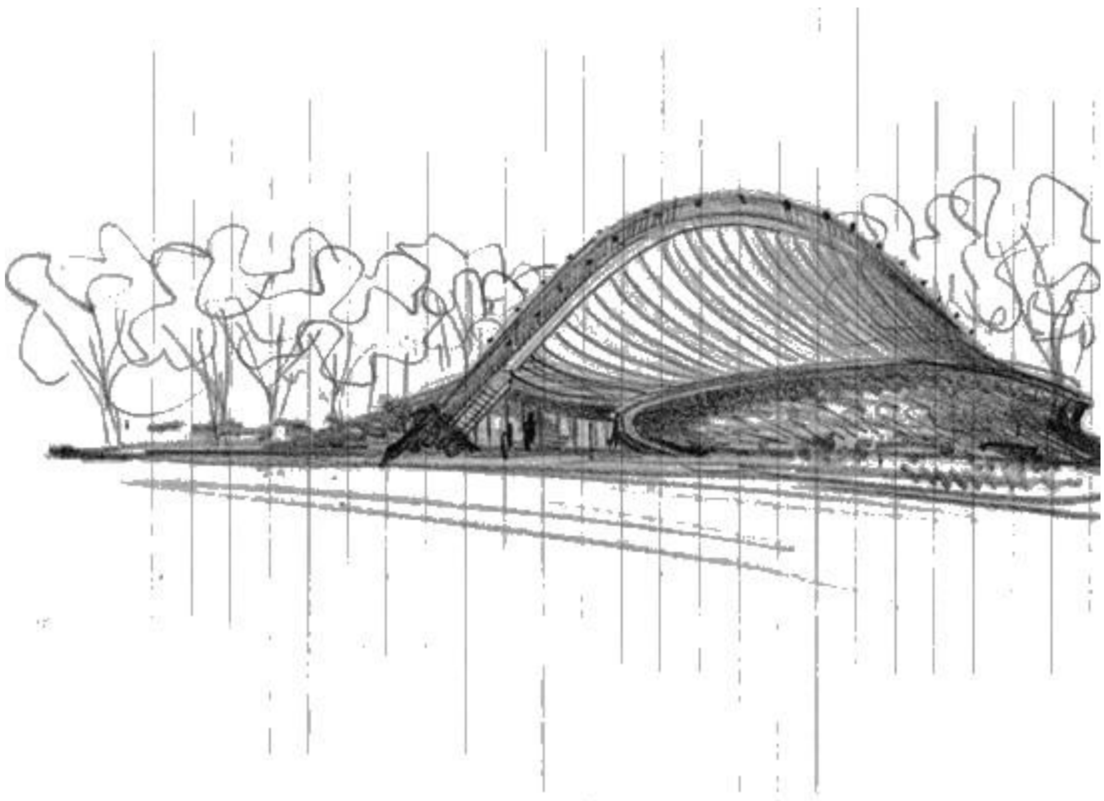


David S. Ingalls Rink

73 Sachem Street, New Haven, CT 06501

Building Statistic I

Amy Chengyue Huan

Lighting/Electrical

Faculty Advisor: Dr. Houser

10.25.13

Building Statistics Part I

|General Building Data

Building name: David S. Ingalls Rink
Location: New Haven, CT
Site: 73 Sachem St, New Haven, CT
Building Occupant Name: Yale University
Occupancy or function types: Assembly A-4. The constructed building contains ground floor Rink, Concourse, lower level Locker Rooms, Fitness Center, Schley Club Room and other utility rooms.

Site Area:	1.48 ac
Building Footprint:	47,983 sf
Total gsf:	61,646 sf
Num. of Stories above Grade:	1
Total Levels:	2

Primary Project Team (Renovation)

Client:	Yale University
Architect:	Kevin Roche John Dinkeloo and Associates LLC
Landscape Architect:	Towers | Golde
Lighting Consultant:	Atelier Ten Consulting Designers
Structure Engineers:	Severud Associates Consulting Engineers, P.C.
Mechanical Consultants:	AltieriSeborWieber LLC
Construction Manager:	Turner Construction Company
Civil Engineer / Landscape Architect:	Tighe & Bond
Acoustics, Audio Visual and Sound System:	Cavanaugh Tocci Associates, Incorporated

