Clackamas High School

Clackamas High School – Building Program

- 1800 Students
- 275,000 ± Square Feet
- 41.6 Acre Developable Site
- Parking for 500± Automobiles
- 25 Bus Loading/Unloading
- Parking for 250 Bicycles

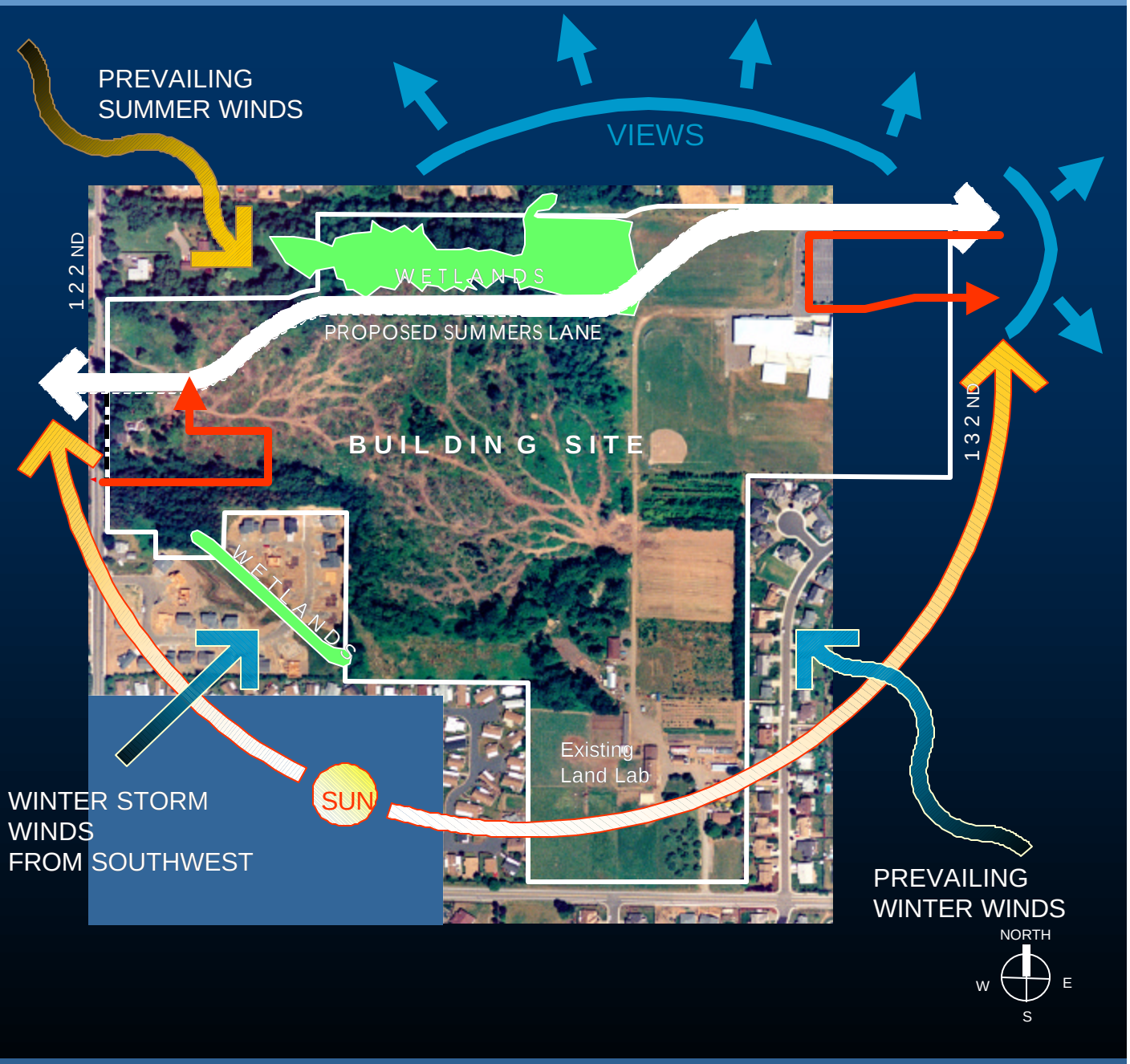
Many Firsts

- 1st new high school in many years.
- 1st collaboration with many team members.
- 1st to fully implement green architecture & sustainable goals.
- 1st that employs a performance based contract to achieve energy savings (including commissioning).
- 1st that involves national leaders in the field of energy conservation.
  - RMI
  - ENSAR
  - Eley Associates
  - PGE
  - NW Lighting Lab

A /E Team

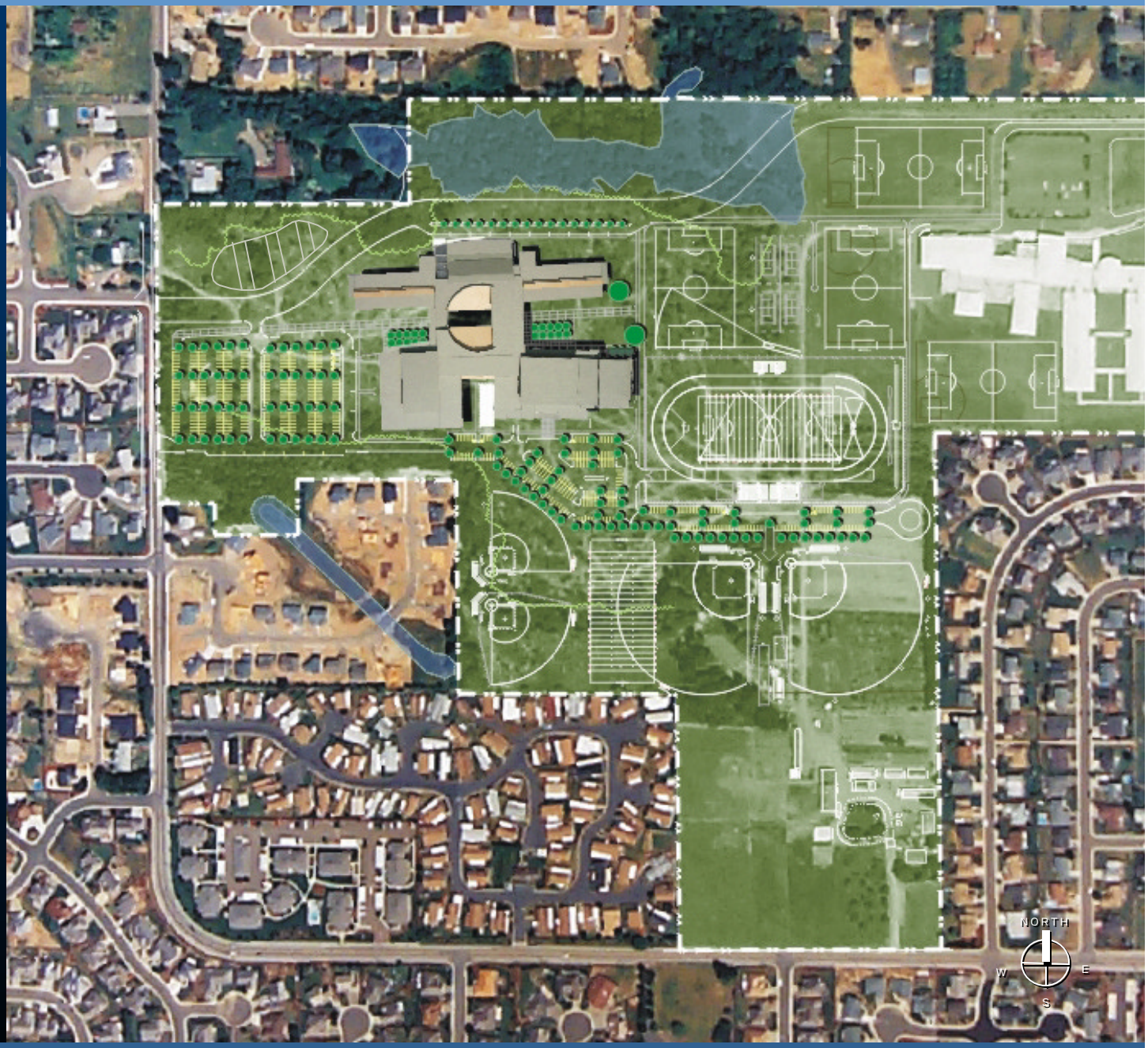
• Architects	BOORA Architects
• Structural	KPFF Consulting Engineers
• Mechanical	CBG
• Electrical	Interface Engineering
• Civil	Compass Ingineering
• Landscape Architects	Beighley & Associates
• Acoustical & Sound	Altermatt Associates, Inc.
• Theatre	Landry & Bogan Theatre Consultants
• Food Service	Halliday Associates, Inc.

