GETTING **SCHOOLED** IN PASSIVE HOUSE

LEARNING OBJECTIVES

SOME PRIOR KNOWLEDGE HELPFUL

1. Identify the challenges that can be expected during the design, bid and construction phases of a passive house project.

2. Explain how energy modeling and the PHIUS (Passive House Institute US) review process can inform the evolution of the building envelope, building systems and project detailing.

3. Compare HVAC system options and describe the methods used for monitoring performance.

4. Explain the PHIUS certification process and identify the deliverables required beyond standard certification.

PRESENTERS

MAINE COAST WALDORF HIGH SCHOOL

HARRY HEPBURN, AIA, LEED AP
BRIBURN
Principal / Architect

CHRIS BRILEY, CPHC, LEED AP
BRIBURN
Principal / Architect,
Certified Passive House Consultant

WAYNFLETE LOWER SCHOOL

JULIA TATE, AIA, LEED BD+C
SCOTT SIMONS ARCHITECTS
Project Architect

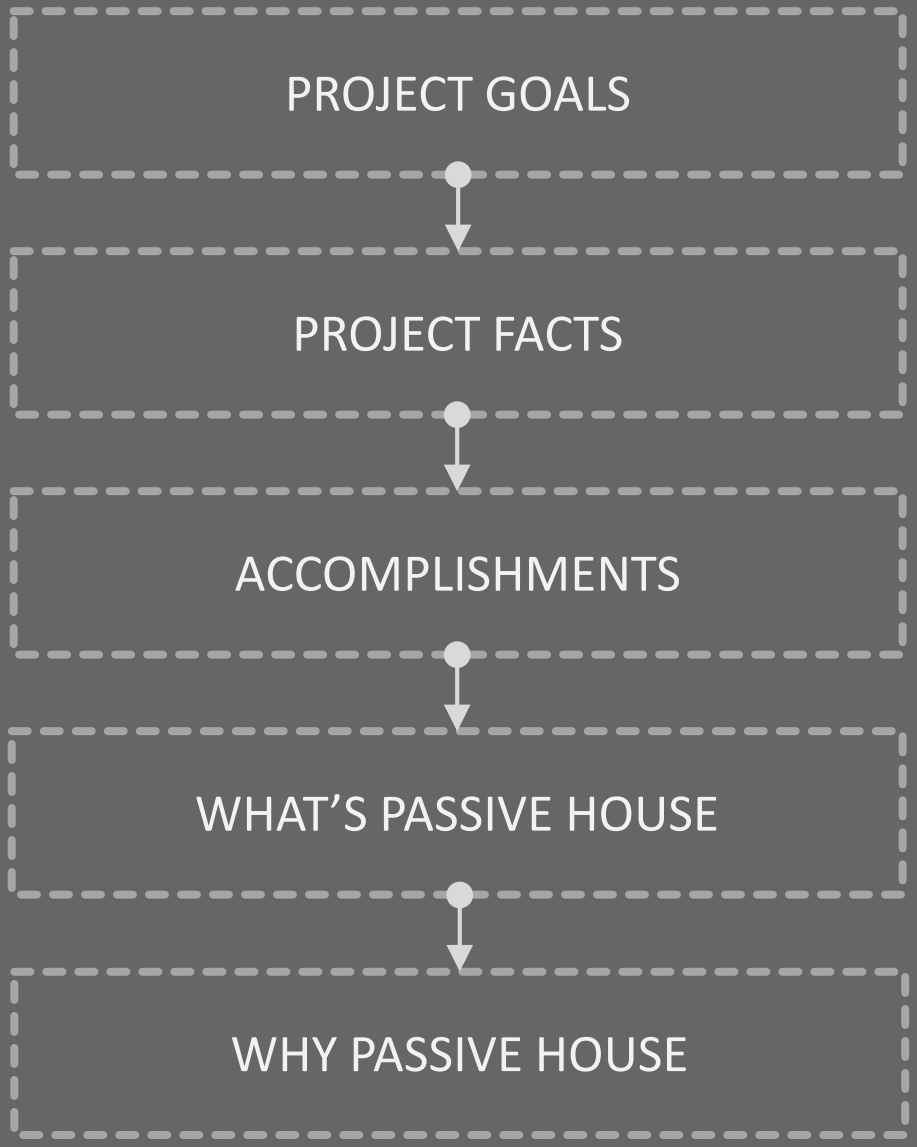
COLIN SCHLESS, CPHC, LEED AP
THORNTON TOMASETTI
Senior Associate,
Certified Passive House Consultant

CASE STUDIES

MAINE COAST WALDORF HIGH SCHOOL

WAYNFLETE LOWER SCHOOL

INTRODUCTION



PROJECT GOALS

MAINE COAST WALDORF HIGH SCHOOL

Consolidate Campus

Energy Conservation / Efficiency

Sustainable Design

Waldorf Principals:

- flexible spaces
- use of natural materials
- natural light
- anthroposophical design
- collaborative teaching
- organic shaped spaces
- high ceilings
- use of chalkboards
- use of color

Anthroposophic Design – creating organic expressionistic designs that cultivate a sensory experience

WAYNFLETE LOWER SCHOOL

Create Sense of Place / Identity

Energy conservation / Efficiency

Sustainable Design

Waynflete principals:

- flexible spaces
- use of natural materials
- natural light
- connection to the outdoors
- open classroom plan
- control over learning environment
- community inclusion

PROJECT FACTS

MAINE COAST WALDORF HIGH SCHOOL

LOCATION:
FREEPORT, ME (RURAL)

SIZE:
11,400 SF

OCCUPANTS:
80 STUDENTS (9-12)
10 FACULTY

COST: $2,842,000 ($249 PSF AVG)
$3,332,000 ($292 PSF W/SITE)

DURATION:
DESIGN 7 MONTHS
CONSTRUCTION 10 MONTHS (COO)

EUI: 14.5 kBTU/ft^2 (MODELED)

WAYNFLETE LOWER SCHOOL

LOCATION:
PORTLAND, ME (URBAN)

SIZE:
28,000 SF NEW CONSTRUCTION
7,100 SF RENOVATION

OCCUPANTS:
212 STUDENTS (EC - 5TH GRADE)
24 FACULTY

COST: $8,600,000 ($245 PSF AVG)

DURATION:
DESIGN 48 MONTHS
CONSTRUCTION 18 MONTHS

EUI: 12.6 kBTU/ft^2 YR (MODELED)

ACCOMPLISHMENTS

MAINE COAST WALDORF HIGH SCHOOL

PASSIVE HOUSE - PHIUS + 2015

- Healthy
- Comfortable
- Very Little Energy Needed

MAINE ADVANCED BUILDINGS CERTIFICATION

- At least 30% more energy efficient than minimum code requirements
- Maintenance and monitoring systems ensure building performs
- New Buildings Institute – Tier 2
- $0.25 / SF to architect ($2,788 total)
- $1.50 / SF to owner ($16,731 total)

ACCOMPLISHMENTS

WAYNFLETE LOWER SCHOOL

PASSIVE HOUSE US +2015 (PRE-CERTIFIED)

- Healthy
- Comfortable
- Very Little Energy Needed

efficiency MAINE

EFFICIENCY MAINE PRESCRIPTIVE INCENTIVE PROGRAM

Heating and Cooling Solutions:

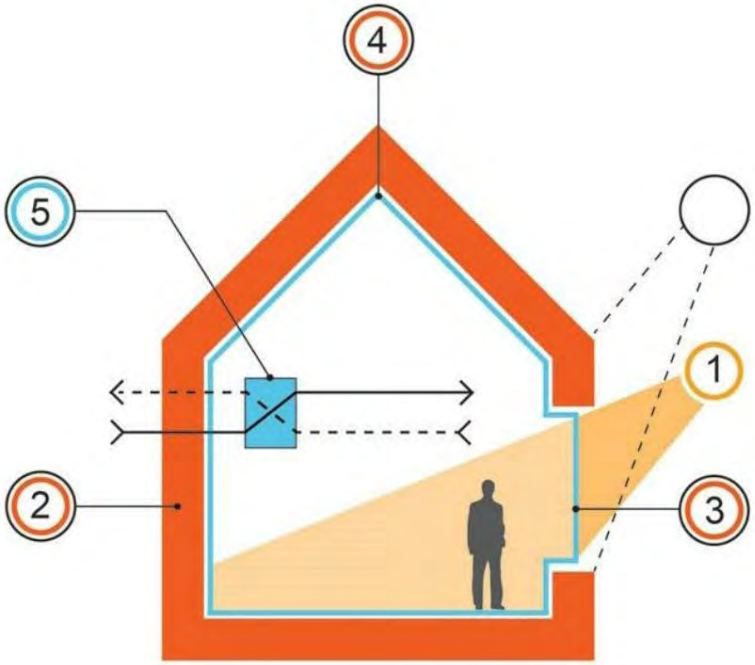
- variable refrigerant flow systems ($3 psf)

Lighting Solutions:

- LPD performance / DLC qualified LEDs (53% cost)
- Occupancy Sensors (33% cost)

WHAT'S PASSIVE HOUSE

HOW IS IT DIFFERENT?



PASSIVE HOUSE

1. Solar orientation
2. High insulation
3. High performance windows
4. Airtight enclosure
5. Balanced ventilation with heat recovery

WHY PASSIVE HOUSE

ALIGNMENT OF VALUES

#1 **Life Cycle Costs / Facilities Operations → Good Business Sense**

Energy Conservation → Legacy of Sustainable Responsibility

Environmental Benefits

daylighting, natural light

quieter spaces

fresh air

comfortable, even temperatures

independent controls

Measurable Performance → Teaching Tool

HOW WE GOT HERE

TEAM PLAYERS

MAINE COAST WALDORF HIGH SCHOOL

BRIBURN
architecture for life™

MAINE COAST WALDORF SCHOOL

Allied Engineering
Structural Mechanical Electrical

BECKER
STRUCTURAL ENGINEERS

WALSH
ENGINEERING ASSOCIATES, INC.

WARREN
CONSTRUCTION GROUP

HORIZON HOMES

BARTLETT DESIGN

LOWELL SPECIFICATIONS, INC.

TEAM PLAYERS

WAYNFLETE LOWER SCHOOL

scott simons architects
designed for human potential

Waynflete

Allied Engineering
Structural Mechanical Electrical

BECKER
STRUCTURAL ENGINEERS

sustainability:

WOODARD &CURRAN

Thornton Tomasetti

WR
Wright-Ryan

ABA
Advanced Building Analysis

PML Project Management, Inc.

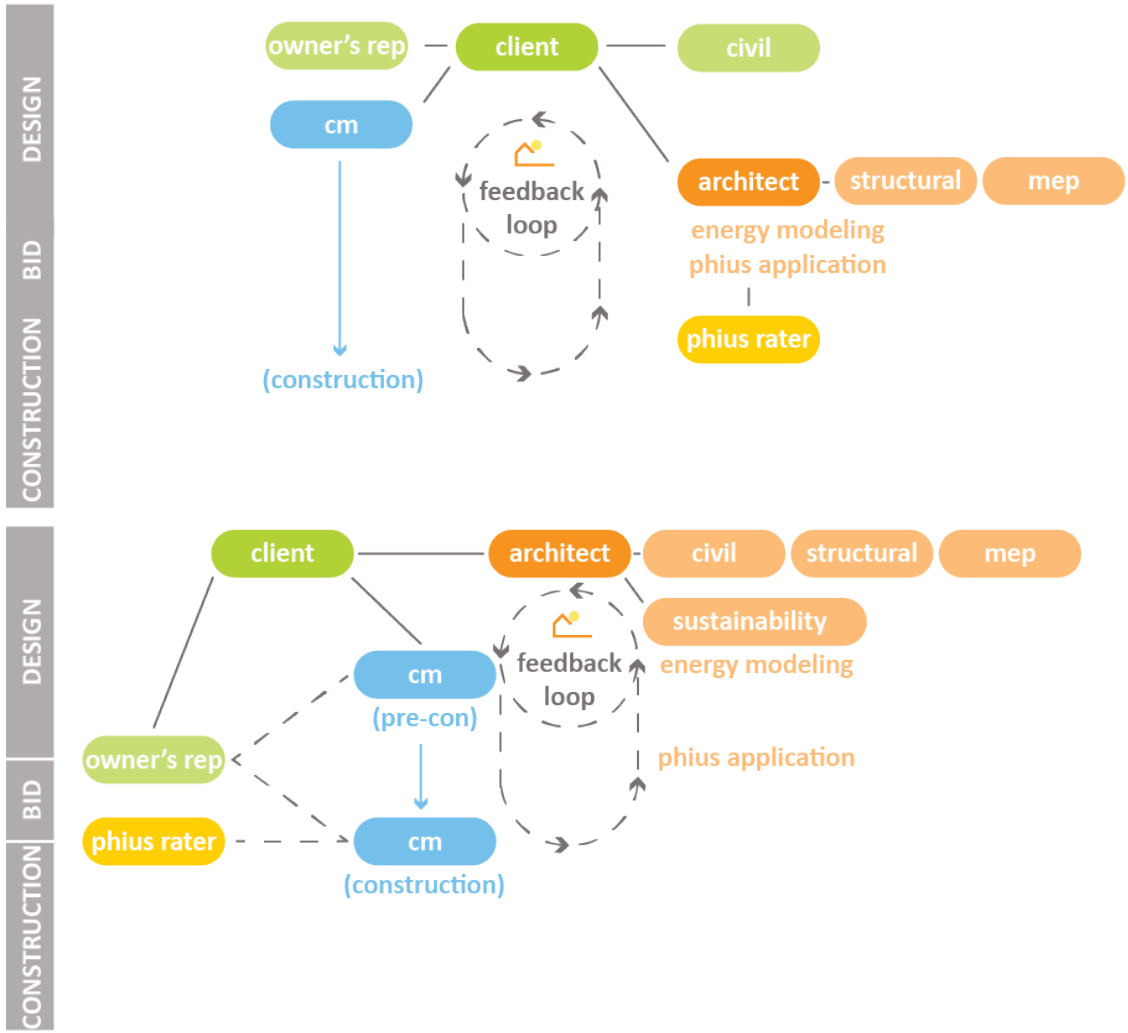
LOWELL SPECIFICATIONS, INC.