Date Constructed: 1953 - 1959 (Renovation 2008-2010)
Cost Information: This information is considered confidential under client's request.
Construction Type: IB Noncombustible
Project Delivery Method: Guaranteed Maximum Price (GMP)
Major National Model Codes: 2005 Connecticut State Building Code (CSBC)
2005 ICC – Connecticut State Fire Safety Code (CSFSC)
2005 ICC – International Building Code
2003 ICC – International Existing Building Code
2003 ICC – International Plumbing Code
2003 ICC – International Mechanical Code
2003 ICC – International Fire Code
2003 ICC – International Property Maintenance Code
2005 NFPA 70 National Electrical Code
2003 ICC – International Energy Conservation Code
1991 Americans with Disabilities Act
2003 ICC/ANSI A177.1 – Accessible and Usable Buildings & Facilities

ASHRAE Standard 90.1 – 2004 Energy Standard for Buildings Except Low Rise Residential Buildings, I – P Edition

Zoning District: PDU 109, New Haven, City Plan Map 6

|Architecture

The David S. Ingalls Rink, also known as the Yale Whale, is one of the most distinctive college hockey rinks in the country. The rink was designed by the famous architect Eero Saarinen and built in 1959. The elliptical shaped building has a dramatic sweeping roof which reaches 76 feet at its zenith and is supported by a 300ft backbone of reinforced concrete. The side walls are the same shape in plan as the arch is in section, acting as a counter part of the arch. Its oak roof is supported aluminum cables suspended from the backbone arch. The exterior walls are also sloped to increase the structural integrity, in the meantime enhance the visual expression of the arch. Plaster ceilings form a graceful curve inside arena above the upper seating and corridor area. The playing surface which spans 200 feet long and 85 feet wide is among the best in the country.

Saarinen followed three principles he was enthusiastic about at the time he designed the arena: function, structure and being a part of his time. He designed the building with an innovative structural form which contributes to the function and other principles. In addition, he paid closely attention to the surrounding environment, which makes the building an enhancing element to the neighboring atmosphere.

The multi – million dollar renovation taken in 2008 included a renovation to the existing press box, and a 14,000 square foot underground addition with Locker Rooms, Fitness Center, Schley Club room, Concession area, Offices and other utility rooms. The new rink today holds 3,500 spectators to watch the hockey game, recreational skating and figure skating.

Maximum Length: 335’
Maximum Width: 196’
Maximum Height: 66’ above grade

|Building Enclosure

Building façades

Figure 1| Building Façade

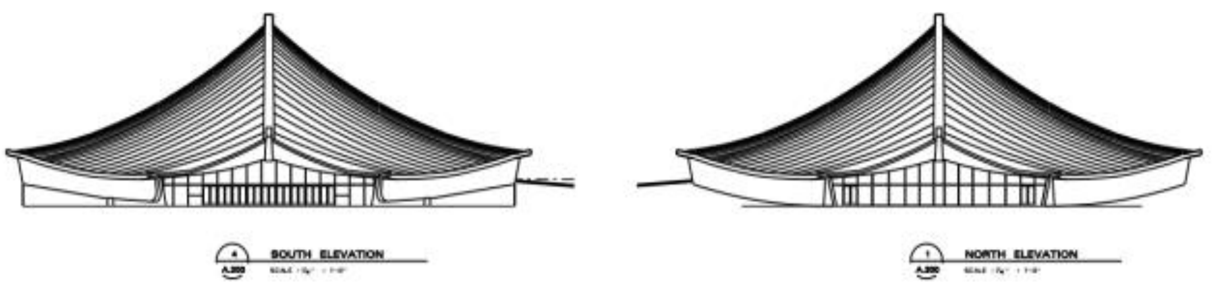
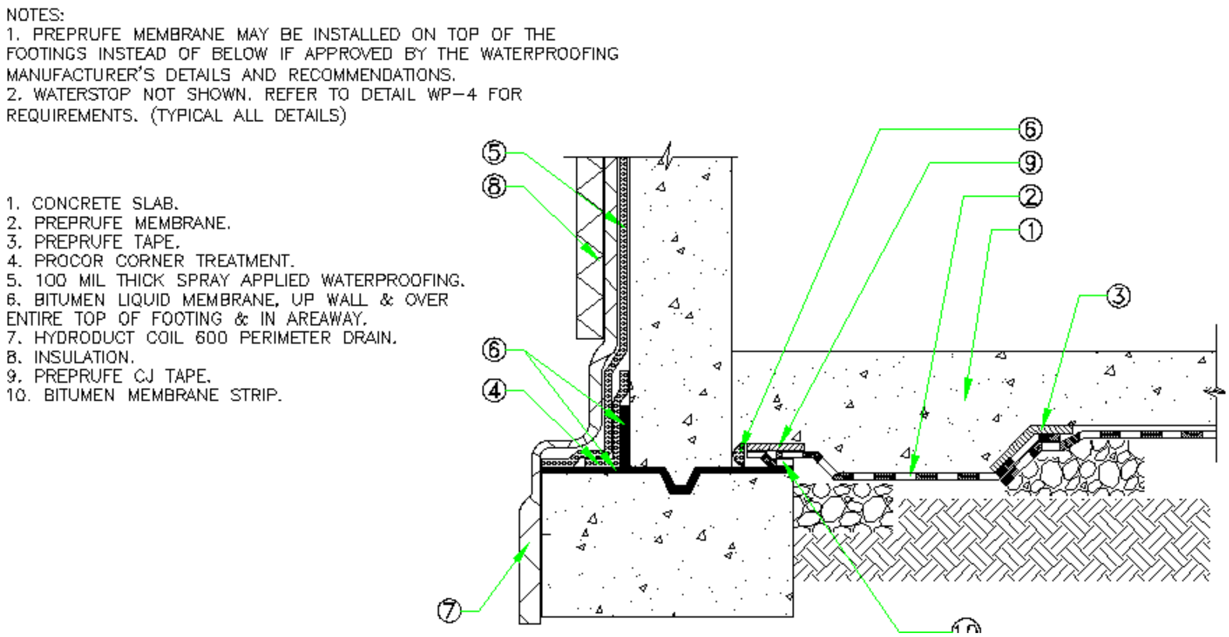


