INTERIOR CONDITION ASSESSMENT

Figure 89: Field House Interior
(River Architects July 12, 2018)

Figure 90: Southwest Entrance Interior
(River Architects July 12, 2018)

Figure 91: Southeast Entrance Interior
(River Architects July 12, 2018)

Overview

As noted previously in this report, the interior of the Field House has changed in a number of ways over the years, and certainly since the period of significance (1930-1947). A major remodeling project in 1974-1976 along with several upgrades to building systems have had a functional impact on the interior while still preserving its utilitarian appearance. Sealed concrete floors, painted concrete and brick masonry walls, exposed structural steel, and unfinished concrete walls are just some of the many elements that contribute to the overall aesthetic of the Field House interior. Although there are no major plans in the immediate future to alter the interior, this report calls attention to some of the various conditions observed and documented by this team.

Methodology

Architects, engineers, preservation consultants, etc. spent time touring the facility, reviewing historic documents and photographs, and have developed a list of items that could be addressed along with the list of items that UW-Athletics has previously deemed as needed upgrades to the building systems.

Alterations

Through the years, building system projects have been implemented in order to accommodate the increasing demand of the facility. HVAC, plumbing, electrical, and fire alarm projects have all had an impact on the overall integrity of the historic fabric of the Field House. Main entrances have been modified, interior spaces have been added, and the entire north end of the building has been completely removed and modified. Numerous additions of exposed ductwork, piping, conduit, etc. have all changed the overall experience. Meanwhile, the largest and most notable difference from the early years, is the blocking of natural light coming into the structure through its large windows on each facade through the use of painted glass and black curtains.

Conditions

The overall condition of the Field House interior is relatively good. There are concerns with the fractured concrete walls which translates to the exterior masonry work and there are additional upgrades to the building systems still to be completed, but all-in-all, the conditions are favorable.

Interior Surface of Exterior Walls

Similar to the exterior, there are evident fractures at each door and window opening, many of which align with those on the exterior. Water infiltration and structural movement over the years likely contributed to this fracturing. It was observed that only selective fractures have been infilled. The exterior walls have been painted red and white up to the eave line while the gable end wall at the south is covered in acoustical panels and the north wall remains as unfinished concrete. Many of the acoustical panels have lost adhesion to the wall and have fallen off or have been removed.

Original stone exterior walls are exposed to the interior at the modern-day bleacher section at the south end zone of Camp Randall Stadium. These remaining areas of wall show the makeup of the terra cotta trim at the base of the building.

Exterior Windows

Behind the opaque window treatments lie original window frames with painted panes of glass. Paint was applied to the glass in an effort to control light penetration as well as to control heat gain. The painted surfaces have deteriorated and require refurbishing.

Operable window sashes remain intact and are in good working condition. Various hardware devices are missing at select units but are mostly unaltered.

Figure 92: Field House Interior (River Architects July 12, 2018)

Figure 93: Field House Interior (River Architects July 12, 2018)

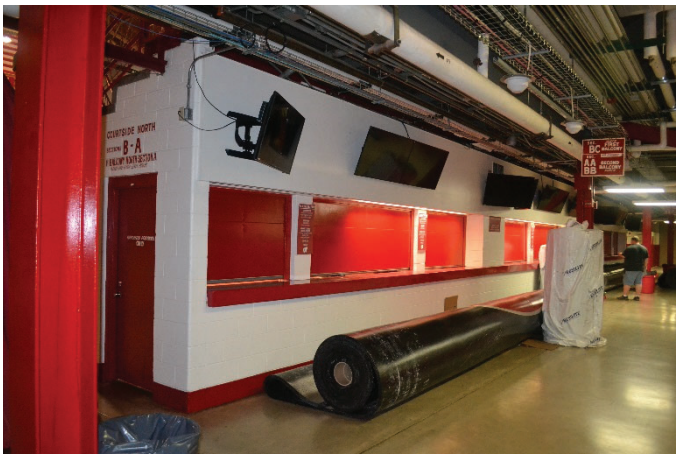


Figure 94: Field House Interior (River Architects July 12, 2018)