STRATEGIC TEAM BUILDING

WHO / WHAT / WHEN

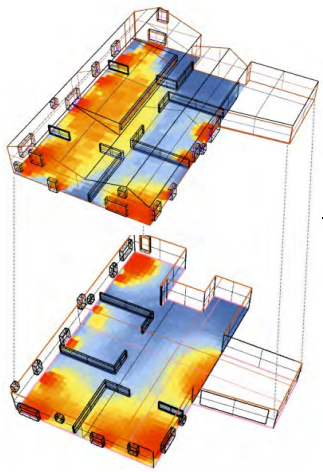
MCW

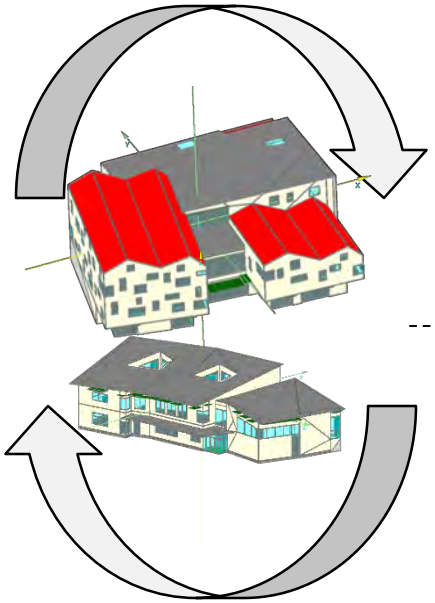
WFLS

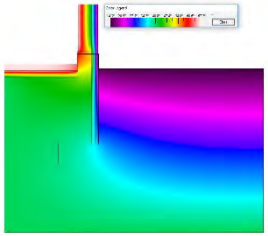


TOOLS TO GET STARTED

SUCCESS IN ENERGY MODELING + NAVIGATING THE PHIUS PROCESS







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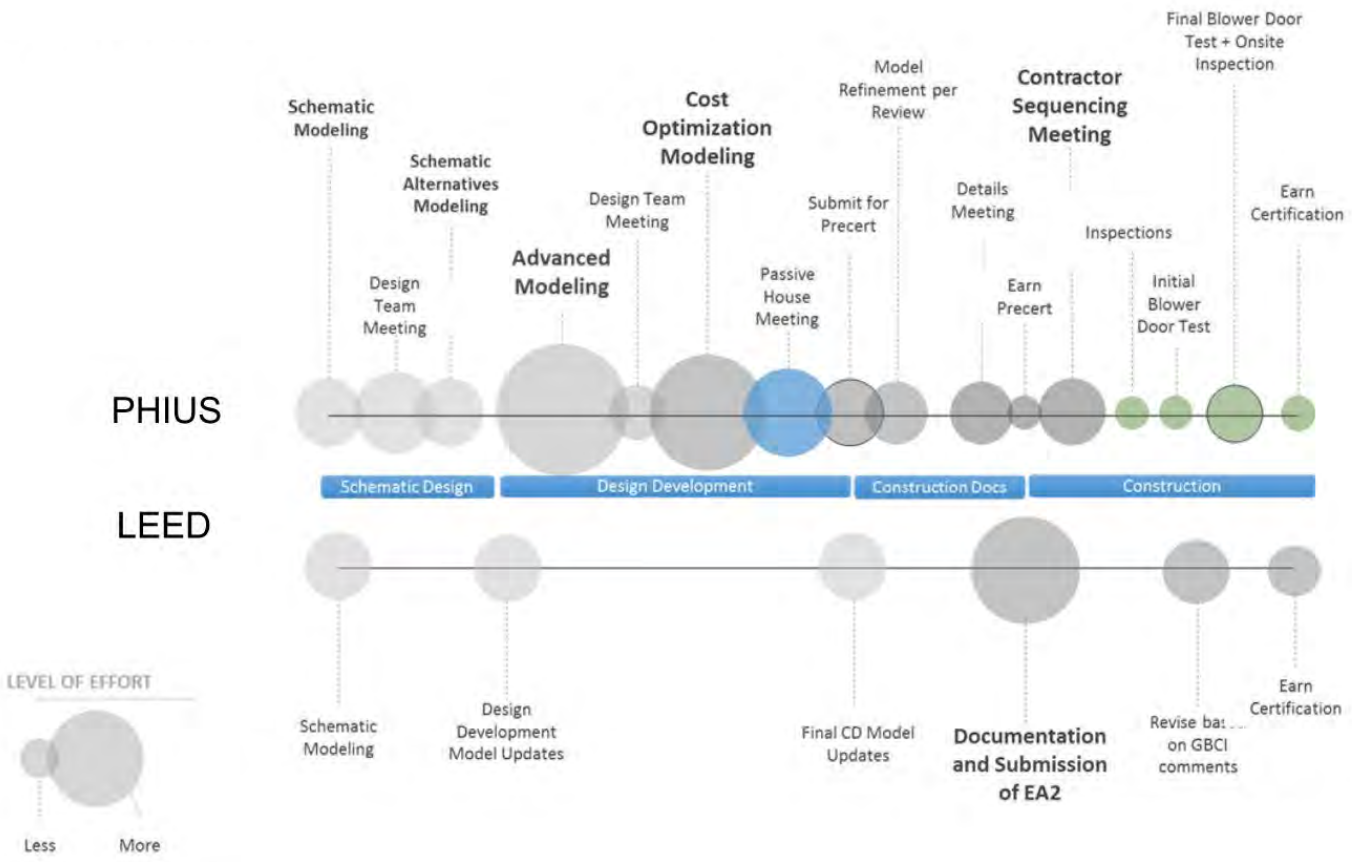
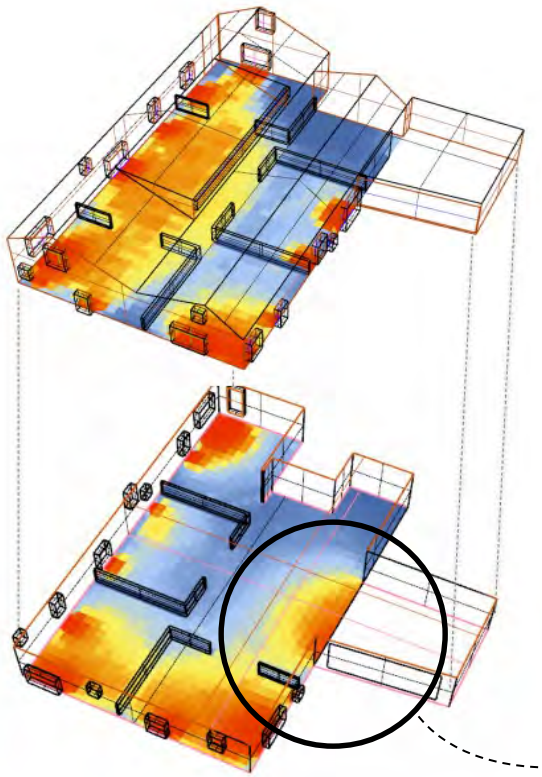