Clackamas High School – Site Analysis



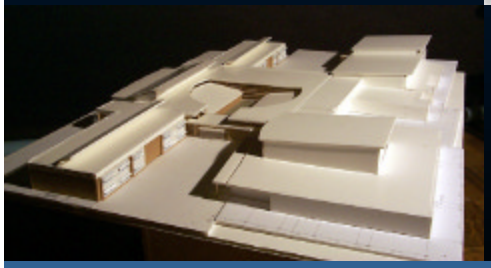
Clackamas High School – Site Design

- Arrangement to protect and preserve environment
- Clear Efficient Organization
  - Parking
  - Building
  - Fields
  - Sharing
- Safety and Security
  - Separation
  - Passive Supervision
  - Service Zones
- Green and Sustainable Design Strategies
  - Preservation of Wetland
  - Native Plants
  - Bio Filtration
  - Recycled Materials
  - Flexibility / Parking
  - Electric Cars
- Athletic Programs
  - Students and Community



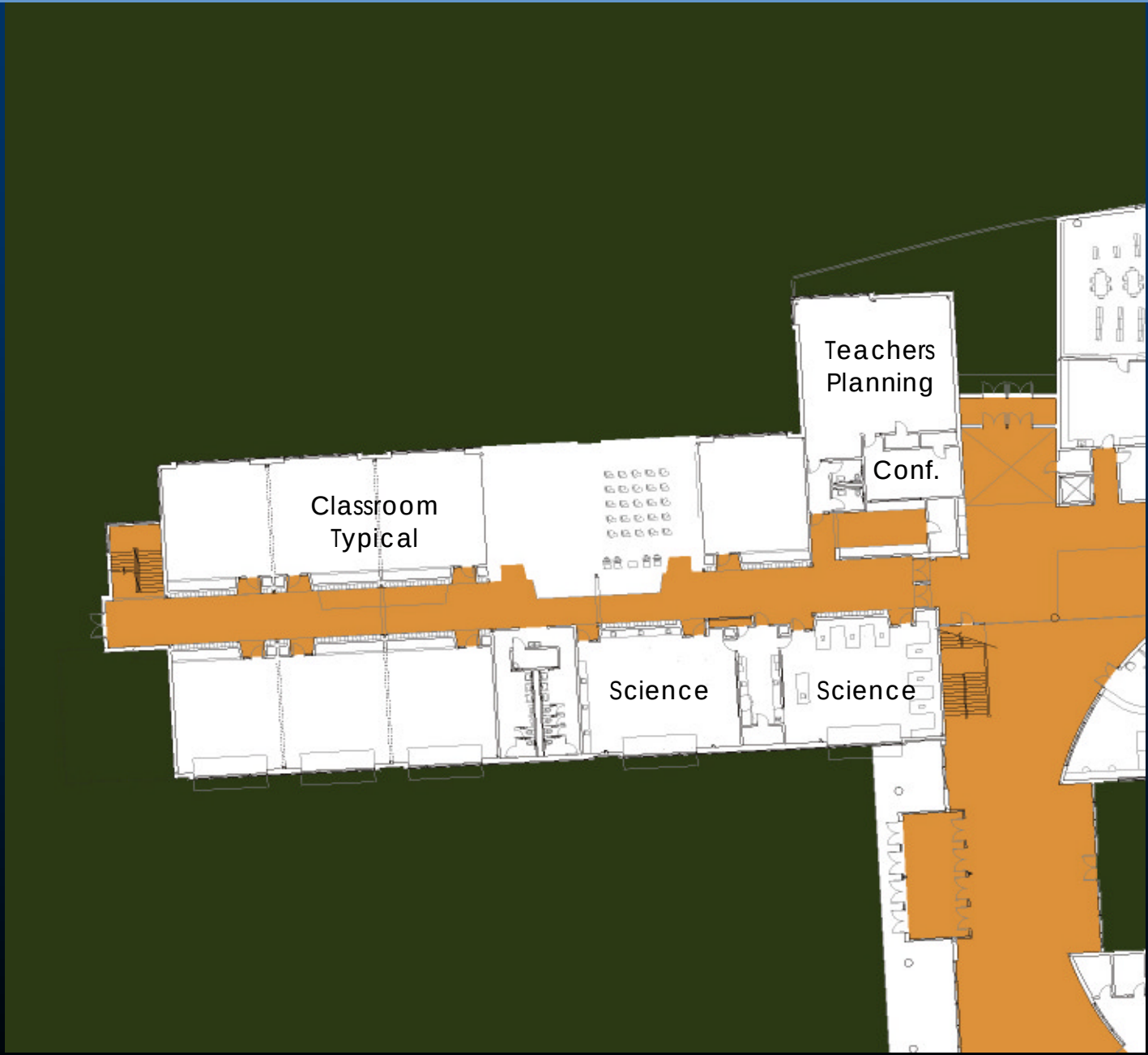
Clackamas High School – Guiding Principles for a New High School

- Flexibility and integration of instruction.
- Learning and social interaction.
- Technology with flexibility for future changes.
- Safe and secure learning environment for students and community.
- Athletic, activity and performance areas for students and community.
- State of the art energy conservation, sustainability and green architecture.
- Building as a teaching tool.



Clackamas High School – Second Floor Plan

Classroom House



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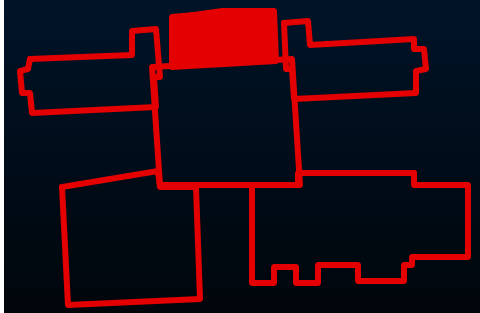
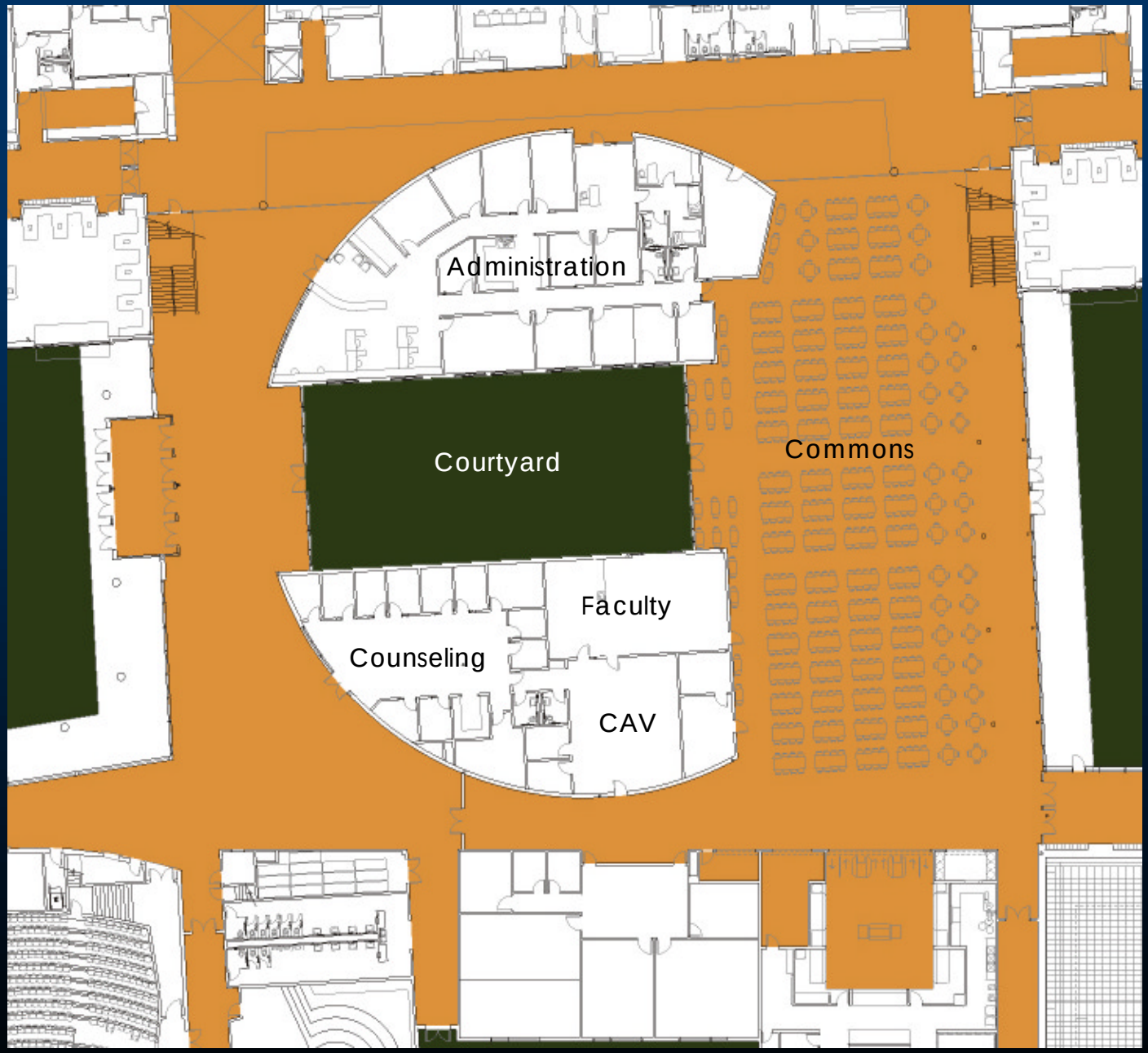
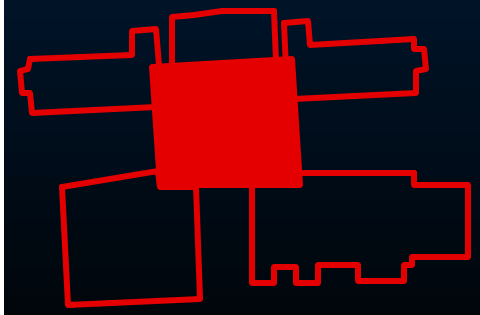
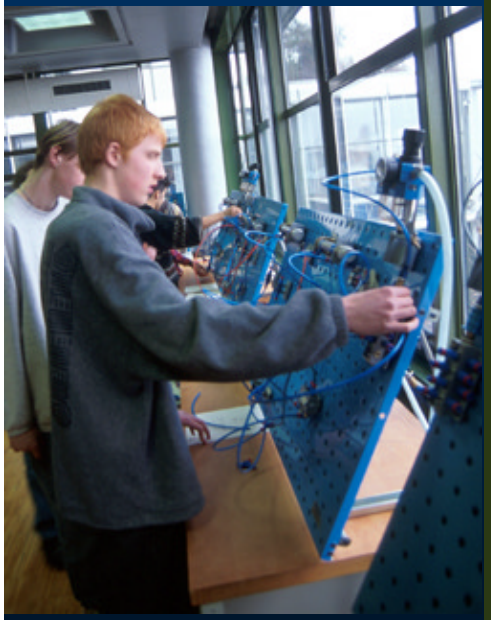