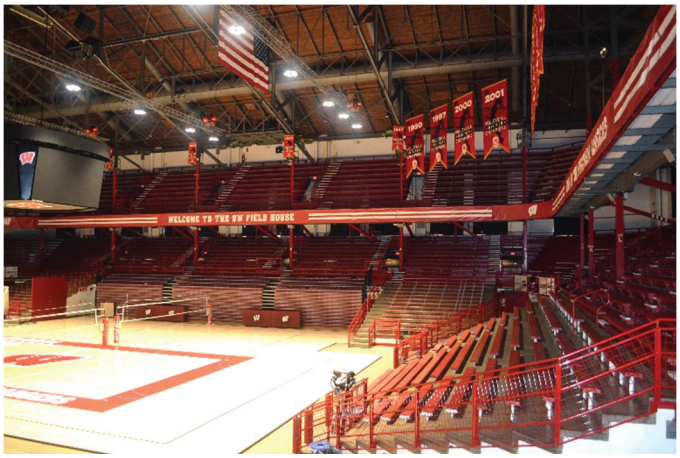


Figure 95: Field House Interior (River Architects July 12, 2018)

Figure 96: Field House Interior (River Architects July 12, 2018)

Figure 97: Field House Interior (River Architects July 12, 2018)

Exterior Doors

All the exterior doors have been replaced since the building's inception. Hollow metal doors and frames are in good condition as are the steel lintels that support the walls above as they do not show signs of rust or deterioration.

Wood Roof Deck

Although it has been mentioned by UW-Athletics that the roof of the Field House has suffered from various water intrusions at the roof level, the wood roof deck is showing signs of damage at the entire perimeter along the eaves and gables. It is highly recommended that the roof system be inspected by a building envelope specialist to determine if any interior moisture is condensing within the roof system during the heating season. Isolated staining would be more conducive to a roof leak, while this wholistic staining appears to be more consistent and warrants further review.

Interior Walls

Constructed of concrete masonry, the interior walls are in good condition. The painted surfaces have withstood the abuse that is often experienced in athletic facilities.

Interior Doors

Nearly all of the interior doors are non-original to the building. Doors located near Gate A appear to be of original design, while the remaining doors have been replaced or are of a modern-day hollow metal design added during various remodeling projects. Original doors also appear to be intact near at the former northwest entrance, which today serves as a service entrance.

North Wall Loudspeaker Enclosures

Enclosures located at the north exterior wall previously served as locations for the loudspeaker system for Camp Randall Stadium. While the original window openings remain intact, the original windows were modified to accommodate the loudspeaker system. These speakers were removed, while the enclosures remain and the window panels were infilled with non-matching frames and glazing.

Stairs

There are numerous sets of stairs within the Field House interior. The stairs are commonly constructed of steel channel stringers with a steel pan tread and include a painted steel pipe rail with a non-original, code-compliant wire mesh guardrail panel. Wire mesh guardrails leading to the second balcony only occur at select stairs.

Figure 98: Field House Interior
(River Architects July 12, 2018)

Figure 99: Field House Interior
(River Architects July 12, 2018)

Figure 100: Field House Interior
(River Architects July 12, 2018)

Figure 101: Field House Interior
(River Architects July 12, 2018)

Figure 102: Field House Interior
(River Architects July 12, 2018)

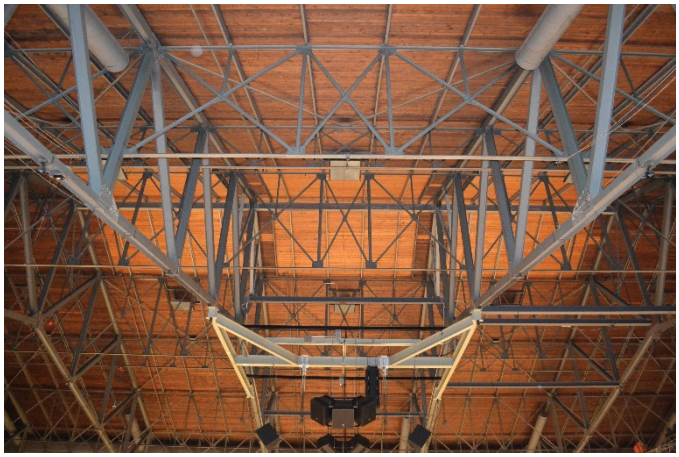


Figure 103: Field House Interior
(River Architects July 12, 2018)

