HPR INTEGRATED DESIGN

Mission Statement:
HPR Integrated Design combines innovative, cutting edge concepts with a collaborative multi-disciplinary approach through the utilization of state-of-the-art BIM technologies to exceed owner expectations both in system efficiencies and the enrichment of the human experience within its aesthetic.
HPR Integrated Design's Project Touchstones for the Penn State Ice Arena

Improve the Game Day experience for both the fans and players
Create an environment that fosters hockey excellence
Minimize the amount of energy the facility consumes
Create an architecturally recognizable facility
Maximize value with minimizing cost
Earn a LEED Gold rating

Required by Contract
Used for this Stage of design
Original load conditions on the spaces.

Day lighting issues (PICTURES! AGI)

We wanted to maintain the views to

Mt. Nittany and reduce the overall loading.

There were also some parts in the concourse

where there was neither a view out on the

building or into the building so the amount

of glass was overkill.
Original load conditions on the spaces.

Day lighting issues (PICTURES! AGI)

We wanted to maintain the views to

mt

nittany

and reduce the overall living.

There were also some parts in the concourse

where was neither a view out on the

building or into the building so the amount

of glass was overkill.

BIM PROCESS

COORDINATED BIM MODEL

Daylighting

Electrical
Redesign Focuses

Original load conditions on the spaces.

Day lighting issues (PICTURES! AGI).

We wanted to maintain the views to

Mt. Nittany

and reduce the overall glazing.

There were also some parts in the concourse

where there was neither a view out on the

building or into the building so the amount

of glass was overkill.
Air Handler Relocation and Event Level Redesign

**REASON:**
- Reduce duct size and length
- Reduce fan energy and use smaller air handling units
- Limit the number of shafts and their sizes.

**Design Constraints**

- 8'-0" Commissary — Rm. 163
- Mt. Nittany Room — Rm. 230

**Approach**
- Club Level
- Concourse Level
- Event Level

**Energy Model**

**AHU-5:**
- Carrier 39MW061
- Serves Event Level Lobby & Administration
- 25,000 CFM Supply
- 9' - 9" W x 30' - 3" L x 8' - 6" H

**AHU-6:**
- Carrier 39MW050
- Serves Event Level — Weight Room
- 20,000 Peak CFM
- 8' - 0" W x 13' - 2" L x 7' - 1" H
Air Handler Relocation and Event Level Redesign
Air Handler Relocation and Event Level Redesign

Access Layout

Multisport Complex
Roof Profile Redesign

**REASON:**
- Maximize the efficiency of the structural system to reduce cost
- Integrate the mechanical, lighting, and catwalk systems to optimize the performance of each
- Create a clean and attractive ceiling area

**DESIGN CONSTRAINTS**

- N-S Section – New Roof Profile
- N-S Section – Lighting Incident Angle Reflection
- 60’ Clear (To Bottom of Steel)
Roof Profile Redesign

**REASON:**
- Maximize the efficiency of the structural system to reduce cost
- Integrate the mechanical, lighting, and catwalk systems to optimize the performance of each
- Create a clean and attractive ceiling area

**DESIGN CONSTRAINTS**

- N-S Section – New Roof Profile
- N-S Section – Lighting
- Incident Angle Reflection

**Approach**
- 60' Clear (To Bottom Of Steel)
Façade Redesign

REASON: We believe we can maintain the original intent of the east façade (to create an impressive view from University Drive as well as a view out to Mt. Nittany and the Bryce Jordan Center) while enhancing the prominence of the entrances as well as reducing thermal loads and cost.

Design Constraints

- View to Mt. Nittany
- Off-glass at 15°
- Louvers added for AHU 5 & 6
- Translate the pattern of repeating glass and brick
We wanted to maintain the views to the mountains and reduce the overall lighting. There were also parts in the concourse where there was neither a view out on the building or into the building, so the amount of glass was overkill.
Original load conditions on the spaces.

Day lighting issues (PICTURES! AGI)

We wanted to maintain the views to mt nittany and reduce the overall lighting. There were also parts in the concourse where there was neither a view out on the building or into the building so the amount of glass was overkill.