TOOLS TO GET STARTED

SUCCESS IN ENERGY MODELING + NAVIGATING THE PHIUS PROCESS



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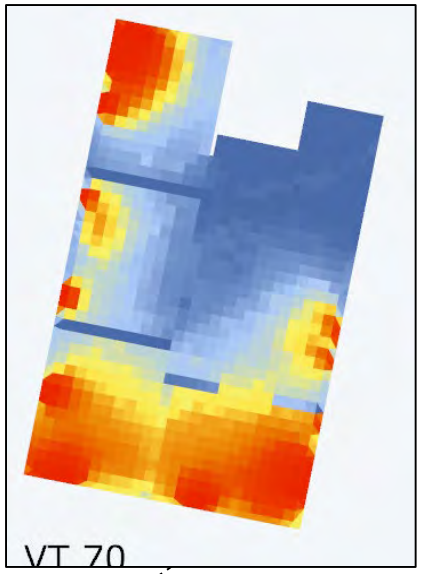

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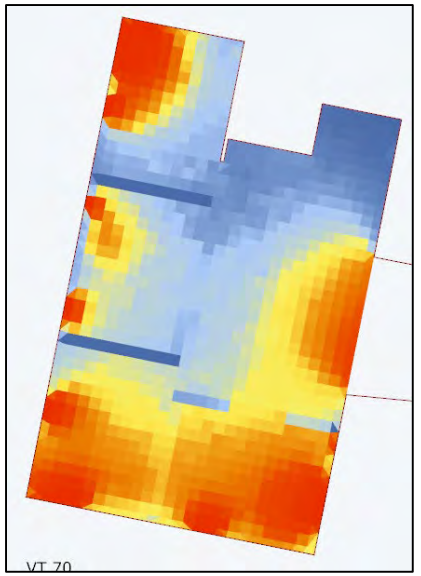
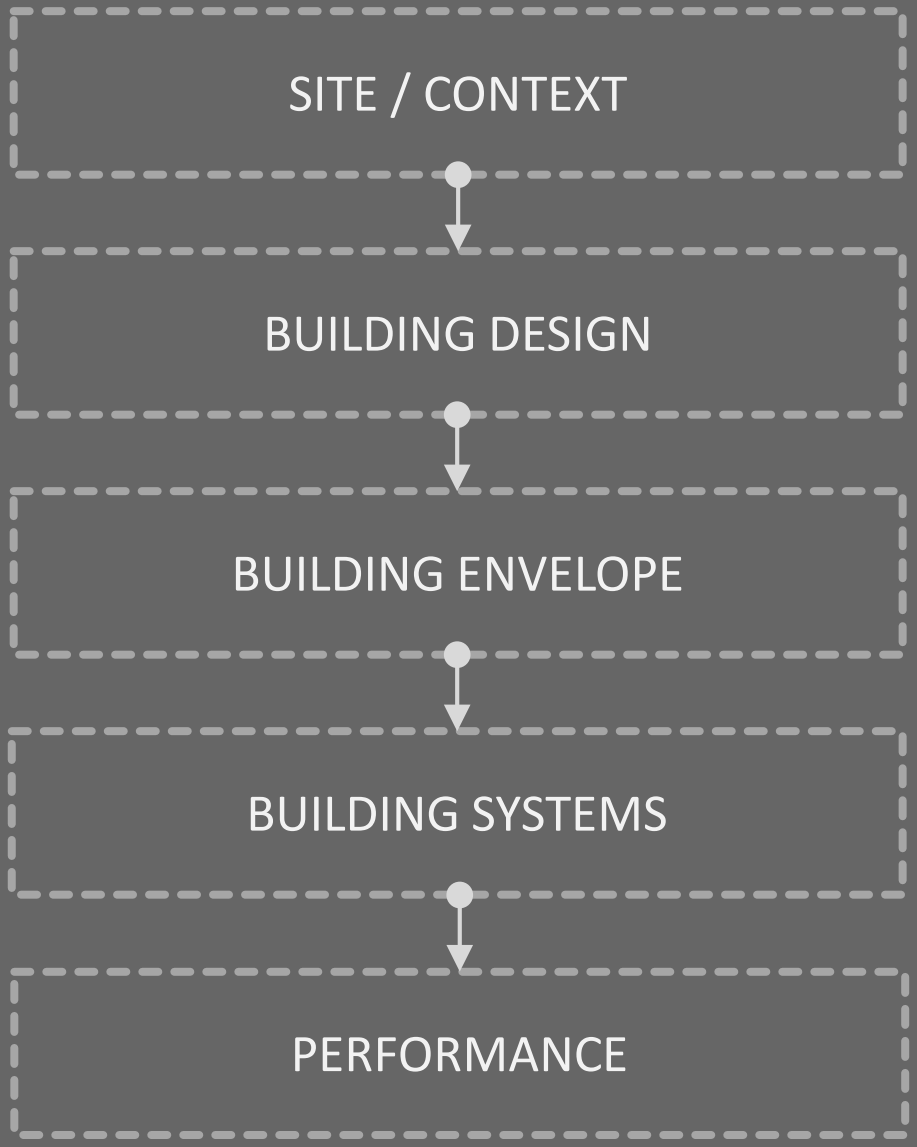
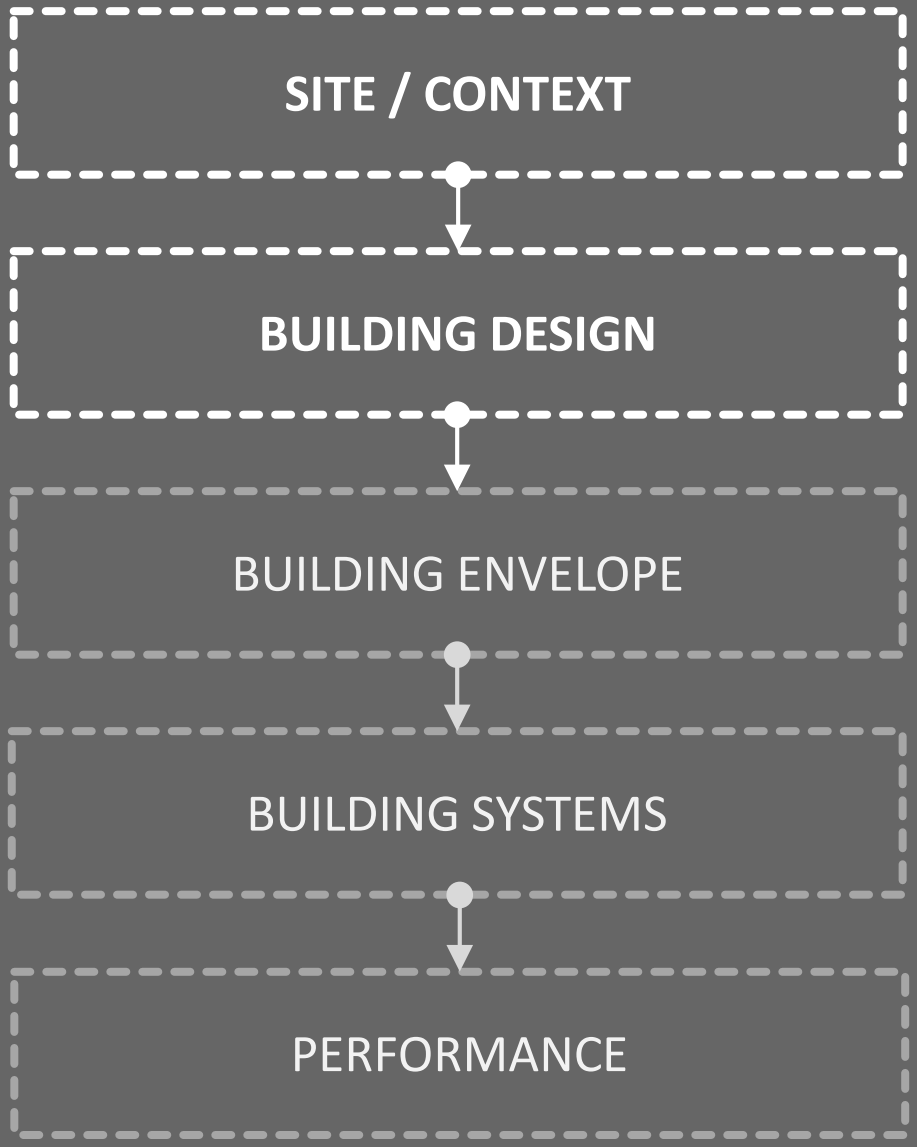