Figure 104: Field House Interior
(River Architects July 12, 2018)

Painted parallel pipe rails not meeting requirements of today's codes are currently located at several stairs. Stairs are in good condition overall.

Restrooms

Much like the rest of the interior, the restrooms are utilitarian in nature and constructed of materials that require little to no maintenance. Durable surfaces such as concrete masonry walls and concrete floors with epoxy coatings allow custodial staff to easily clean the facilities after large events. The restrooms have modern-day fixtures and are in good condition. An overhead coiling door can be opened to another set of restroom fixtures on the opposite side of the wall during football games.

Future Assessment

Because the use of the facility is primarily a sports venue and multipurpose assembly space, it is imperative that all building codes be closely evaluated so as to ensure the safety of the athletes and spectators. Any future aspirations by UW Athletics to restore the interior of the Field House back to a previous date would require much closer evaluation.

Anticipated Scope of Work

As previously noted, the main focus on the interior will likely be related to building systems upgrades. These items are noted in this section of the report with recommended treatments identified in Part 2. Architectural work that is being considered is also noted in Part 2.

Figure 105: Field House Restroom
(River Architects July 12, 2018)

STRUCTURAL SYSTEMS

Available documentation from the circa-1929 construction of the Field House includes 21 sheets of scanned drawings. On several sheets, the portion of the title block indicating the sheet number and date of the drawing did not scan, but the majority of the sheets containing structural information are dated May 16, 1929, with a note indicating the drawings were "REVISED DECEMBER 1935", presumably to document the actual as-built conditions for record purposes. The drawings are fairly legible, although in some cases it is difficult to read some of the smaller text.

Design live load values do not appear to be stated directly on the structural drawings, but it is likely that a live load of 100 pounds per square foot (psf) was used, based on the relevant building code requirements of the era. The State of Wisconsin, Department of Safety and Professional Services, maintains an online archive of old codes. The archives include a 1927 edition of the Wisconsin Building Code, an update to the code dated December 29, 1929 (addressing the use of open-web steel joists), and a version that went into effect on April 16, 1931. We do not know for certain which version of the code was in effect at the time the Field House went through the permitting process, but our assumption is that it was likely the 1927 edition. Figure 107 on the next page is a reproduction of a table from that edition of building code, showing a live load requirement of 100 psf for "grand stands."

The 100 psf live load indicated in the 1927 edition of the Wisconsin Building Code is consistent with the live load requirements of currently applicable codes. However, additional investigation would be necessary to confirm if the structural design shown on the plans is sufficient for a 100 psf live load. There is a possibility that the 1931 version of the Wisconsin Building Code was used; as shown in Figure 108, the 1931 edition included a reduced live load requirement of 80 psf for "Grandstands".

