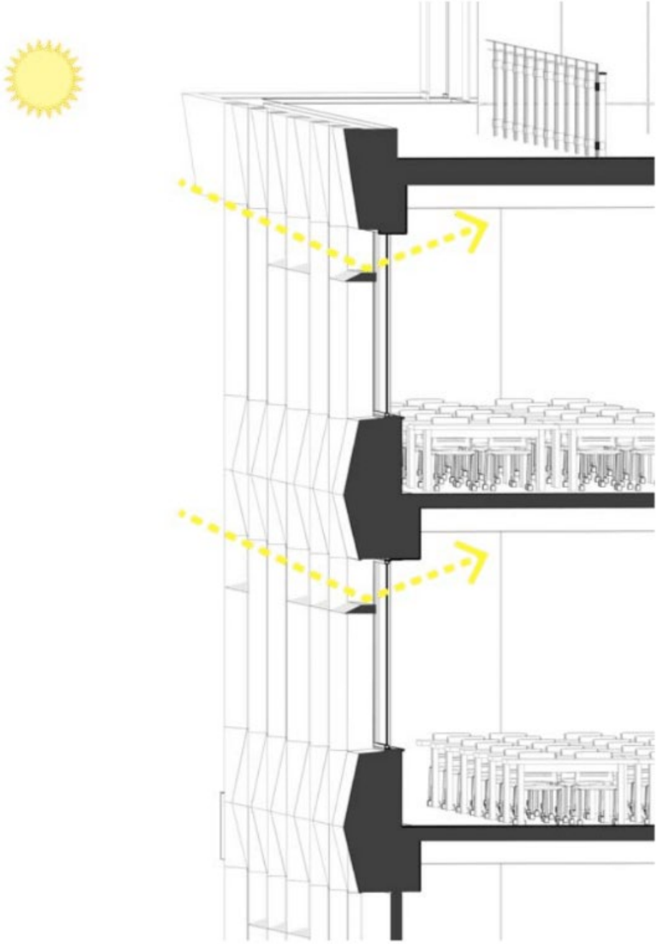
Teeple Architects PROSCENIUM ARCHITECTURE + INTERIORS INC. PFS STUDIO

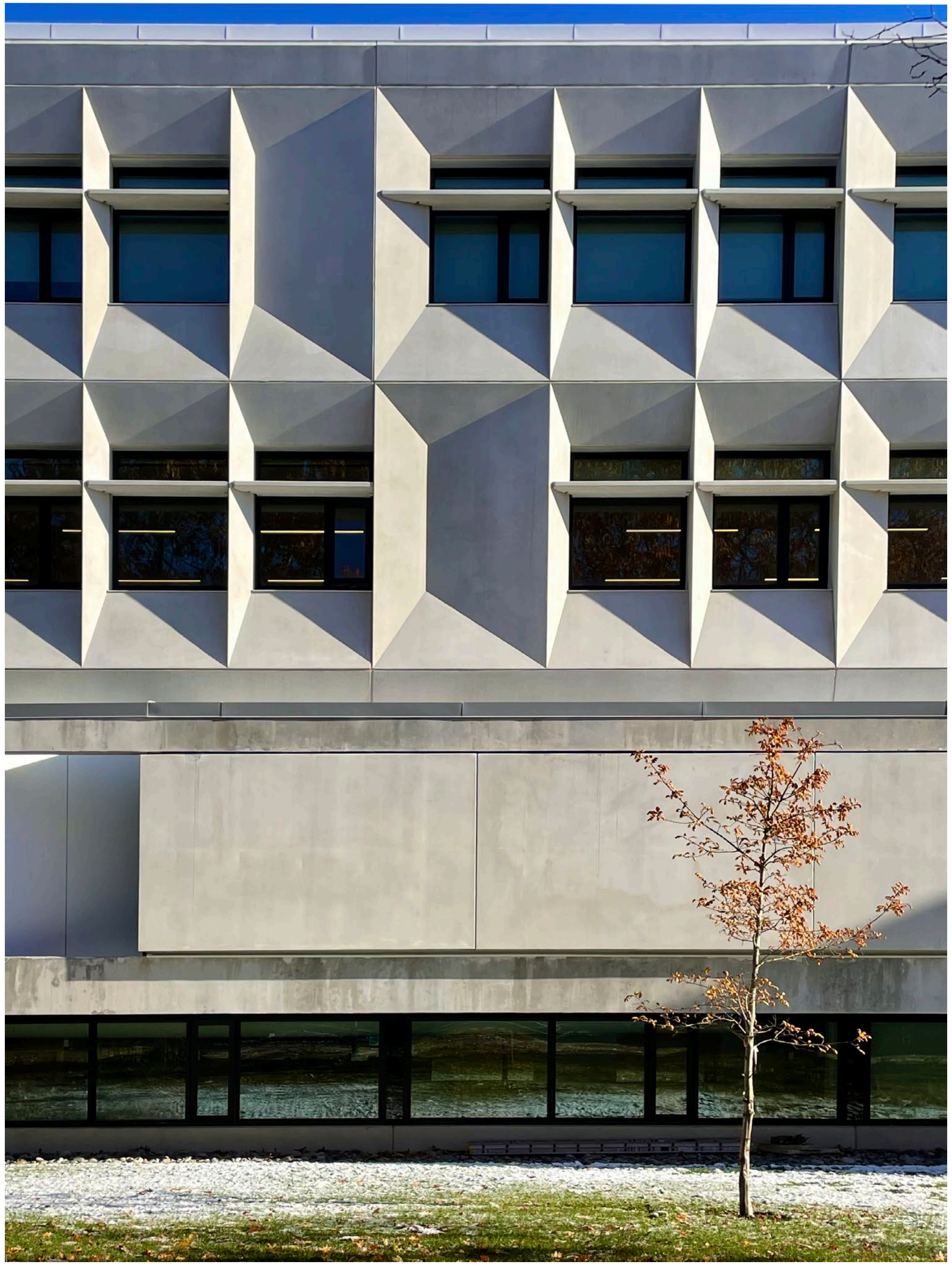
Courtesy: Teeple Architects & Proscenium