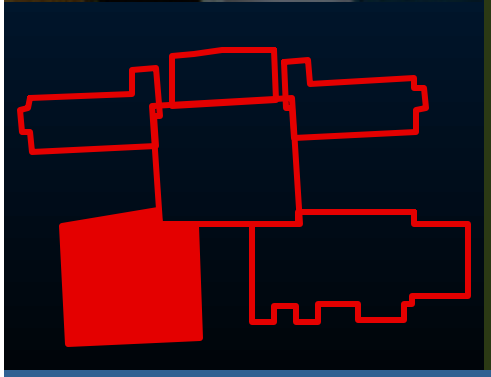
Office / Commons

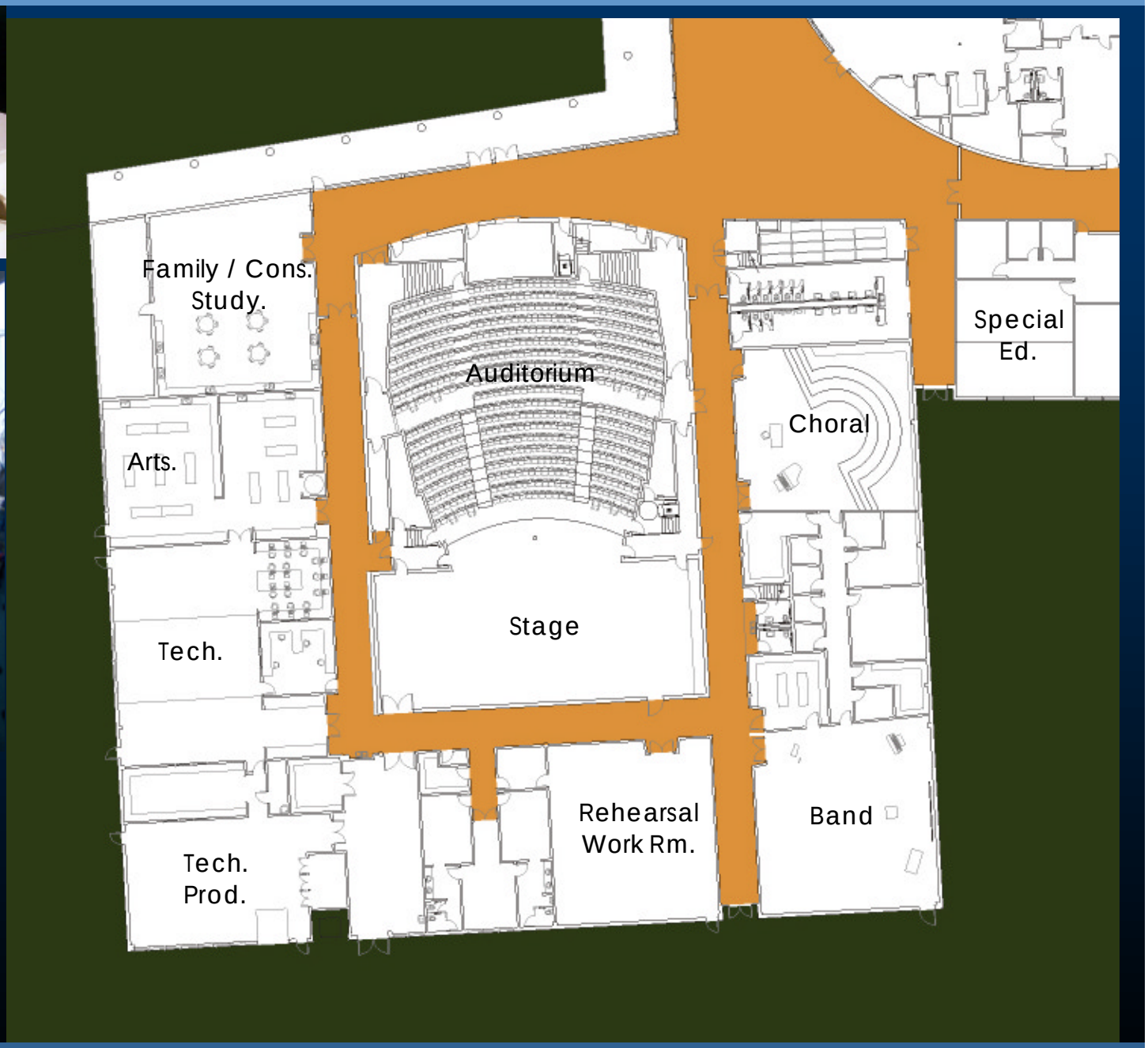




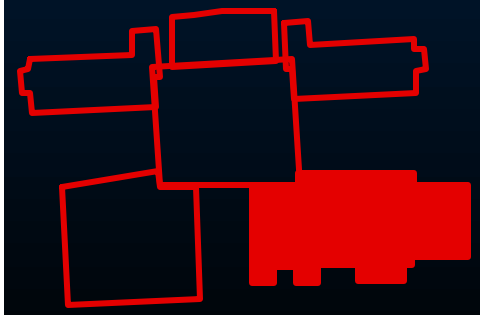
Fine & Performing Arts / Technology







Physical Education



Clackamas High School – EarthSmart Programs

Energy Efficiency

- Whole Building Energy Analysis
- Specific Requirements for Building Envelope, HVAC and Lighting System
- Building Commissioning
- Integrated Design Process

Quality Indoor Environment

- Low-toxicity Building Products
- Fresh Air Ventilation
- Natural Daylighting

Environmental Responsibility

- Indoor Water Efficiency
- Environmentally Appropriate Landscaping
- Interior Recycling Storage Area
- Efficient Transportation