DESIGN CONSIDERATIONS



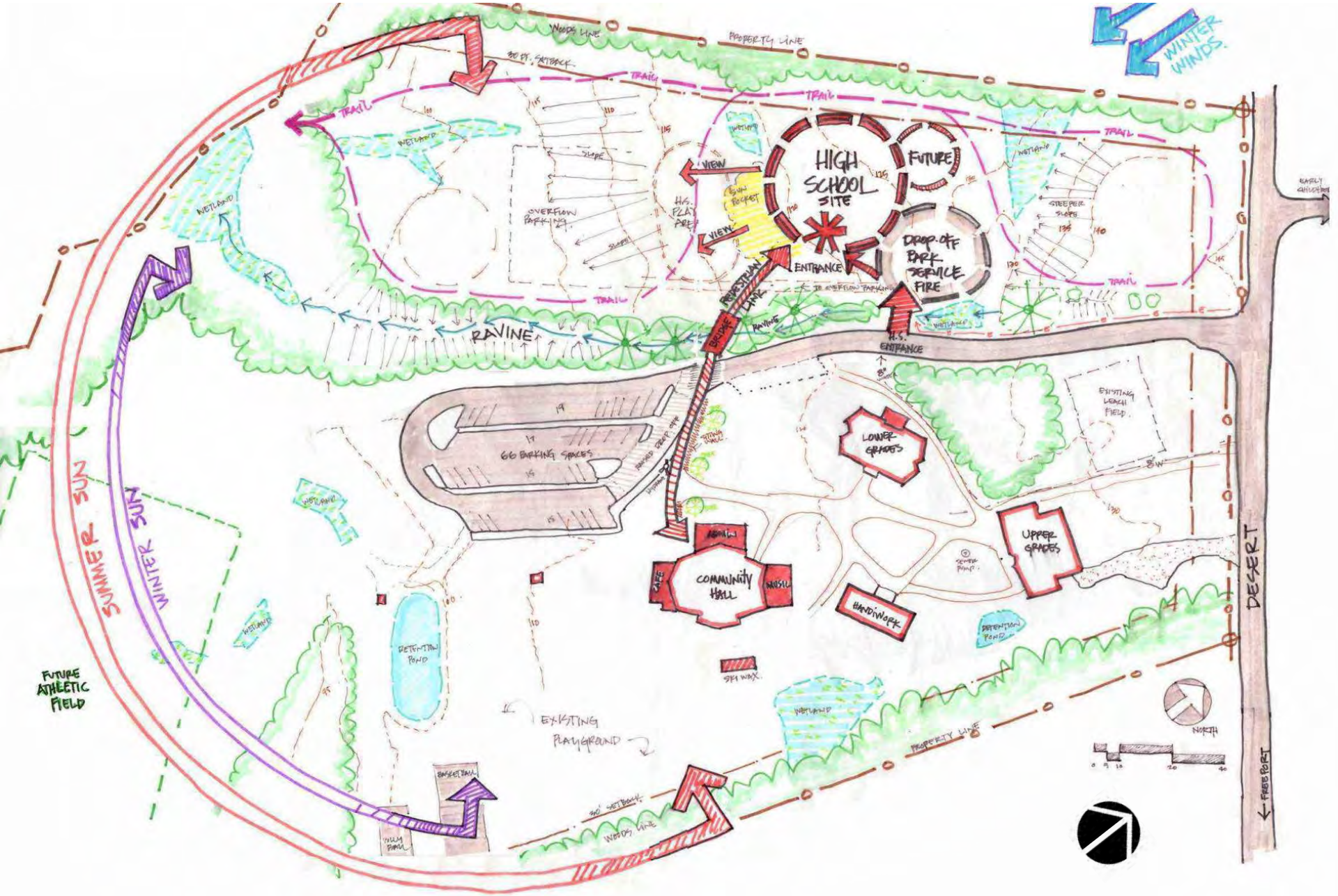
DESIGN CONSIDERATIONS



MAINE COAST WALDORF HIGH SCHOOL

SITE / CONTEXT + BUILDING DESIGN

SITE / CONTEXT


WINTER WINDS
PROPERTY LINE
TRAIL
WOODS LINE
WETLAND
SLOPE
OVERFLOW PARKING
VIEW
SUN POCKET
HIGH SCHOOL SITE
FUTURE
DROP-OFF PARK SERVICE FIRE
ENTRANCE
PEDESTRIAN LINK
BRIDGE
RAVINE
H.S. ENTRANCE
66 PARKING SPACES
LOWER GRADES
UPPER GRADES
COMMUNITY HALL
CAFE
MUSIC
HANDIWORK
EXISTING LEACH FIELD
RETENTION POND
SKI WAX
EXISTING PLAYGROUND
BASKETBALL
VOLLEY BALL
SUMMER SUN
WINTER SUN
FUTURE ATHLETIC FIELD
DESERT
NORTH
FREEPORT