**KEY MILESTONES:**

- **January 27th, 2012:** Initial Architectural Modeling Completed
- **February 13th, 2012:** Air Handler Relocation & Event Level Design Completed
- **March 2nd, 2012:** Initial Clash Detection & Value Engineering
- **March 26th, 2012:** All Redesign Focuses Completed.
- **April 4th, 2012:** Final Report Submission
- **April 9th, 2012:** Final Presentation
Original load conditions on the spaces.

Day lighting issues (PICTURES! AGI)

We wanted to maintain the views to

mtnittany

and reduce the overall laving.

There were also so parts in the concourse

where was neither a view out on the

building or into the building so the amount

of glass was over kill

---

**Redesign Focus Schedules**

**AIR HANDLER RELOCATION & EVENT LEVEL REDESIGN**

**MAIN ARENA ROOF SYSTEMS**

**FAÇADE REDESIGN**
Original load conditions on the spaces.

Day lighting issues (PICTURES! AGI)

We wanted to maintain the views to

"""""
mittany

and reduce the overall lighting.

There were also parts in the concourse

where there was neither a view out on the

building or into the building so the amount

of glass was overkill.

Scheduled Timeline
ENERGY MODEL

Touchstones
Minimize the amount of energy the facility consumes
Create an architecturally recognizable facility
Maximize value with minimizing cost
Earn a LEED Gold rating

REASON:
To improve the architecture and reduce load on the east façade

Friday, January 27th, 2012

MILESTONE: Architectural Modeling Completed

SOFTWARE
MAJOR BIM USE(S)
Progress
- Arena Roof Systems
- Façade Redesign

Air Handler Relocation

Design Authoring, Structural Analysis
Design Authoring, Lighting Analysis
Design Authoring, Mechanical Analysis
Cost Estimation, 4D Modeling

Team Schedule

- Two Way Flooring Redesign & Arena Roof Modeling
- Event Level Daylighting & Electrical Load Calculations
- Event Level Load Calcs, AHU & Ductwork Sizing
- Existing Conditions Estimate & Scheduling Analysis
**Touchstones**

- Minimize the amount of energy the facility consumes
- Create an architecturally recognizable facility
- Maximize value with minimizing cost
- Earn a LEED Gold rating

**REASON:**

To improve the architecture and reduce load on the east façade

---

**MILESTONE:** Air Handler Relocation Completed

**Team Schedule**

<table>
<thead>
<tr>
<th>Milestone Date</th>
<th>Milestone</th>
<th>Milestone</th>
<th>Milestone</th>
<th>Milestone</th>
<th>Milestone</th>
<th>Project Date</th>
<th>Milestone</th>
</tr>
</thead>
<tbody>
<tr>
<td>0/01/12</td>
<td>1/01/12</td>
<td>2/01/12</td>
<td>3/01/12</td>
<td>4/01/12</td>
<td>5/01/12</td>
<td>6/01/12</td>
<td>7/01/12</td>
</tr>
<tr>
<td>7/01/12</td>
<td>8/01/12</td>
<td>9/01/12</td>
<td>10/01/12</td>
<td>11/01/12</td>
<td>12/01/12</td>
<td>01/01/12</td>
<td>02/01/12</td>
</tr>
<tr>
<td>03/01/12</td>
<td>04/01/12</td>
<td>05/01/12</td>
<td>06/01/12</td>
<td>07/01/12</td>
<td>08/01/12</td>
<td>09/01/12</td>
<td>10/01/12</td>
</tr>
<tr>
<td>11/01/12</td>
<td>12/01/12</td>
<td>01/01/13</td>
<td>02/01/13</td>
<td>03/01/13</td>
<td>04/01/13</td>
<td>05/01/13</td>
<td>06/01/13</td>
</tr>
</tbody>
</table>

**SOFTWARE**

- **MAJOR BIM USES**
  - **Progress**
    - Air Handler Relocation
    - Arena Roof Systems
    - Façade Redesign

- **SOFTWARE**
  - **MAJOR BIM USES**
    - **Gravity Column Redesign & Long Span Truss Design**
    - **Façade Daylighting Controls & Finalize Event Lvl. Design**
    - **Finalize Event Level Designs & AHU Relocations**
    - **LEED Analysis & Crane Placement Study**