Resource Efficiency

- Recycled Content Building Products

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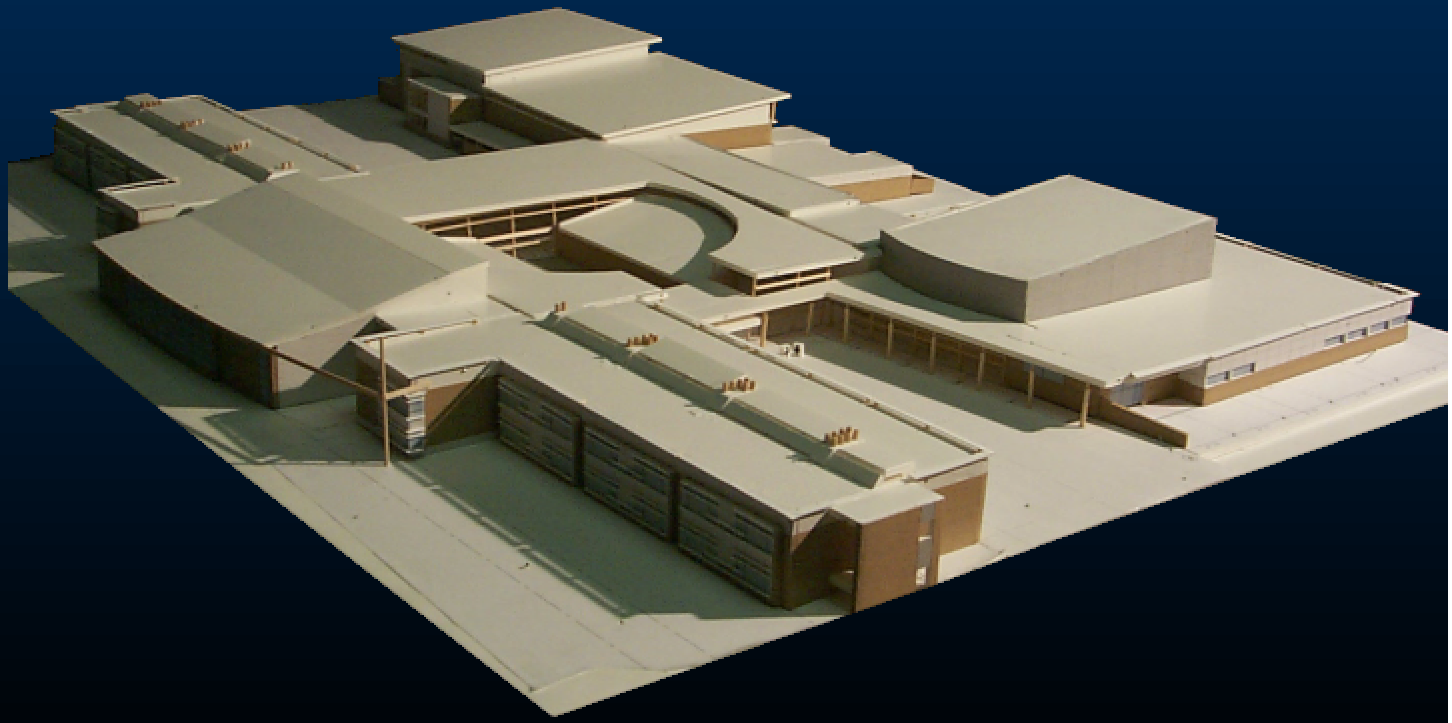
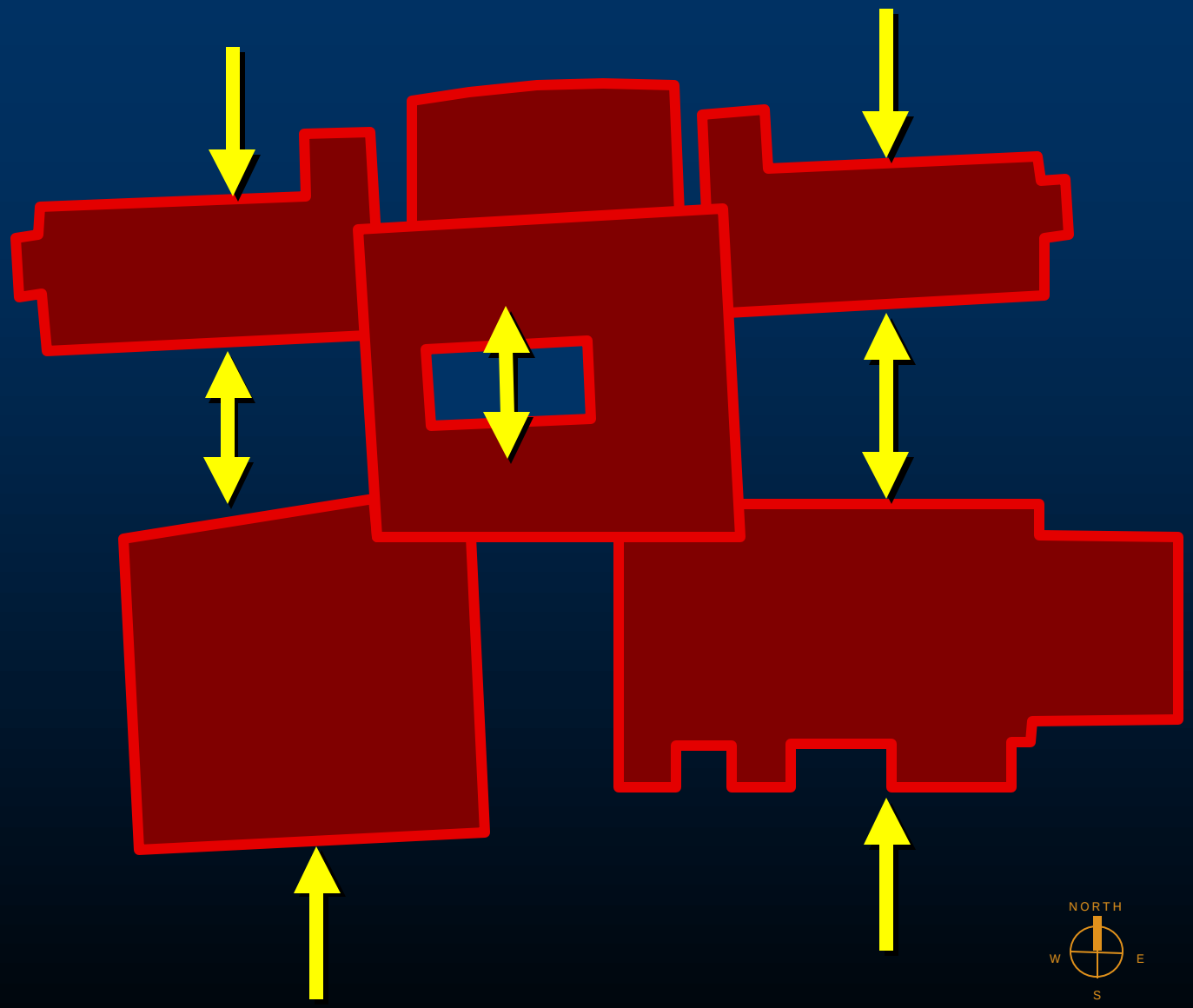
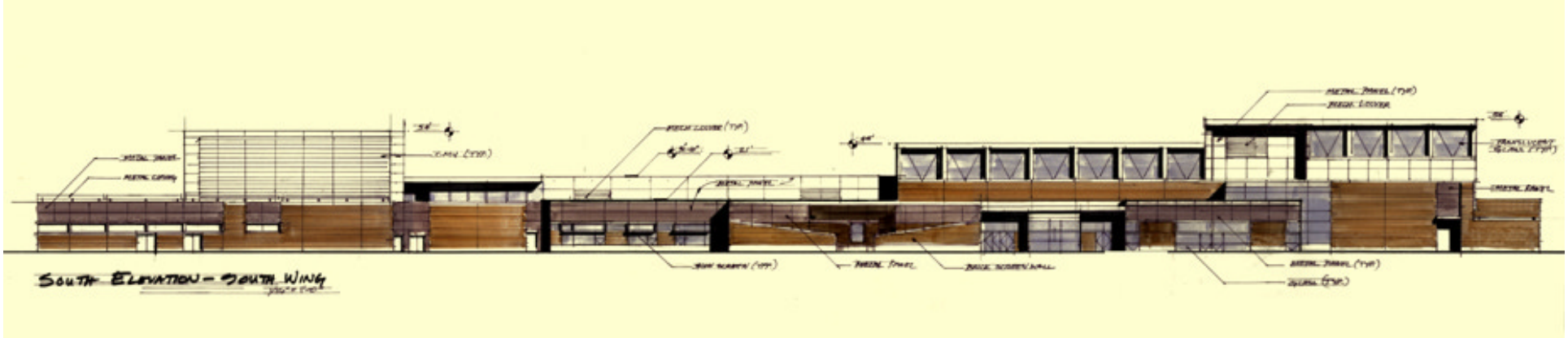