SITE PLAN

DESERT ROAD

01

04

05

06

02

03

07

08

09

10

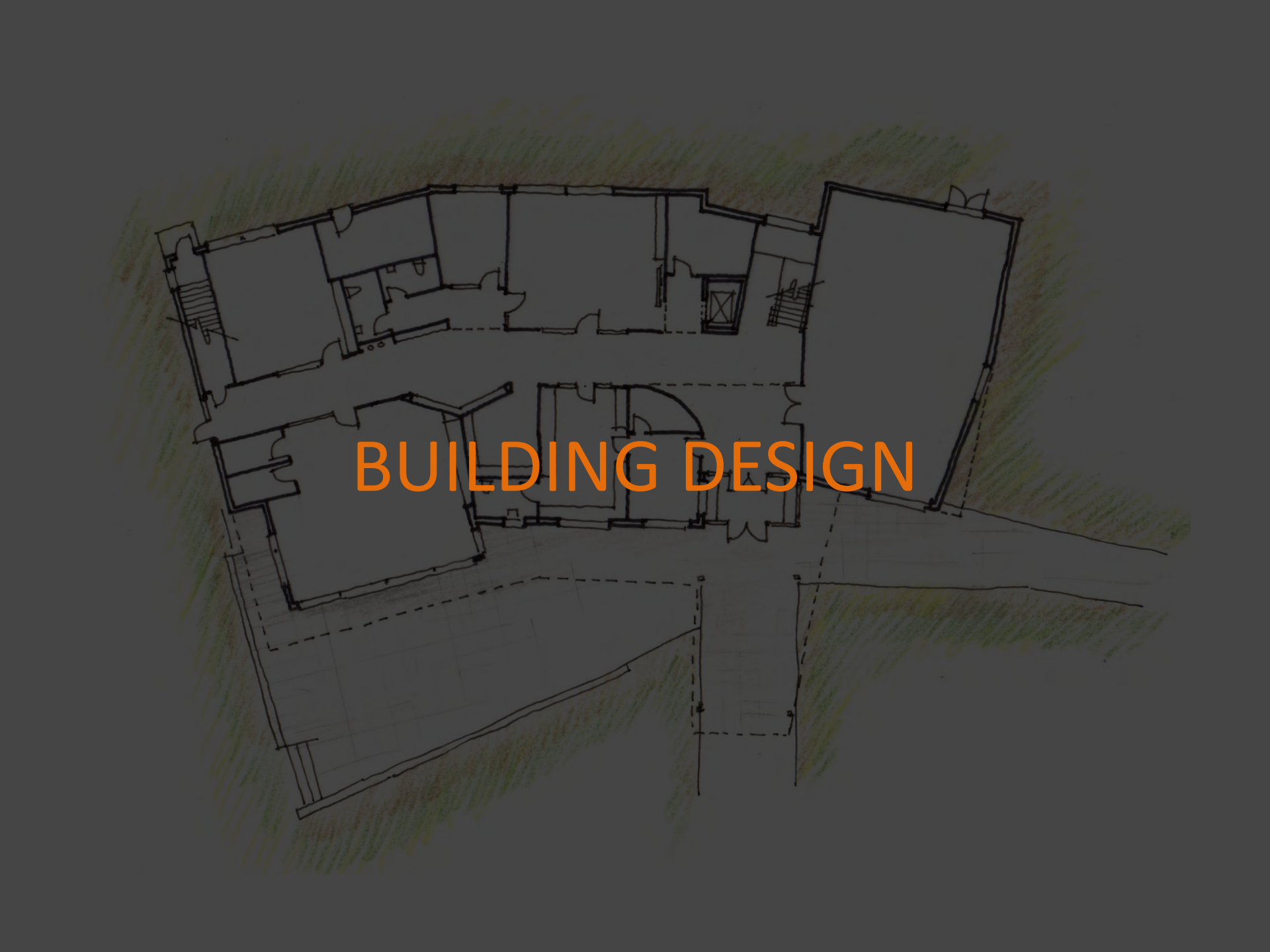
11

12

PLAN KEY

01 CAMPUS ENTRY
02 HIGH SCHOOL DROP OFF
03 MAIN ENTRY
04 SECONDARY ENTRY
05 LIGHT WELL DORMER
06 SOLAR PANELS
07 OUTDOOR CLASSROOM / PATIO
08 GRAVEL PATH
09 LOWER GRADES
10 UPPER GRADES
11 HANDWORK
12 COMMUNITY HALL

60' 30' 0' 60' 120'


BUILDING DESIGN

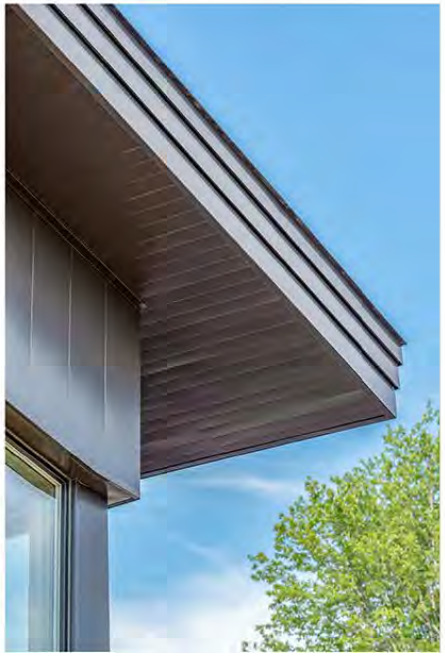
FIRST FLOOR PLAN

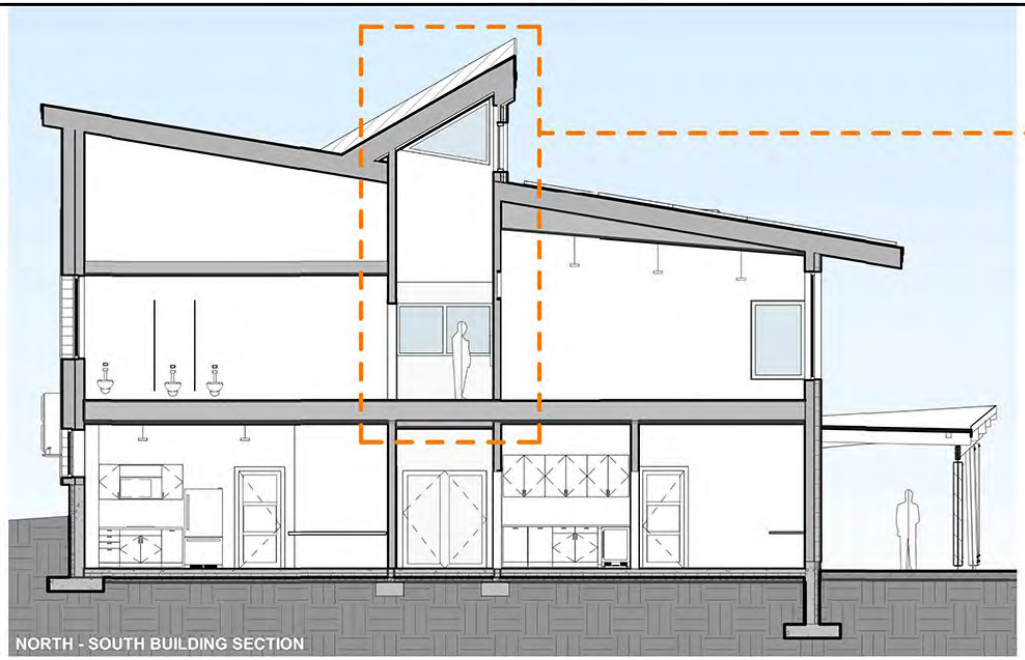
SECOND FLOOR PLAN

SOUTH ELEVATION

10' 5' 0' 10' 20'

WEST ELEVATION





NORTH - SOUTH BUILDING SECTION

10' 5' 0' 10' 20'