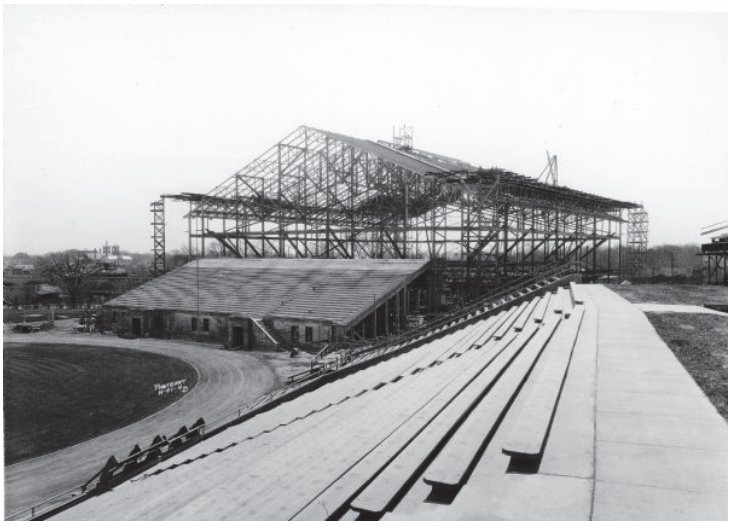


Figure 106: Construction
(Wisconsin Historical Society 1930)

Part IV
STRUCTURAL DESIGN

Only the most general features of structural design are touched on in this code. Detailed requirements may be adopted by cities if they desire. Such details are beyond the scope of this code and would be of no particular benefit. "Rules cannot produce or supersede judgment; on the contrary, judgment should control the interpretation and application of rules," whether the rules are general or detailed.

Either safety or economy, and often both, will be sacrificed unless both the designer and the builder have a competent knowledge of building construction in general and of the particular kind of construction which is being used.

Such details as are given in the following orders are typical, not restrictive. The Industrial Commission will, on application, approve any other type of design which affords equal strength and security in accordance with standard practice. See under "Appeal," p. 9.

SECTION 1. FLOOR AND ROOF LOADS.

Order 5300. The minimum stresses to be resisted by any structure shall be calculated by adding to the weight of the structure, called dead load, the following superimposed live loads uniformly distributed in pounds per square foot of horizontal area.

Theaters, Assembly Halls, and other places of assemblage:—

Auditorium with fixed seats	70
Lobbies, passageways, stairways and auditoriums or places of assemblage without fixed seats	120
Dance halls	120
Theater stage	150

School Buildings, Libraries, and Museums:—	
Classrooms and rooms for similar use	60
Corridors, laboratories, and similar public parts of the building	80
Hotels, Apartment and Tenement Houses, Clubhouses, Hospitals, and Places of Detention:—	
Private rooms and apartments	50
Public corridors, offices, lobbies, dining rooms, etc.	80
Office Buildings:—	
First floor	100
Upper floors	60
Grand stands	100
All stairs	100
Workshops, factories and mercantile establishments	100

In warehouses, workshops, factories and mercantile establishments used for the sale, storage or manufacture of heavy merchandise or machinery the floors shall be designed to carry all loads safely, including an allowance of at least 25 per cent for vibration where such occurs.