Clackamas High School – Implementing Daylighting

- Solar Access
- Orientation
- Massing
- Bay Depth
- Shading
- Microclimate



Envelope Design



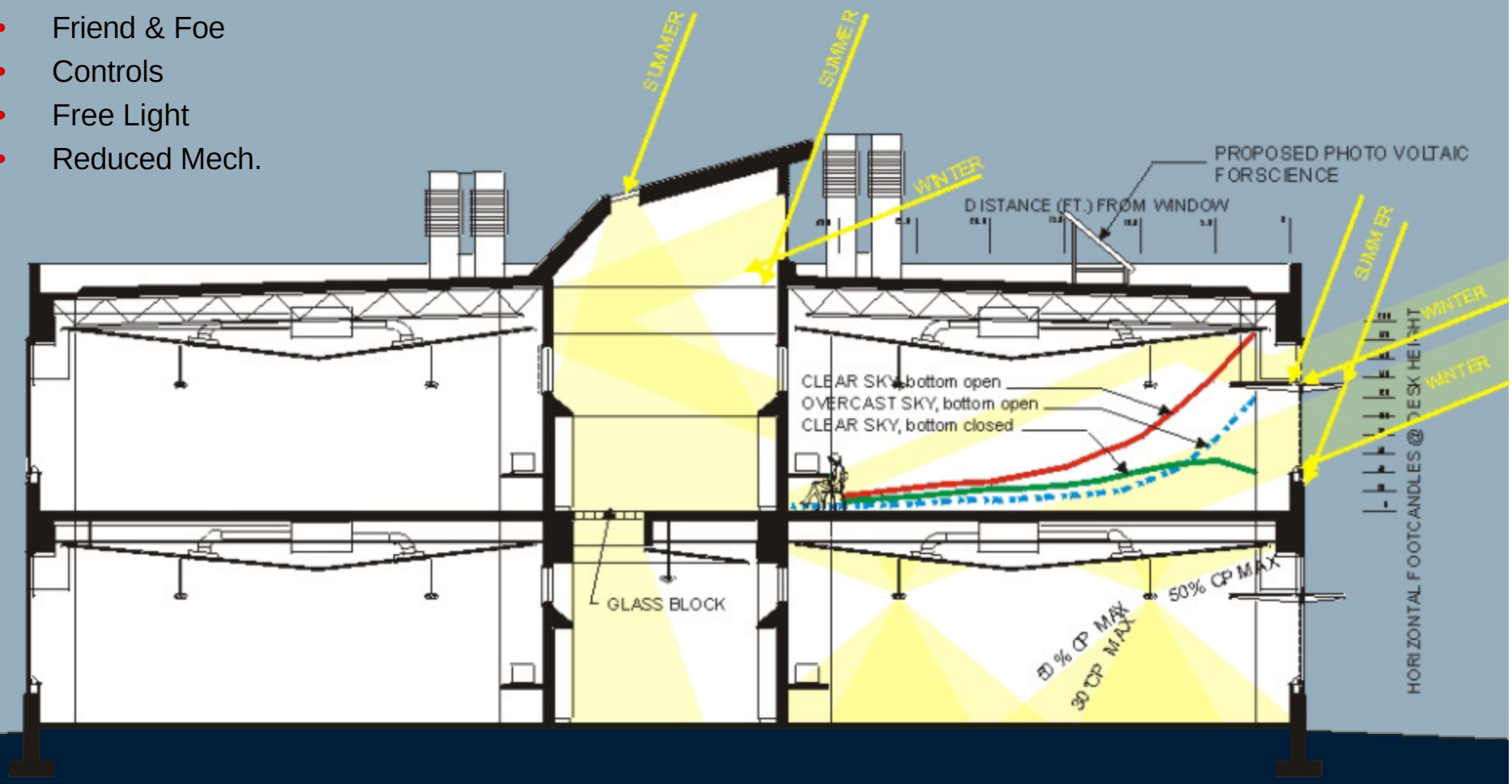
- Orientation
- Glazing
- Solar + Light Transmittance
- Shading Devices
- Reflectivity
- Insulation

Clackamas High School – Early Daylighting Model

- 3/8” to ½” scale
- Black foam core
- Laminate paper w/ proposed color (approx. light & darkness)
- Tracing paper for translucent materials Close seams w/ tape
- 4’ grids numbered & lettered on floor
- Camera view ports 2 ½” x 2 ½” min.
- Flexibility

Clackamas High School – Daylighting

- Old Concept
- Healthy Environment
- Connection to Outdoors
- Friend & Foe
- Controls
- Free Light
- Reduced Mech.