**Structural Analysis**

- **MAJOR BIM USES**
  - **Design Authoring, Lighting Analysis**
  - **Design Authoring, Mechanical Analysis**
  - **Site Utilization, LEED Analysis**
**ENERGY MODEL**

- Touchstones
- Minimize the amount of energy the facility consumes
- Create an architecturally recognizable facility
- Maximize value with minimizing cost
- Earn a LEED Gold rating

**REASON:**

To improve the architecture and reduce load on the east façade

---

**Friday, March 2nd, 2012**

**MILESTONE:** Initial Clash Detection & Value Eng.

**SOFTWARE**

**MAJOR BIM USE(S)**

- Progress
- Air Handler Relocation
- Arena Roof Systems
- Façade Redesign
- Long Span Truss Design & Façade Glazing Analysis
- Arena Lighting Layout & Finalize Electrical Redesign
- Main Arena Mechanical Design & Coordination
- Update Cost, Schedule & Perform Clash Detection

**Team Schedule**

<table>
<thead>
<tr>
<th>Milestone Date</th>
<th>Milestone 2</th>
<th>Milestone 3</th>
<th>Milestone 4</th>
<th>Project Due</th>
<th>Revisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>1/10/2012</td>
<td>1/10/2012</td>
<td>1/10/2012</td>
<td>1/10/2012</td>
<td>1/10/2012</td>
</tr>
<tr>
<td>Week 2</td>
<td>1/24/2012</td>
<td>1/24/2012</td>
<td>1/24/2012</td>
<td>1/24/2012</td>
<td>1/24/2012</td>
</tr>
<tr>
<td>Week 3</td>
<td>2/13/2012</td>
<td>2/13/2012</td>
<td>2/13/2012</td>
<td>2/13/2012</td>
<td>2/13/2012</td>
</tr>
<tr>
<td>Week 7</td>
<td>4/10/2012</td>
<td>4/10/2012</td>
<td>4/10/2012</td>
<td>4/10/2012</td>
<td>4/10/2012</td>
</tr>
</tbody>
</table>

**SOFTWARE**

- Design Authoring, Structural Analysis, 3D Coordination
- Design Authoring, Lighting Analysis
- Design Authoring, Mechanical Analysis, 3D Coordination

**SOFTWARE**

- 3D Coordination, Cost Estimation, 4D Modeling
### MILESTONE: Redesign Focuses Completed

#### Progress
- Air Handler Relocation
- Arena Roof Systems
- Façade Redesign

#### SOFTWARE
- **MAJOR BIM USE(S)**
  - Progress
  - Air Handler Relocation
  - Arena Roof Systems
  - Façade Redesign

#### Team Schedule

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Week 1</td>
<td>1/26/2012</td>
<td>1/26/2012</td>
<td>1/26/2012</td>
<td>1/26/2012</td>
<td>1/26/2012</td>
</tr>
<tr>
<td>Week 2</td>
<td>2/2/2012</td>
<td>2/2/2012</td>
<td>2/2/2012</td>
<td>2/2/2012</td>
<td>2/2/2012</td>
</tr>
<tr>
<td>Week 4</td>
<td>2/16/2012</td>
<td>2/16/2012</td>
<td>2/16/2012</td>
<td>2/16/2012</td>
<td>2/16/2012</td>
</tr>
<tr>
<td>Week 8</td>
<td>3/16/2012</td>
<td>3/16/2012</td>
<td>3/16/2012</td>
<td>3/16/2012</td>
<td>3/16/2012</td>
</tr>
<tr>
<td>Week 10</td>
<td>3/30/2012</td>
<td>3/30/2012</td>
<td>3/30/2012</td>
<td>3/30/2012</td>
<td>3/30/2012</td>
</tr>
</tbody>
</table>

#### SOFTWARE
- **SOFTWARE**
  - 3D Coordination, Cost Estimation, 4D Modeling
  - Design Authoring, Mechanical Analysis, 3D Coordination
  - Design Authoring, Lighting Analysis
  - Structural Analysis, 3D Coordination

#### Column Analysis & Façade Redesign
- Finalize Arena Lighting Design & Façade Redesign
- Main Arena Mechanical & Life Safety Designs
- Finalize Cost Estimates, Schedule & LEED Analysis

**Monday, March 26th, 2012**
**MILESTONE:** Final Report Submission

---

**Progress**

- Air Handler Relocation
- Arena Roof Systems
- Façade Redesign

---

**Wednesday, April 4th, 2012**

---

**SOFTWARE**

**MAJOR BIM USE(S)**

- None.