FLEX CLASSROOM

SECOND FLOOR CORRIDOR

GREAT ROOM

FIRST FLOOR CORRIDOR & STUDENT CENTER

FIRST FLOOR CORRIDOR, LOCKERS, & ART CLASSROOM

WAYNFLETE LOWER SCHOOL

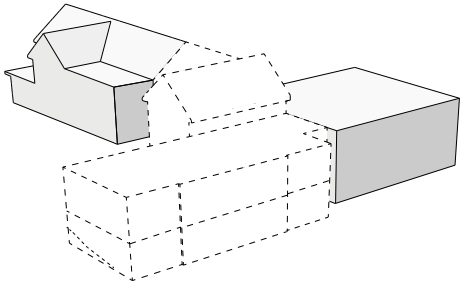
SITE / CONTEXT + BUILDING DESIGN

SITE / CONTEXT

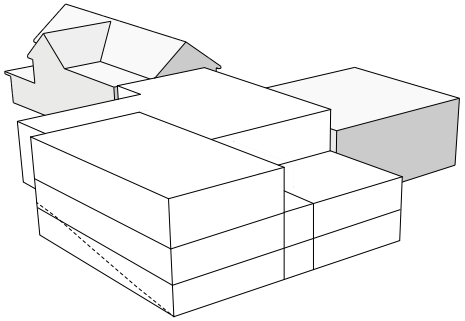

CASCO BAY
PORTLAND
SOUTH PORTLAND


WAYNFLETE CAMPUS
HISTORIC DISTRICT BOUNDARY
FORE RIVER

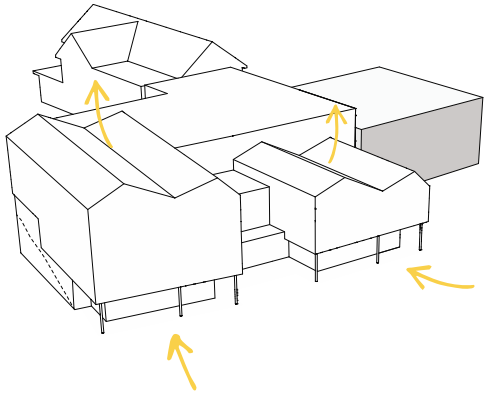
BUILDING DESIGN



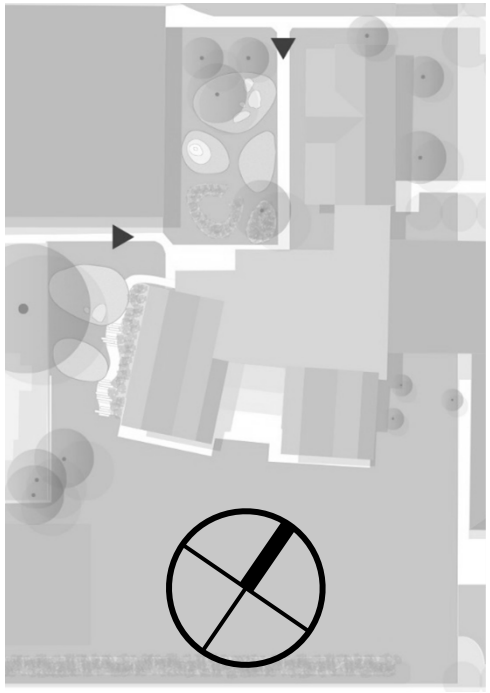
EXISTING BUILDING MASSING

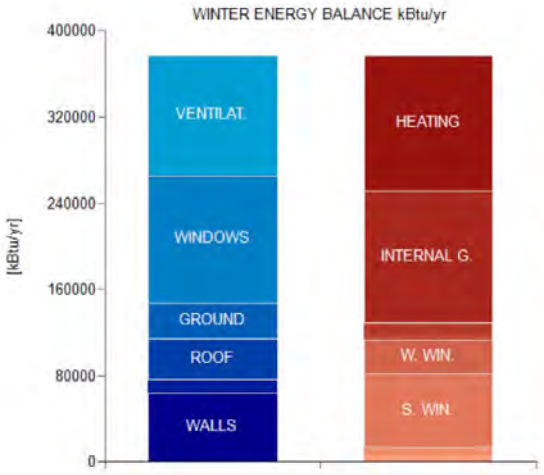


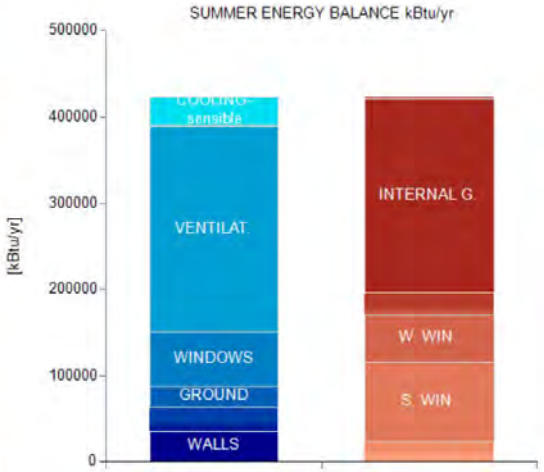
PROCESS DESIGN MASSING

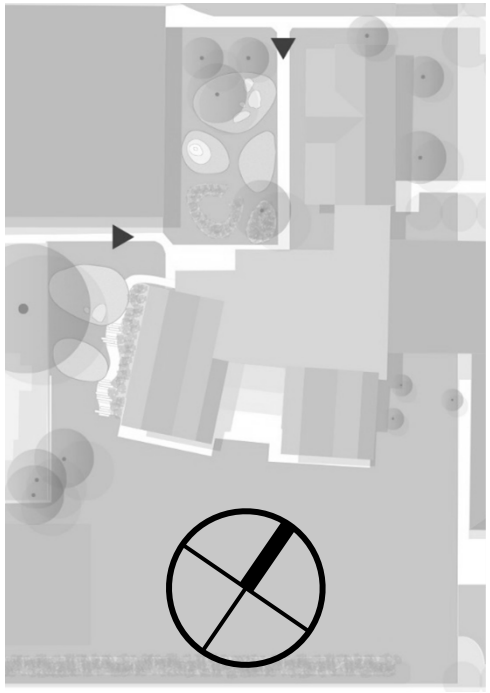


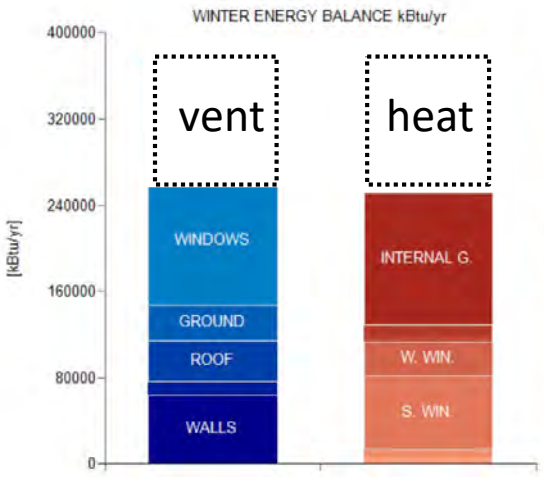
EVOLUTION OF DESIGN AND SCOPE

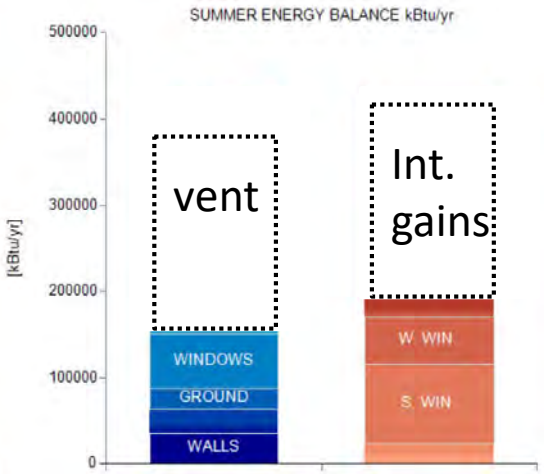



WINTER ENERGY BALANCE kBtu/yr
[kBtu/yr]
400000
320000
240000
160000
80000
0
VENTILAT.
WINDOWS
GROUND
ROOF
WALLS
HEATING
INTERNAL G.
W. WIN.
S. WIN.