Figure 2| Building Elevations

The spine shaped arch on the building exterior plays a dominant role of establishing rink's identity. To enhance the dramatic appearance and visual interest of the concavity and convexity, the arch curves back up skyward for the building façade to counteract the downward sloping of the roof. Under the concrete canopy, the main façade is a mullion made composed of wood and glass. The unfinished concrete exterior wall has a wood texture to echo the oak roof. The "Dragon Eye" lighting sculpture was designed by Oliver Andrews from UCLA, which added highlight and further enhanced the "soaring" effect.

Please see the following for exterior Wall Detail



Roofing

The roof was designed to represent architect's interpretation of the beauty of skating. The roof structure for this building consists of oak wood supported by aluminum cables suspended for a tension web. Wood slat on the roof worked together with the concrete formwork was designed effectively to have survived without major replacement. Three bracing cables with 1 ¾ in diameter was placed on both north and south half of the roof to help resist snow loads.

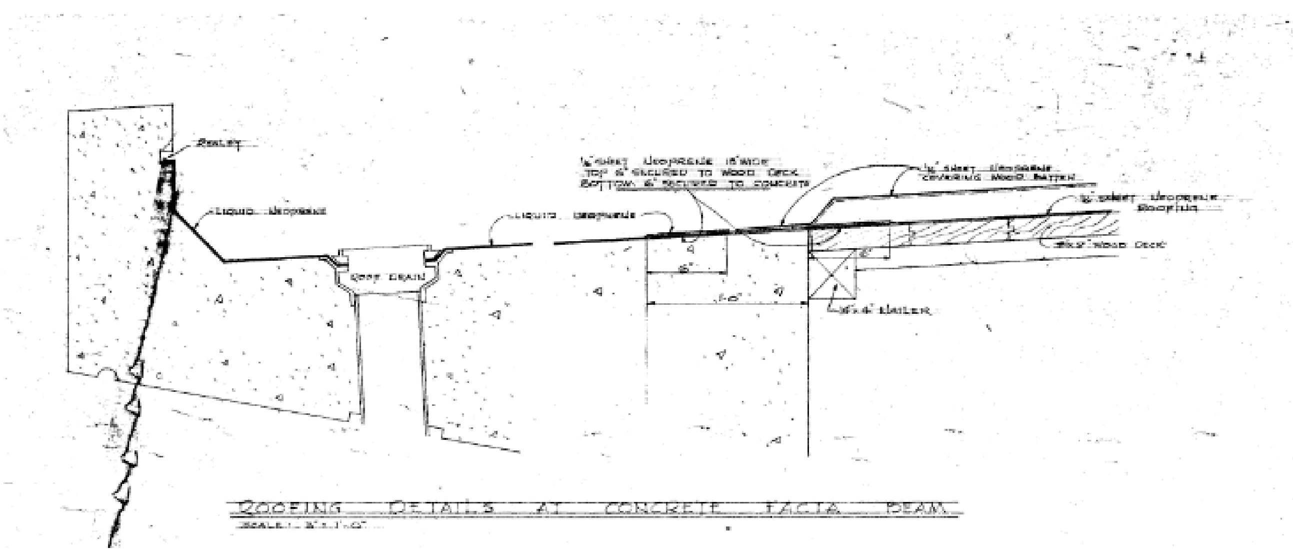


Figure 3| Detail at Concrete Facia Beam

Figure 4 | Roofing Detail

|Sustainability Features

Atelier Ten environmental consulting group was commissioned to consult for Schematic Design phase. Yale decided not to pursue LEED for this project. However, sustainable features such as upgrading of waterless urinals and installing motion sensors for lighting and energy-efficient hand dryers was added to the building features in order to achieve a more sustainable design.

|Primary Engineering Systems

Construction

The David S Ingalls Rink at Yale University is an extraordinary building designed by architect Eero Saarinen and originally completed in 1958. The multi-million renovation taken in year 2008-2010 restored the previous architectural appearance of the building and added an underground training room and locker room addition. Turner Construction Company was the primary construction management firm for this project.

Electrical

The building power of David S. Ingalls Rink is served by Yale's Central Power Plant. The building electrical system has a utilization voltage of 480Y/277V. Main service and distribution equipment includes metal enclosed NEMA 1 enclosure switchboards and 480Y/277V panelboards to serve motors and lightings. Automated Transfer Switch (ATS) was used to switch the emergency panels to emergency power in the case of main power failure. A step-down transformer with a secondary end of 208Y/120V was installed to provide lower voltage for the emergency receptacle panel. The equipment that are connected to the emergency power systems include emergency lighting, low air compressor and fire alarm control panels.

Lighting