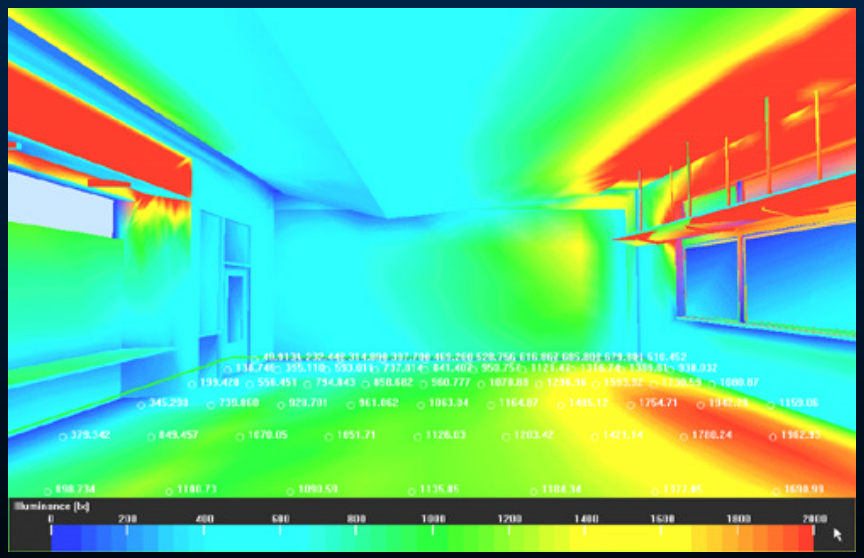


Clackamas High School – Daylighting Analysis - Lightscape

January 1 | 12:00pm | Clear Sky

March 1 | 12:00pm | Clear Sky

September 1 | 12:00pm | Clear Sky

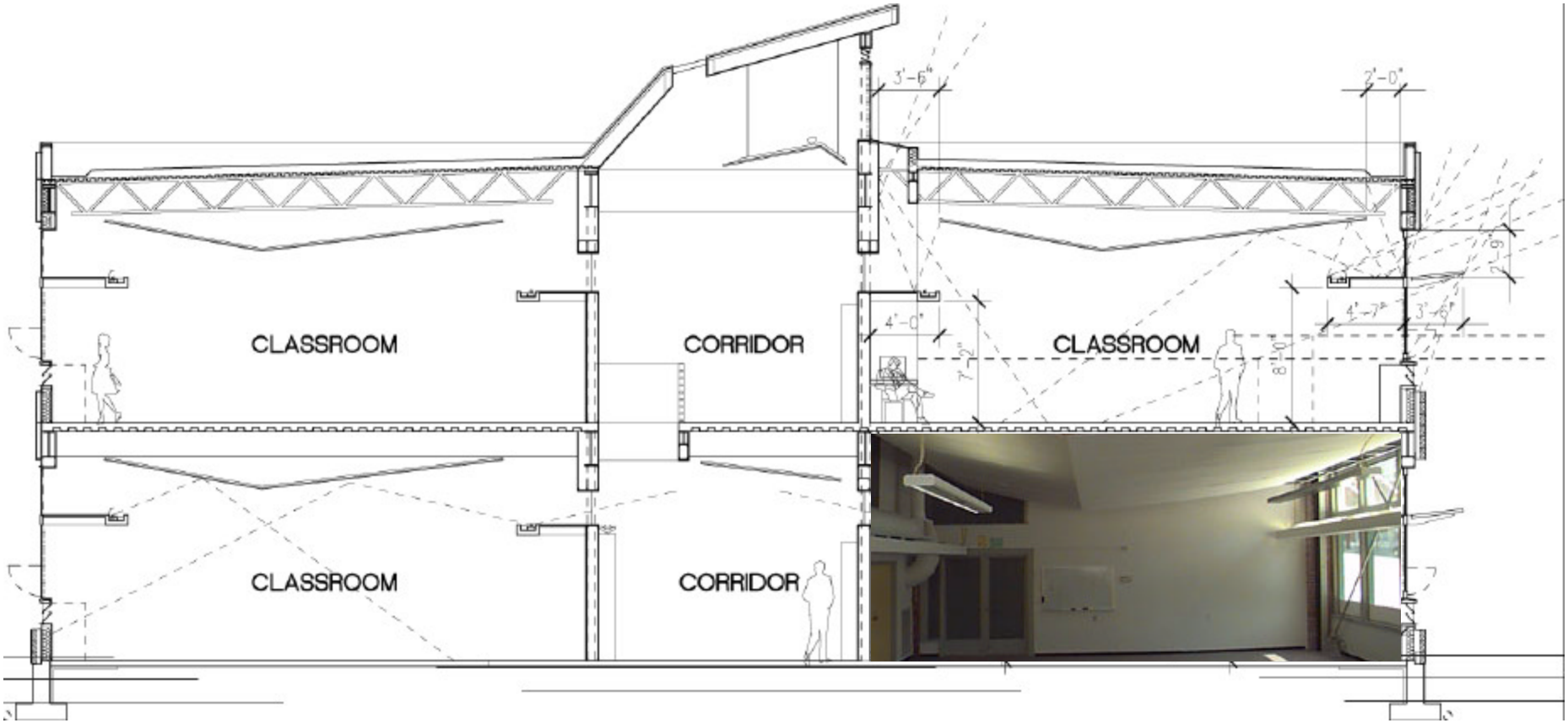


Daylighting Analysis

Clackamas High School – Lighting Design Lab Services

- Consultation
  - Mtgs. – on or off site
  - Review of lighting & control strategies
  - Design input
- Model Studies
  - Performance under clear or overcast skies
  - Identification of problem areas
  - Report & recommendations
  - Animations
- Mock-ups
  - Full scale mock-up for daylighting & electric lighting

Clackamas High School – Lighting Design Lab Mock-Up



Clackamas High School – On Site Mock-Up

- Model as a teacher

Clackamas High School – On Site Mock-Up

Clackamas High School – On Site Mock-Up

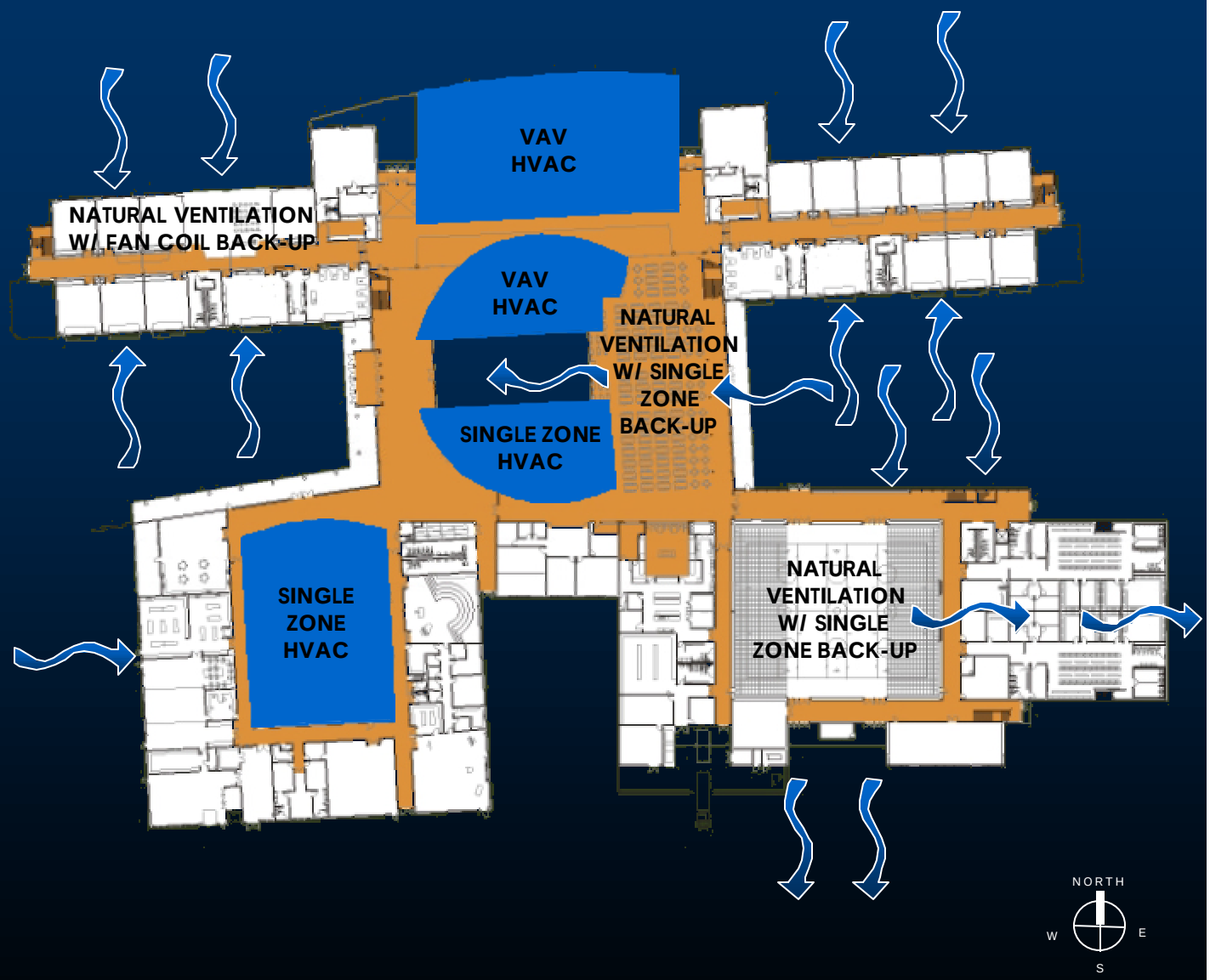
- Testing of T5 HO fixtures

Clackamas High School – Actual Classroom

Clackamas High School – Technology / Controls

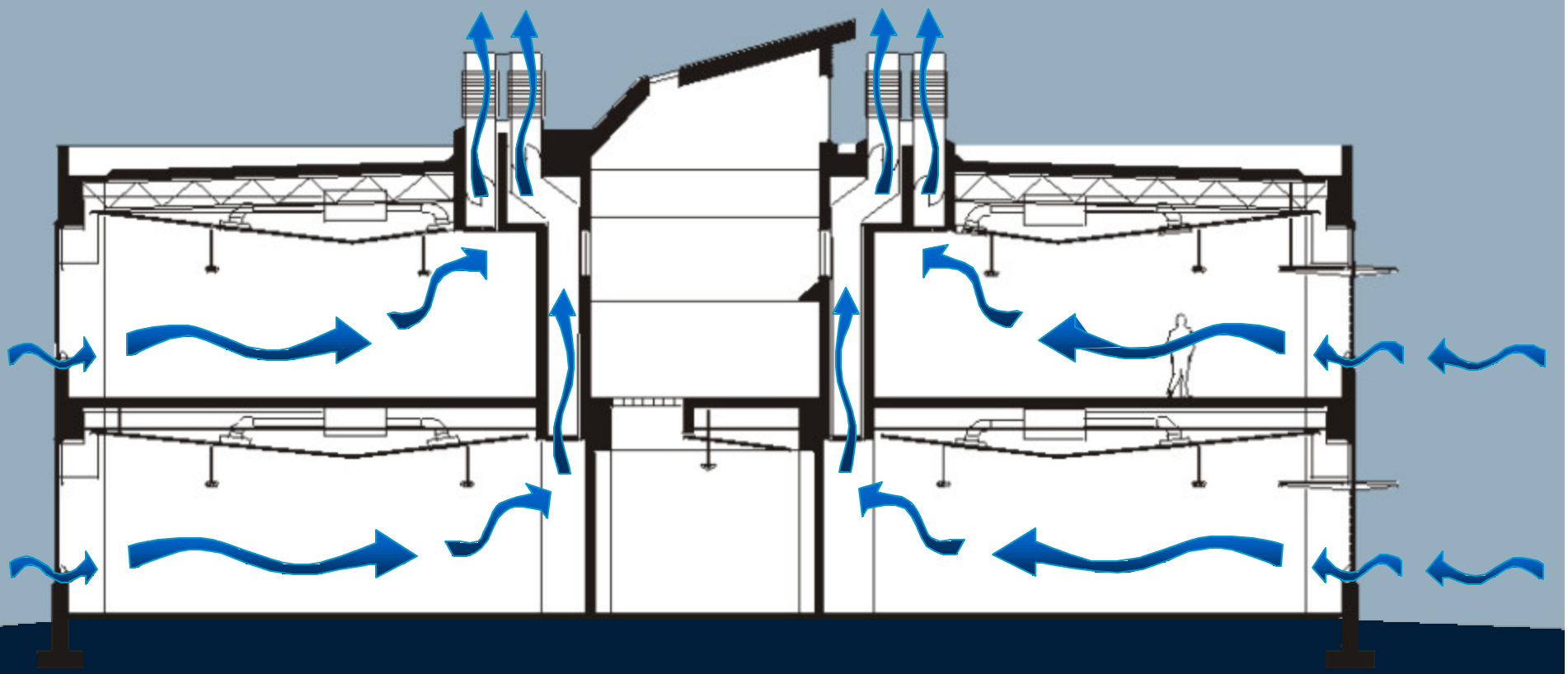
Clackamas High School – Mechanical System