SUMMER ENERGY BALANCE kBtu/yr
[kBtu/yr]
500000
400000
300000
200000
100000
0
sensible
VENTILAT.
WINDOWS
GROUND
WALLS
INTERNAL G.
W. WIN
S. WIN



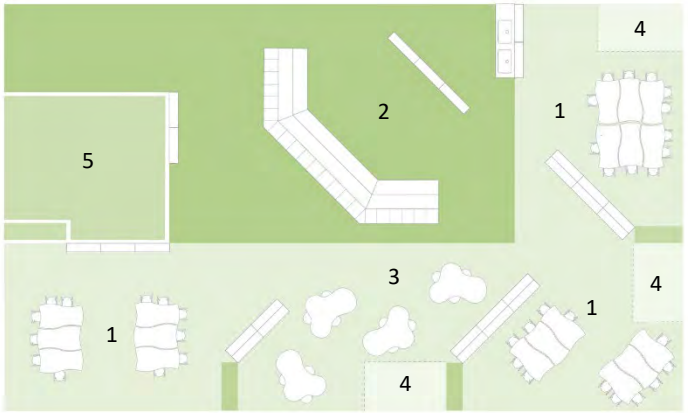

WINTER ENERGY BALANCE kBtu/yr
[kBtu/yr]
400000
320000
240000
160000
80000
0
vent
heat
WINDOWS
GROUND
ROOF
WALLS
INTERNAL G.
W. WIN.
S. WIN.


SUMMER ENERGY BALANCE kBtu/yr
[kBtu/yr]
500000
400000
300000
200000
100000
0
vent
Int.
gains
WINDOWS
GROUND
WALLS
W. WIN
S. WIN

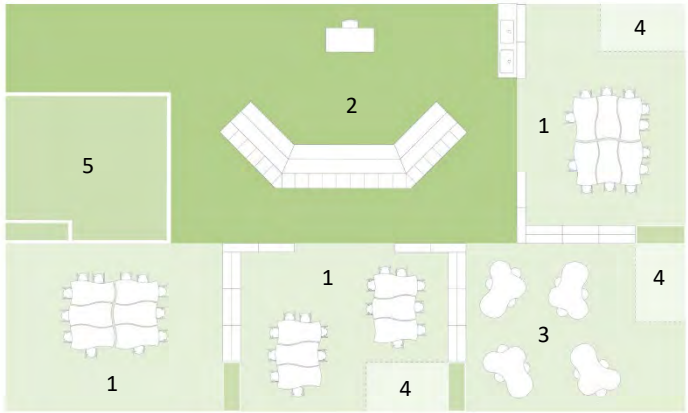
ADMINISTRATION
SHARED CLASSROOM
FACILITIES SUPPORT
CLASSROOM
COMMON SPACE
EXISTING

0 2' 8' 16' 24'

FLEXIBLE CLASSROOM LAYOUTS:



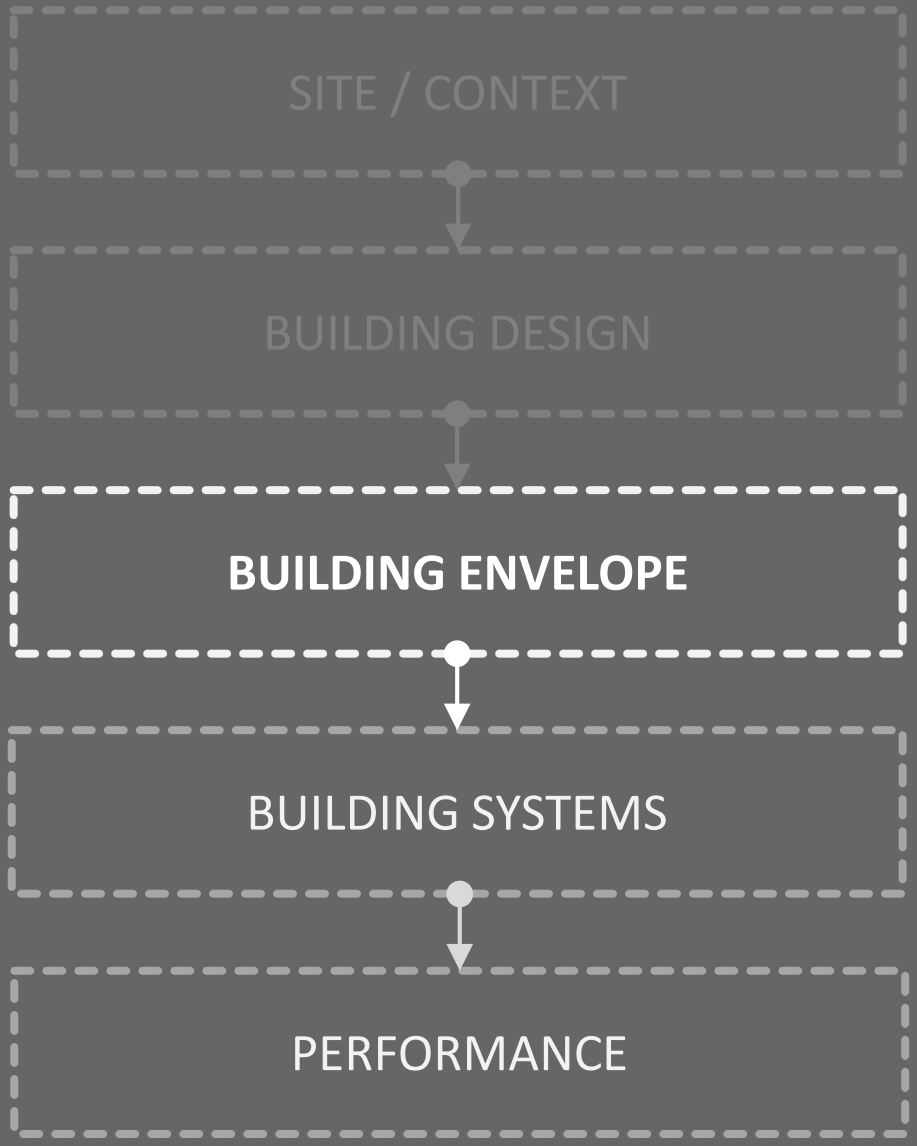
EXAMPLE B



EXAMPLE A

1. Classroom habitat
2. Gathering space
3. Activity station
4. Play loft
5. Restrooms

DESIGN CONSIDERATIONS



BUILDING ENVELOPE

ROOF ASSEMBLY

WALL ASSEMBLY

SLAB ASSEMBLY

WINDOWS + DOORS