CASE STUDY : MACLEOD BUILDING

ENVELOPE DESIGN

- Light Shelves for enhanced daylight penetration

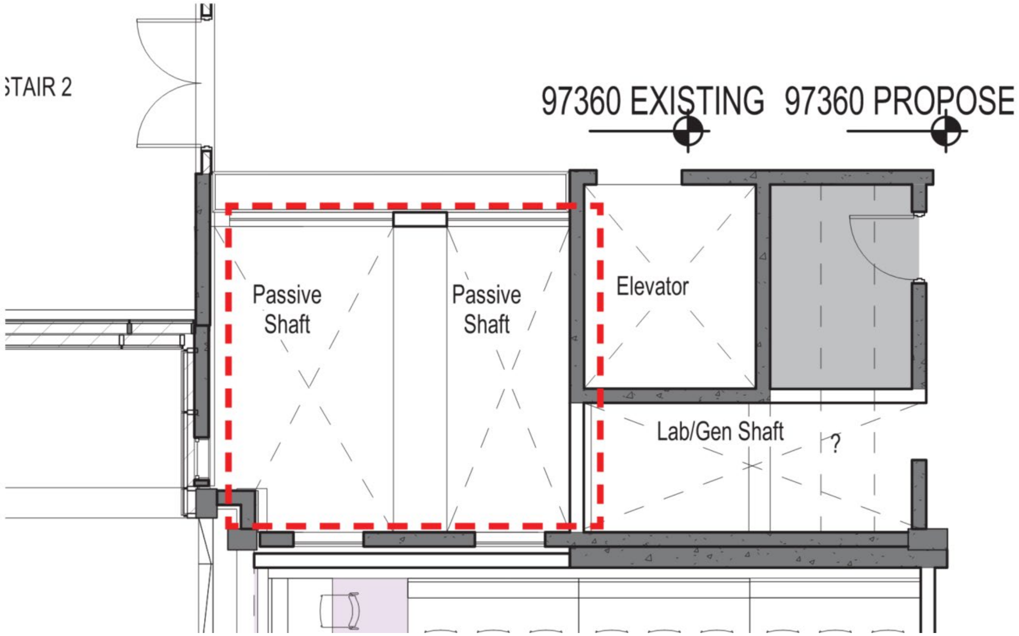


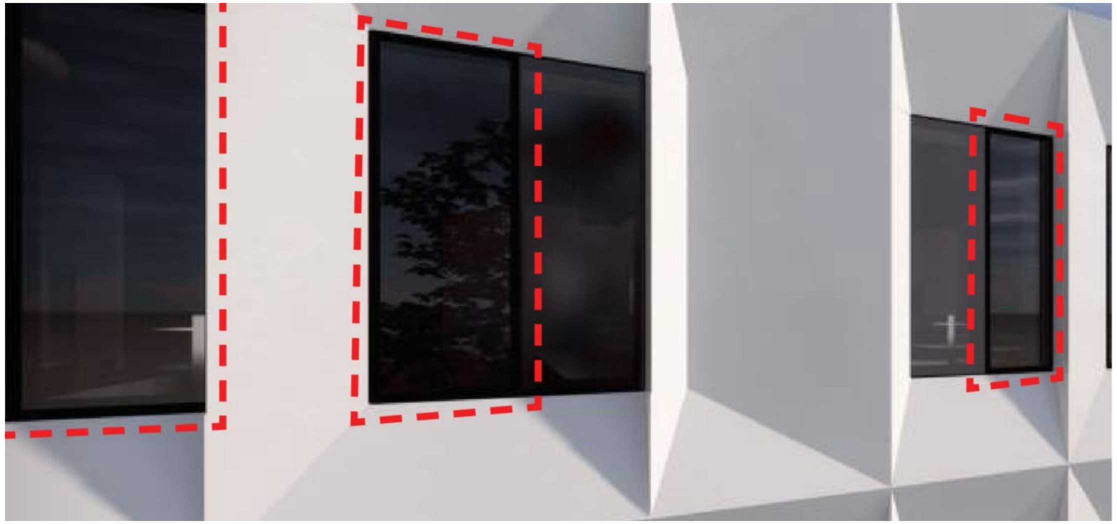


CASE STUDY : MACLEOD BUILDING

PASSIVE VENTILATION MEASURES

- Operable windows (up to 25%)
- Vertical air shaft (passive air return with fan assist) w/ heat recovery on exhaust air from shaft
- Offers visual transparency within the building

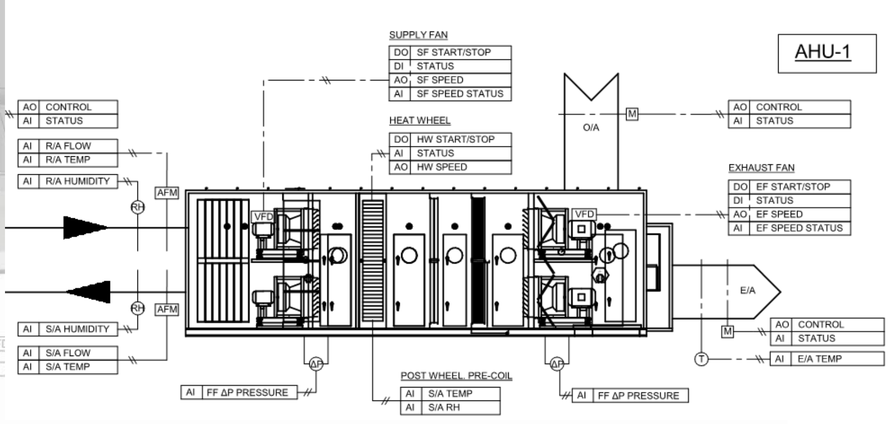




Courtesy: Teeple Architects & Proscenium

CASE STUDY : MACLEOD BUILDING

- Mechanical design
  - 4-pipe heat recovery ASHP for heating and cooling (expandable for future additional floor)
  - DES heating for peaking (sub-fed from neighboring building)
  - Radiant panels (heating and cooling) + VAV w/ reheat in zones
  - AHUs with heat recovery wheels for ventilation
    - Return air via "passive shaft" to assist airflow through windows.



. ROOM 3D VIEW - PUMPS AND BUFFER TANKS

Courtesy:AME

CASE STUDY : MACLEOD BUILDING

PSO MINIMUM RESILIENCE STANDARDS EXISTING BUILDING SCORECARD

Risk	Compliance	Design strategies	Challenges
Climate and extreme heat events	good	Future weather files used for design, low carbon operation, cooling added, high performance envelope, passive measures incorporated	Sensitivity to extreme climate events (smoke events, power outages)
Flooding-pluvial	partly	Use of future IDF curves, roof slope, terrain slope, professional foundation drainage design	On site detention or capture, stormwater treatment in vehicle areas, moisture resistant materials
Droughts	good	Drought resistant and non invasive species, smart irrigation	
Power outages	partly	Back up generator is typically used for life safety power and research equipment at UBC (24 hours)	Back up power for: heating ,cooling of refuge area, BMS etc

TAKEAWAYS FROM CASE STUDY

- Develop organization's resilience requirements as far as possible to avoid consultants spending time
- Communicate and provide clarity for consultants early on in design process
- Modular approach for future additions is possible strategy (eg modular heat pumps)
- Passive measures need an interdisciplinary approach

Costs

- Low cost premium to design cooling for 2050
- Adding back up power to heating and cooling systems could have significant incremental capital costs
- Rainwater detention systems for additional rainfall could have significant incremental capital costs

QUESTIONS AND DISCUSSION

THE UNIVERSITY OF BRITISH COLUMBIA