SITE ANALYSIS + CONCEPTS

SITE AND SEASONAL QUALITIES

ARCHITECTURAL CONCEPT

CORE: a new programmatic core is the counterpart of the plaza of the courtyard. It serves as a circulation backbone, connecting the formerly disparate departments of architecture, landscape architecture, and the CSBR, catalyzing interaction between these departments and integrating the CSBR into the university culture. The core also serves as a passive strategy; it pours diffuse north light into the new atrium and pulls stale air out of the building through stratification.

REACTION: the inner-facing and universal Cerny building is acknowledged and re-interpreted in the CSBR addition. The reclusive "O" is broken into a South-facing "C", exposing the inner loop circulation to generous south light and opening the building to cool summer breezes.

LAYERS: the CSBR addition is conceptualized as a series of delaminated layers, gradually opening to the South of the building, forming a gradient of spaces from seasonally exposed outside courtyards to semi-enclosed meeting spaces to fully sheltered workspaces. Layers are exposed on the East and west facades, but continue through the building, defining separations in program.

ECOLOGICAL CONNECTIVITY

ECOLOGICAL LANDSCAPE CONCEPT

Campus ecological corridors, populated with native vegetation...

Intervention with the dramatic topography of the river bank...

Intimate front porch off of conference room

Intimate front porch off of conference room

Native seasonal shading device

Rain garden delineating southern boundary

Extensive sedum green roof above courtyard
**DAYLIGHT AND THERMAL PROGRAM**

**THERMAL PROGRAM**

- **ZONE 1: THERMAL FLUX**
  - Temperature shifts with seasons, sun intensity, and weather.

- **ZONE 2: SOUTH FACING**
  - Takes full advantage of direct passive gains.

- **ZONE 3: NORTH FACING**
  - Fewer windows and increased insulation for thermal stability.

**DAYLIGHT PROGRAM**

- **ZONE 1: SOLAR FLUX**
  - Most direct connection to atmospheric conditions.

- **ZONE 2: FULL DAYLIGHTING**
  - Direct sunlight controlled through louvers and light shelves.

- **ZONE 3: AMBIENT DAYLIGHT**
  - Ambient north light provides lower light quality.

- **ZONE 4: MINIMAL DAYLIGHT**
  - Low occupancy spaces with minimal daylighting.

**Notes:**

- Pergolas create shaded outdoor spaces.
- Conference room with visual connection to atmospheric conditions.
- Ambient north lighting in researchers offices.
- South facing corridors feed light into adjacent rooms.
- Ample light through central core.
- Outdoor demonstration area with protection from wind and connection to interior space.
- Lab spaces and back from glass to reduce only indirect daylight.
- Deep overhangs on 4th floor corridor allows direct sun in winter, shade in summer.

**ZONE 1: THERMAL FLUX**
- 57-80°F (conditioned range)
- Most direct connection to exterior thermal conditions.

**ZONE 2: SOUTH FACING**
- 65-78°F (conditioned range)
- Takes full advantage of direct passive gains.

**ZONE 3: NORTH FACING**
- 65-78°F (conditioned range)
- Fewer windows and increased insulation for thermal stability.

**ZONE 4: MINIMAL DAYLIGHT**
- 0-300 lux
- Low occupancy spaces with minimal daylighting required.
**ENVELOPE & SYSTEMS INTEGRATION**

**LIGHTING AND HEATING STRATEGY (PASSIVE + ACTIVE)**

- Tall, native plants filter direct summer light.
- Overhang designed to maximize direct solar gain in winter.
- Operable louvers block out high summer sun.
- Solar panels angled based on 44° north latitude.
- Radiant heat system integrated with thermal mass to supplement solar gain.