Roofs	30
Sidewalks	150

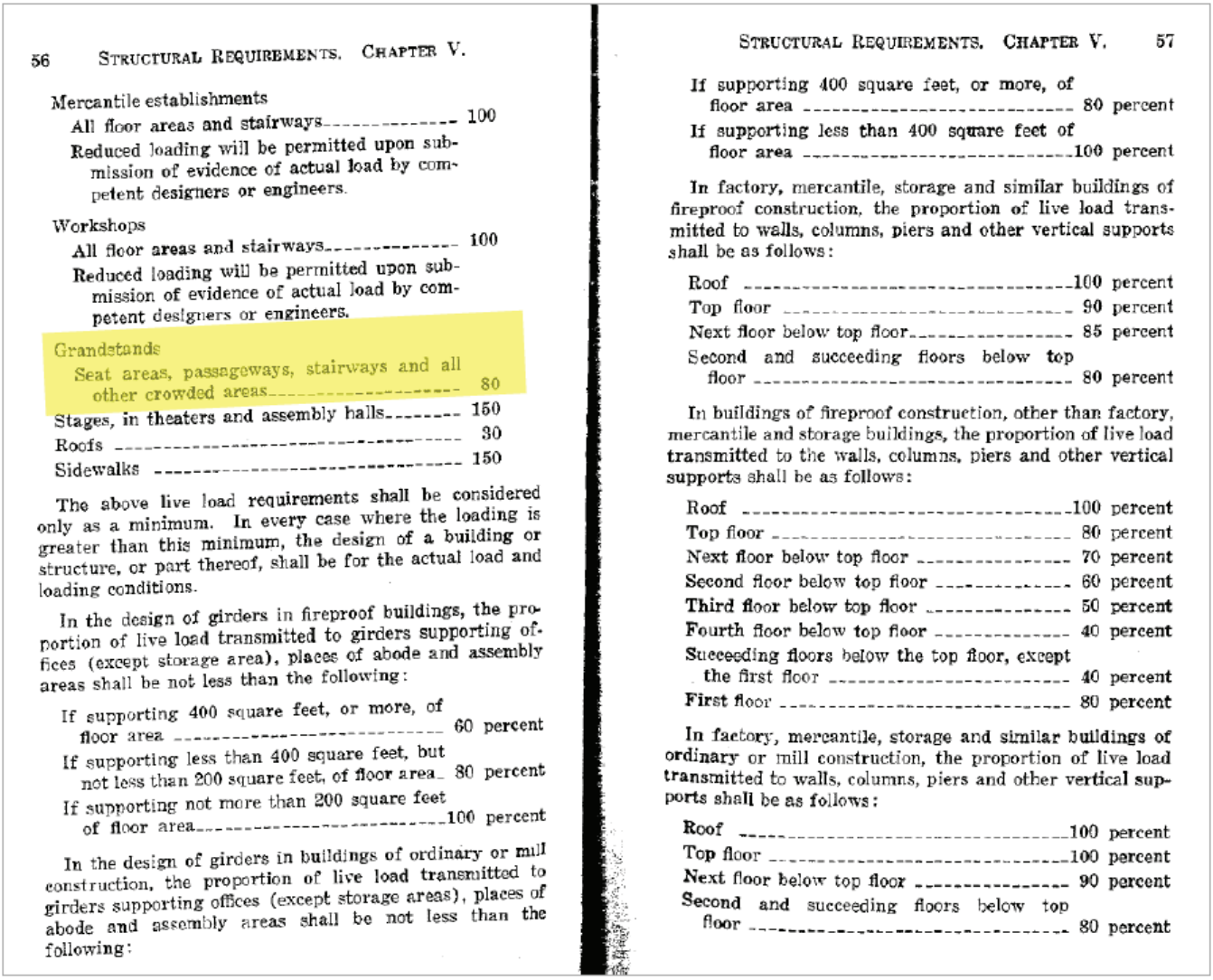
In any building where the floor load on any floor is taken as more than 150 pounds per square foot, the sidewalk load shall be taken equal to the maximum floor load.

The foregoing floor loads (but not the roof or sidewalk loads) may be decreased by 20 pounds in buildings of fireproof construction.

Note. This reduction is permitted because (1) A fireproof floor suffers little or no deterioration; (2) A fireproof floor is not weakened by fire below; (3) The greater dead load of a fireproof floor means that any accidental overload is a small proportion of the total dead and live load.

Concentrated, partial, and eccentric loading shall also be provided for.

Figure 107: Reproduction from 1927 Wisconsin Building Code (Wisconsin Code Officials Alliance 1927)



56 STRUCTURAL REQUIREMENTS. CHAPTER V.

Mercantile establishments	
All floor areas and stairways	100
Reduced loading will be permitted upon submission of evidence of actual load by competent designers or engineers.	
Workshops	
All floor areas and stairways	100
Reduced loading will be permitted upon submission of evidence of actual load by competent designers or engineers.	
Grandstands	
Seat areas, passageways, stairways and all other crowded areas	80
Stages, in theaters and assembly halls	150
Roofs	30
Sidewalks	150

The above live load requirements shall be considered only as a minimum. In every case where the loading is greater than this minimum, the design of a building or structure, or part thereof, shall be for the actual load and loading conditions.