- Natural Ventilation + Cooling
- Single Zone HVAC w/ Variable Speed Drive
- Cooling Transfer Options



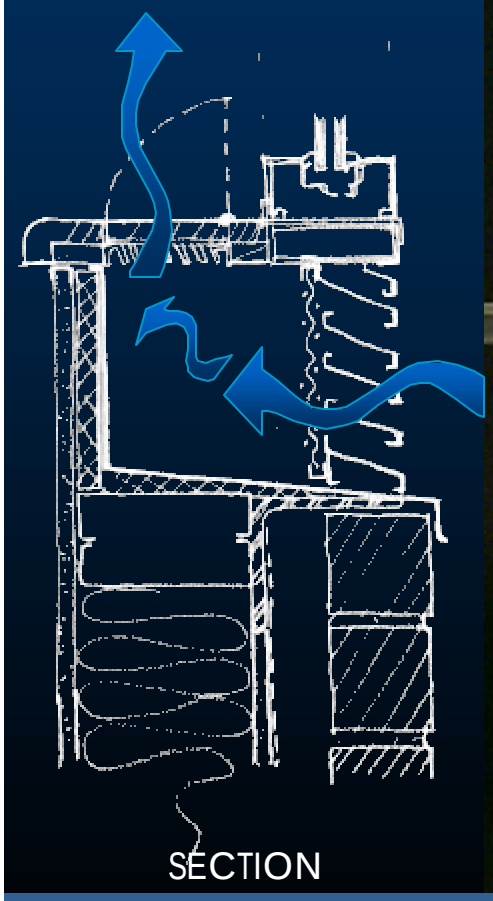
Clackamas High School – Natural Ventilation & Back-up System

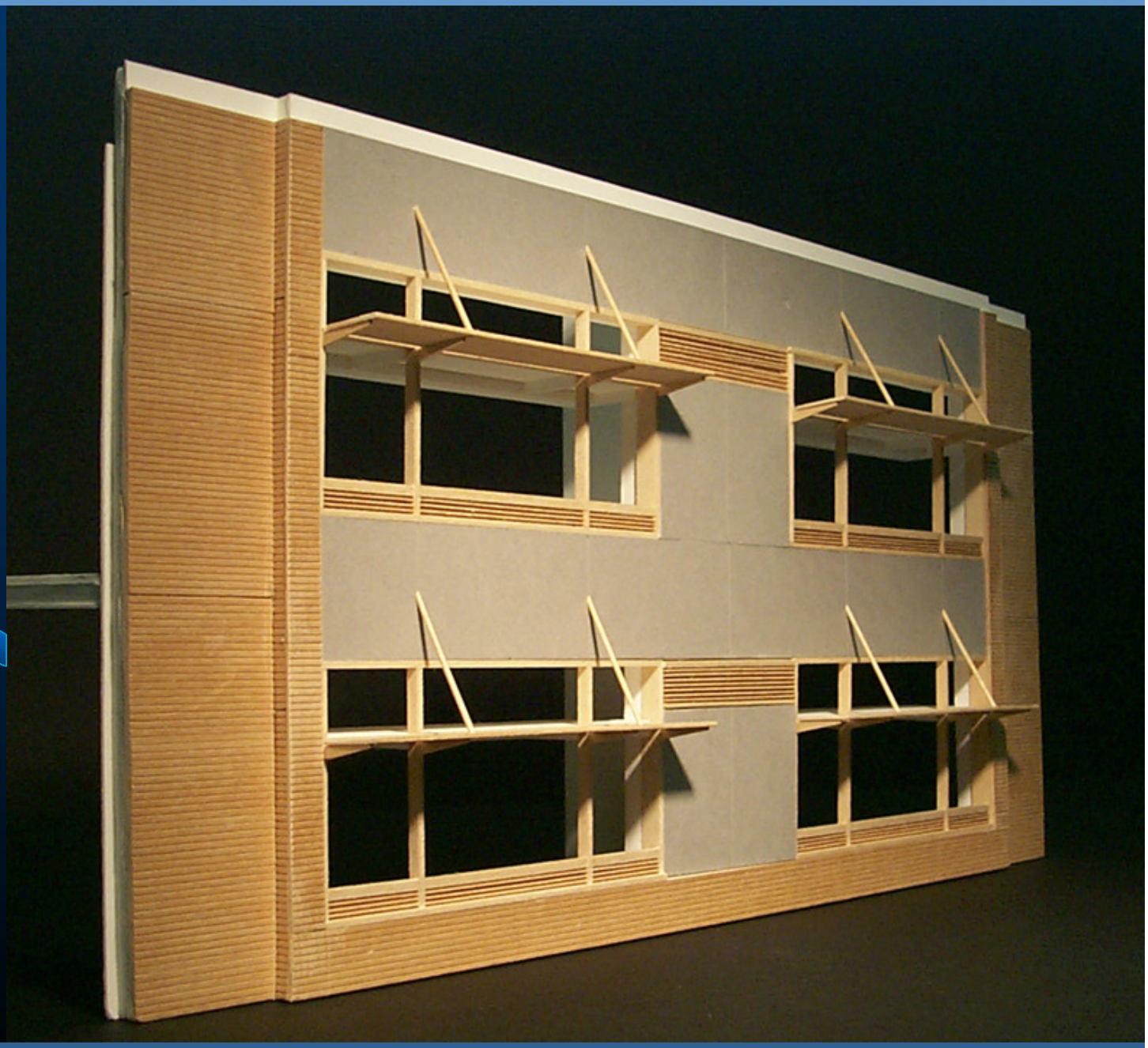
- Old Concept
- Connects Occupants to Outside
- Saves Energy + Maintenance
- Lower Initial Costs



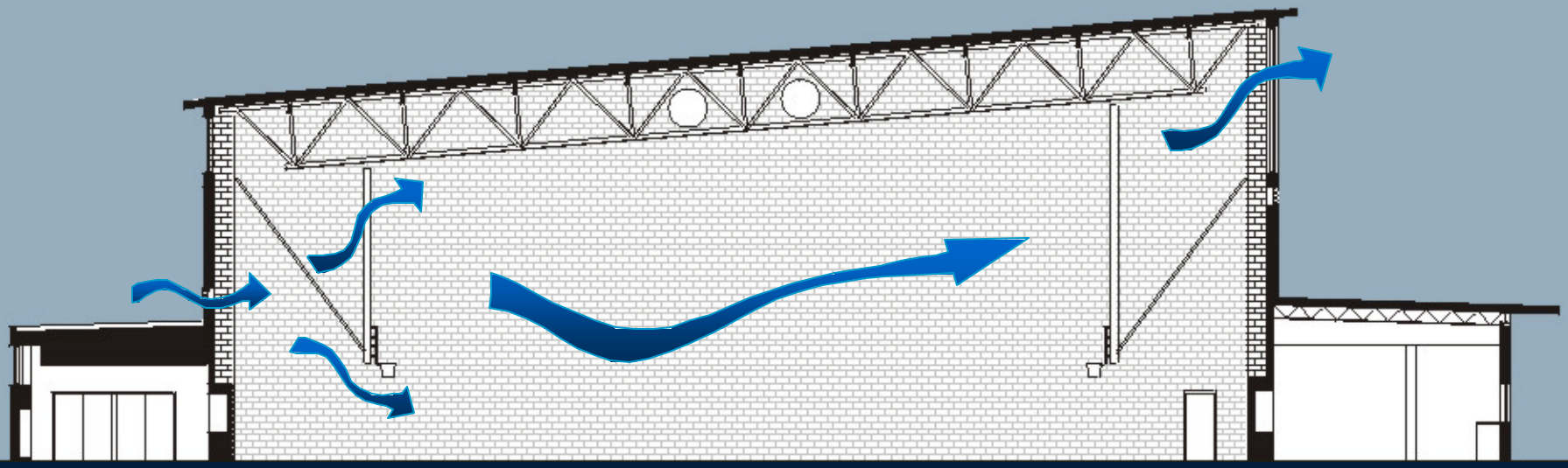
Clackamas High School – Detail - Natural Ventilation