**COOLING AND VENTILATION STRATEGY (PASSIVE + ACTIVE)**

- Existing forces air system
- Operable windows for passive ventilation
- Atrium facilitates passive ventilation through stratification
- Radiant Heating System
- Radiant Cooling System
- Geothermal ground loop supports heating & cooling systems

**WALL SECTION**

- Double-sealed window with cork separator
- Triple-pane glass with argon fill
- Concrete facing panels
- Weatherproofing
- Rigid insulation (protects VIP from puncture)
- Porextherm vacuum insulated panel (primary insulation)
- OSM
- Moisture barrier
- Gypsum board

**SYSTEMS INTEGRATION**

- Airducts
- Concrete floor slab
- Ventilation duct
- Lighting strip
- Radiant cooling ceiling panel
- VIP panel insulation
- Radiant floor system
- Louver system
- Thermo-light control shutters

**ENVELOPE PRECEDENTS**

- Waldsee BioHaus, Bemidji, MN (Stephen Tanner of INTEP)
  - Made of spruce/fir, cork, larch, and aluminum cladding.
  - Porextherm Vacupor® VIPs meet the requirements of the German energy conservation provision EnEV without dramatically increasing the insulation thickness. They allow a slimness, which offers more space for design and is ideal for inside and outside areas.

- Waldsee BioHaus, Bemidji, MN (Stephen Tanner of INTEP)
  - Optiwin’s 3 wood window is the “world’s finest window.”
  - It achieves the German Passivhaus Certification with an overall R-value of 8.0.

- Toronto City Hall, Toronto, Canada (PLANT Architect Inc./Shore Tilbe Irwin & Partners)
  - An extensive green roof offers a delightful outdoor space for work and demonstrations as well as thermal insulation in the winter and cooling in the summer. Local vegetation will connect with the surrounding environment, attract wildlife, and collect/filter rain.

- School Complex, Pichling, Austria (Loudon + Habeler)
  - In the winter, fresh air is pre-heated through geothermal heat exchange and pre-cooled in the summer. Exhaust air is collected for heat recovery through rotary heat exchanger. The core of the building will act as a thermal chimney.

- Omega Center, Rhinebeck, New York (BNIM Architects)
  - The Omega Center takes full advantage of photovoltaic roof panels, geothermal, thermal masses, natural ventilation, passive cooling, daylighting, passive heating, and shading.

- Solar voltaic placement
RELATIONSHIP TO CERNY: The CSBR offices acknowledges and reinterprets the aesthetic of the existing building. While the universal regularity of the existing windows of the first two floors are not directly continued upwards, the eight-foot spacing of the windows forms the basis of columnar structure and the expanding spacing of the layers. The black-painted steel of the floor bands are carried up into the vertical louvers of the addition, while the mass of the brick changes to board-formed concrete, drawing on existing materials.

NORTH FACE: The north and south faces of the addition, rather than expressing the cross-section of the concept, show the facades of these slices. The north face is made up of five compressed layers, the outermost of concretes, the inner layers are a soft underbelly of wood, barely visible in the window sections. The window placement articulates inner program needs; narrower windows reflect spaces adjacent to the light-filled core space, wider windows are adjacent to spaces higher daylighting needs. The form of the windows is a hybrid between the vertical slots present in the Cerny building and the punched squares in the Hall addition.
DAYLIGHT AND THERMAL STUDIES

BASELINE DAYLIGHTING

FINAL DAYLIGHTING

PERSPECTIVE VIEWS

ROOM ILLUMINANCE STUDY

BASELINE NO SHADING DEVICES

FINAL DESIGN: OPERABLE SHUTTERS AND LIGHT SHELF

DAYLIGHT AUTONOMY

U DI (USEFUL DAYLIGHT ILLUMINANCE)

BASELINE THERMAL

FINAL THERMAL

FINAL W/ RENEWABLE ENERGY

77 Kbtu PER SQ. FT.

36 Kbtu PER SQ. FT.

0 Kbtu PER SQ. FT.
Isometric view of west facade

EXPERIENTIAL QUALITIES

LIGHT MODEL STUDY

Dec 21, 08:00  Dec 21, 12:00  Dec 21, 15:00

Mar 21, 08:00  Mar 21, 12:00  Mar 21, 15:00

Jun 21, 08:00  Jun 21, 12:00  Jun 21, 15:00

Jun 21, 15:00  Mar 21, 15:00

Operable shutters linked to thermal flux zone allow users inside of rooms to control the amount of heat and light entering the space.

CLOSED – Block heat/light from flux space

ANGL ED OPEN – Allow some heat, block direct light

OPEN – Take full advantage of passive solar heat and outside light levels

RENDERED VIEWS

View from flux space looking east

View from flux space looking south