---

### Team Schedule

<table>
<thead>
<tr>
<th>Milestone Date</th>
<th>Milestone 1: 1/17/12</th>
<th>Milestone 2: 2/20/12</th>
<th>Milestone 3: 3/21/12</th>
<th>Milestone 4: 4/13/12</th>
<th>Project Due: 4/20/12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>1/17/2012</td>
<td>1/20/2012</td>
<td>1/23/2012</td>
<td>1/26/2012</td>
<td>1/29/2012</td>
</tr>
<tr>
<td></td>
<td>2/13/2012</td>
<td>2/16/2012</td>
<td>2/19/2012</td>
<td>2/22/2012</td>
<td>2/25/2012</td>
</tr>
<tr>
<td></td>
<td>4/7/2012</td>
<td>4/10/2012</td>
<td>4/13/2012</td>
<td>4/16/2012</td>
<td>4/19/2012</td>
</tr>
<tr>
<td></td>
<td>7/9/2012</td>
<td>7/12/2012</td>
<td>7/15/2012</td>
<td>7/18/2012</td>
<td>7/21/2012</td>
</tr>
<tr>
<td></td>
<td>8/1/2012</td>
<td>8/4/2012</td>
<td>8/7/2012</td>
<td>8/10/2012</td>
<td>8/13/2012</td>
</tr>
<tr>
<td></td>
<td>10/3/2012</td>
<td>10/6/2012</td>
<td>10/9/2012</td>
<td>10/12/2012</td>
<td>10/15/2012</td>
</tr>
<tr>
<td></td>
<td>11/7/2012</td>
<td>11/10/2012</td>
<td>11/13/2012</td>
<td>11/16/2012</td>
<td>11/19/2012</td>
</tr>
<tr>
<td></td>
<td>12/5/2012</td>
<td>12/8/2012</td>
<td>12/11/2012</td>
<td>12/14/2012</td>
<td>12/17/2012</td>
</tr>
</tbody>
</table>

**SOFTWARE MAJOR BIM USE(S)**

- None.

---

**REASON:**

- To improve the architecture and reduce load on the east façade.

---

**Energy Model Touchstones**

- Minimize the amount of energy the facility consumes
- Create an architecturally recognizable facility
- Maximize value with minimizing cost
- Earn a LEED Gold rating

---

**Wednesday, April 4th, 2012**
**Energy Model**

**Touchstones**
- Minimize the amount of energy the facility consumes
- Create an architecturally recognizable facility
- Maximize value with minimizing cost
- Earn a LEED Gold rating

**Reason:**
To improve the architecture and reduce load on the east façade

**Monday, April 9th, 2012**

**Milestone:** Final Presentation

**Team Schedule**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4/1/2012</td>
<td>4/7/2012</td>
<td>4/13/2012</td>
<td>4/25/2012</td>
<td>5/2/2012</td>
<td>5/18/2012</td>
</tr>
</tbody>
</table>

**Major BIM Use(s):**
- Progress
- Air Handler Relocation
- Arena Roof Systems
- Facade Redesign

**Software:** None.

**Milestone (s):** None.

**Finalize & Practice Final Presentation**

- Finalize & Practice Final Presentation
- Finalize & Practice Final Presentation
- Finalize & Practice Final Presentation
- Finalize & Practice Final Presentation

**Monday, April 9th, 2012**
<table>
<thead>
<tr>
<th></th>
<th>FACADE</th>
<th>ENERGY MODEL</th>
<th>OUTDOOR CLASSROOM</th>
<th>FLEX + MULTI</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHU</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHU</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Commissary</td>
<td>—</td>
<td>Rm. 163</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mt. Nittany Room</td>
<td>—</td>
<td>Rm. 230</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>