- Natural Ventilation During inclement Weather
- Natural Nighttime Ventilation





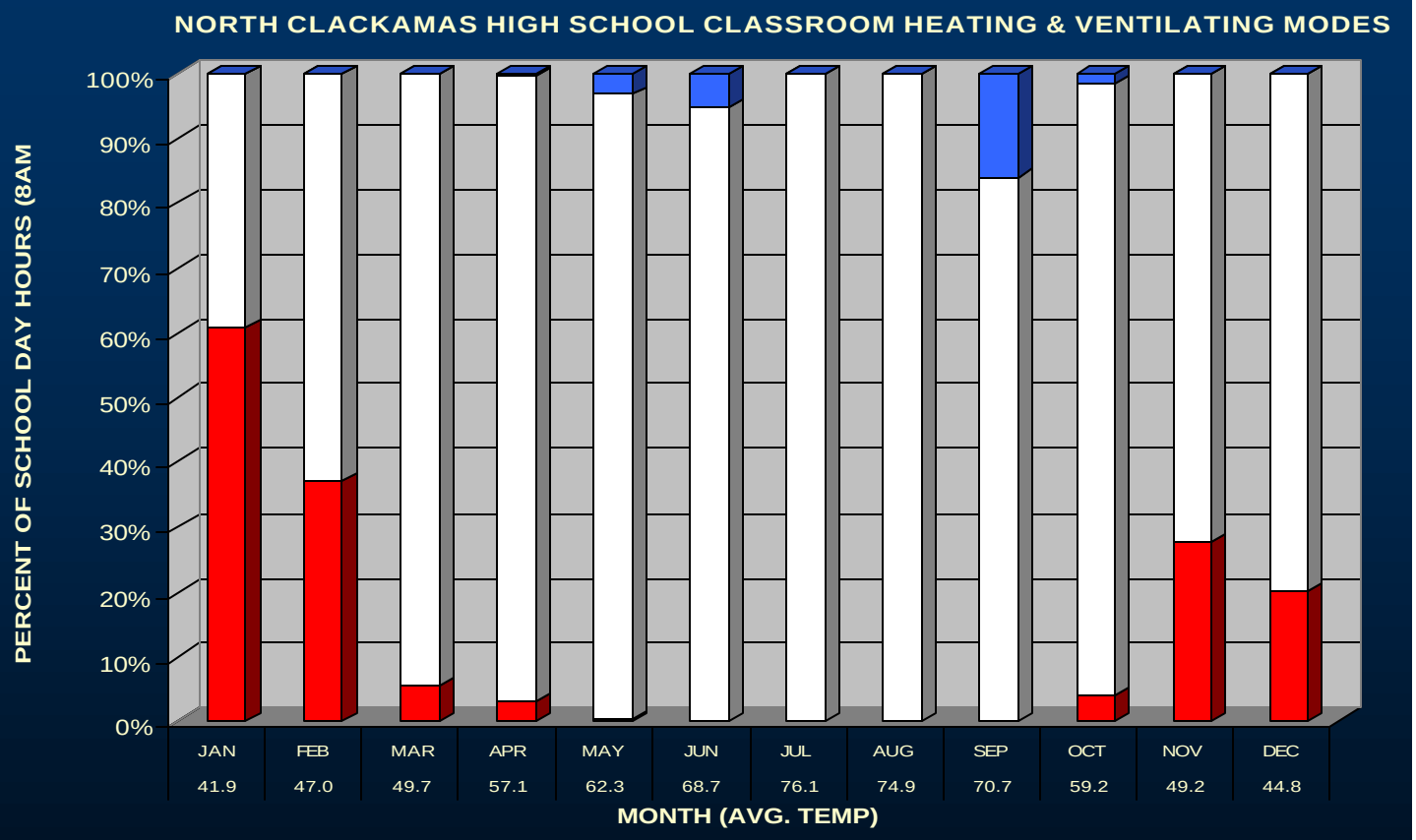
Clackamas High School – Gym Natural Ventilation



Clackamas High School – Gym Natural Ventilation

Clackamas High School – Classroom Heating + Ventilating Modes

- At 45 degrees full heating.
- Includes December, March and June Vacations.

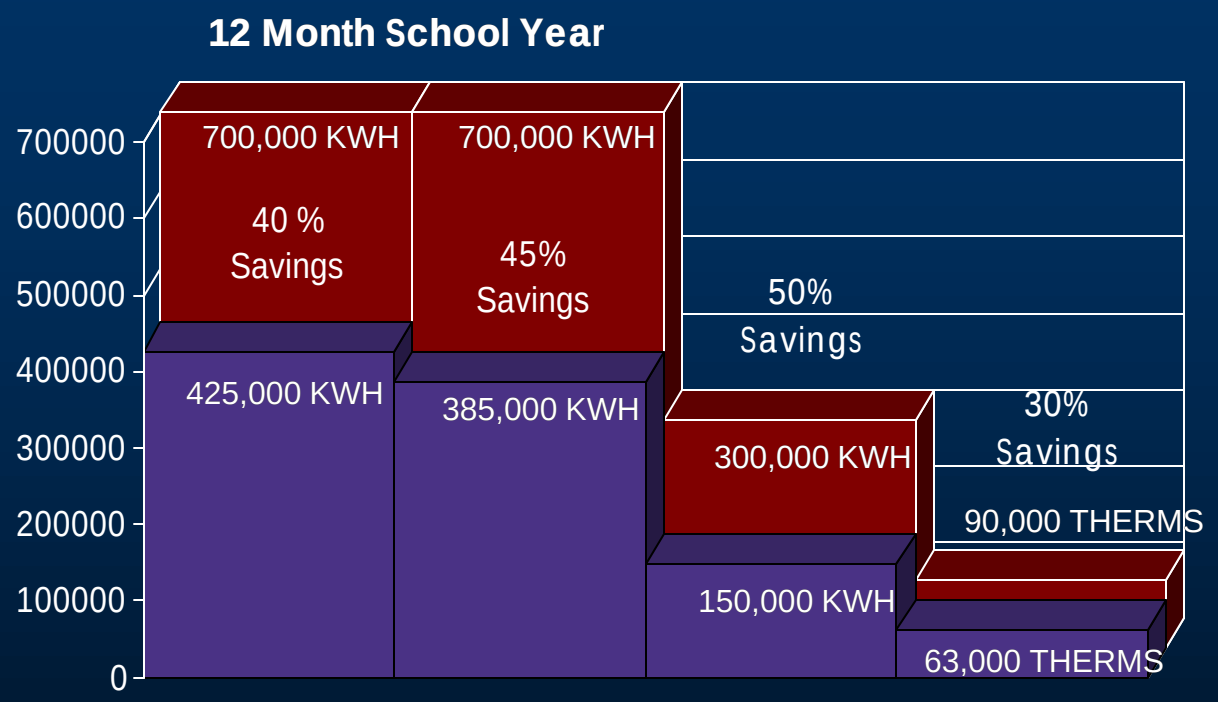


Clackamas High School – Potential Energy Savings

Represents Current Oregon Energy Code

Not Included:
- Plug Loads
- Equipment
- Hot Water

Potential Savings
35% - 40% = $50,000/Year



Lighting
- Daylighting
- Controls

Fans / Pumps
- Natural Ventilation
- High Efficiency Fans & Motors
- Lower Heating & Cooling Loads
- Variable Frequency Drives

Cooling
- Envelope
- Natural Ventilation
- Fan Induced Free Cooling

Heating
- Envelope
- Natural Ventilation
- Occupancy Controls

Clackamas High School – Environmental Responsibility

- Indoor Water Efficiency
  - Toilets
  - Shower Heads
  - Faucets
- Recycled Materials
  - Interior
  - Exterior
- Efficient Transportation
  - Secure Bicycle Parking
  - Coordinated Deliveries
  - Provisions for Electric Cars

Clackamas High School – Environmental Responsibility

Sword Fern

- Environmentally Appropriate Landscaping
  - Native Plants - Re-use
  - Drought Resistant Plants
  - Protection of Existing Vegetation
  - Re-use of Grey Water

Red Alder

Red Huckleberry

Big Leaf Maple

Tolmia Menziesil

Holly

Salal

Western Hazelnut

Clackamas High School – Sustainable Materials + Systems

- Low Toxicity Building Products
  - Paints / Adhesives
  - Laminates / Panelings
  - Sealants
- Low Maintenance Building Products
  - Concrete
  - Ceramic Tiles
  - Linoleum
  - Brick, Metals, etc.
- Long Life Products
  - Concrete
  - Brick
  - Glass
  - Metals
- Building System Efficiency
  - Structural
  - Acoustical
  - Security
  - Impact Resistant
  - Moisture Resistant, etc.