High-bay luminaire mounted with slight changes following the ceiling curves were used to provide recommended light levels for athletic competition for the rink area. Fluorescent lighting fixtures were used in the rest of the space inside the building including concourse, Schley Memorial Club Room, and the lower level new addition. The system utilizes Lutron lighting control system which is designed to provide two-level output: full output for varsity practice and games, then 50% output for recreational skating to save further energy.

Mechanical

Two Air Handling Units each with 10,800 CFM and 3,000 CFM are located in the lower level renovation addition to serve for building ventilation and exhaust. Two air condition systems each with 10,000 CFM capacity located in the ice arena were the full replacement for the existing heating ventilation units. Each unit has two supply fans operation continually when building is occupied. Two Desiccant Dehumidification systems located in the rink area were used to remove moisture from the air at low temperature and increase the cooling coil capacity. Run-around Heat Recovery Coils were placed throughout the lower level to transfer sensible and latent heat carried by airflow via liquid medium.

Structure

The David S. Ingalls Rink has a structural system which consists of reinforcing steel frames and cast-in-place concrete slab on grade. All concrete works are class I normal weight with a minimum ultimate compressive strength of 4000 PSI. The building has a slab on grade Caisson-pile supported foundation, reinforced CMU bearing exterior walls and oak wood roof hung from the central concrete spine and held in place by grid of aluminum cables running perpendicular to the spine. Because of the innovative roof structure, the ground level interior of David S. Ingalls Rink is free of columns.

|Additional Engineering Support Systems

Fire Protection

The fire alarm system receives 120 VAC emergency power via circuit breakers with handle locking devices. The system incorporates one-way voice communication and tone generating capabilities.

Audio/Video System

The rink video and support systems include video and audio monitoring, video distribution of game cameras to support spaces, sound playback, television production tie lines and cable pathways, production intercom, an assistive listening system, and digital signage. The rink sound system was designed to provide high quality audio performance while maintaining a low visual profile and controlling acoustic wastes in a highly reverberant rink space.

Special Systems

- Acoustical panels and exposed suspension systems at rink area.

- Camera video distribution system and instant replay system are provided in the rink area. Additional audio system was added to the Team Lounge, Strength and Conditioning Room, Locker Room during renovation.

- Electric Frost Prevention: Cables are mineral insulated type with two conductors with a single cold splice at one end. Each system is controlled by a combination time clock and temperature sensing probe. 3 wire temperature sensing probes were used for automatic operation of the system.