In the design of girders in fireproof buildings, the proportion of live load transmitted to girders supporting offices (except storage area), places of abode and assembly areas shall be not less than the following:

If supporting 400 square feet, or more, of floor area	60 percent
If supporting less than 400 square feet, but not less than 200 square feet, of floor area	80 percent
If supporting not more than 200 square feet of floor area	100 percent

In the design of girders in buildings of ordinary or mill construction, the proportion of live load transmitted to girders supporting offices (except storage areas), places of abode and assembly areas shall be not less than the following:

STRUCTURAL REQUIREMENTS. CHAPTER V. 57

If supporting 400 square feet, or more, of floor area	80 percent
If supporting less than 400 square feet of floor area	100 percent

In factory, mercantile, storage and similar buildings of fireproof construction, the proportion of live load transmitted to walls, columns, piers and other vertical supports shall be as follows:

Roof	100 percent
Top floor	90 percent
Next floor below top floor	85 percent
Second and succeeding floors below top floor	80 percent

In buildings of fireproof construction, other than factory, mercantile and storage buildings, the proportion of live load transmitted to the walls, columns, piers and other vertical supports shall be as follows:

Roof	100 percent
Top floor	80 percent
Next floor below top floor	70 percent
Second floor below top floor	60 percent
Third floor below top floor	50 percent
Fourth floor below top floor	40 percent
Succeeding floors below the top floor, except the first floor	40 percent
First floor	80 percent

In factory, mercantile, storage and similar buildings of ordinary or mill construction, the proportion of live load transmitted to walls, columns, piers and other vertical supports shall be as follows:

Roof	100 percent
Top floor	100 percent
Next floor below top floor	90 percent
Second and succeeding floors below top floor	80 percent

Figure 108: Reproduction from 1931 Wisconsin Building Code (Wisconsin Code Officials Alliance 19234)

The Basement and Foundation Plan on Sheet 5 in the circa-1929 drawings shows reinforced concrete piers and footings under the interior frame columns, shown on the plans as 8E, 10E, 12E, 14E, 16E, and 18E on the east side, and 8W, 10W, 12W, 14W, 16W, and 18W on the west side. Typical piers at these locations are indicated at 3'-0" square, and footing sizes at these locations are 7'-6" x 7'-6". Footings on the east side of the Field House are scheduled as 24" thick, and footings on the west side of the Field House are shown as 42" deep. The footings are reinforced with 1/2" diameter bottom bars at 3" on center in both directions.

Bottom of footing elevations are between 5'-6" to 9'-6" below finished floor elevation. Typically, footings are held only about four to five feet below grade level for frost protection; based on our knowledge of other construction on the site it is possible that the deeper footings shown on the Field House drawings may have been based on the depth required to have the footings bear directly on the underlying bedrock.

Concrete piers on the footings are shown typically with the top of the piers held 2'-0" below the finished floor elevation. Information regarding reinforcing steel requirements within the piers was not found on the drawings; it is possible that the piers do not have any reinforcing steel.

Assumed allowable soil bearing pressure was not found directly stated on the circa-1929 drawings. However, based on the vertical truss forces shown on Sheet 15 for the corresponding footings, allowable soil pressure can be estimated at about 6,000 psf. In comparison, the allowable soil bearing values shown on the drawings for a circa-1976 remodeling project were 1,000 psf for the first 8 feet of soil below the finished floor slab, and 3,000 psf for deeper excavations. The basis for the soil bearing pressures indicated on the 1976 drawings are unknown.

Exterior foundation walls on the 1929 drawings are 2'-8" thick to 4'-8" thick around the perimeter, although there are locations on the north end where foundation walls are only 1'-0" thick. Reinforcement for the wall footings is indicated on the drawings, but required reinforcing in the foundation walls was not found; it is possible that the foundation walls are unreinforced concrete.

The First Floor Plan on Sheet 6 in the circa-1929 drawings shows a dirt floor, with a running track around it. The elevation of the dirt floor is given as 873.5', or 99'-6" based on the reference top of slab elevation 100'-0" = 874'-0" as shown on both the 1929 and 1976 drawing sets. As shown on this sheet, the first floor plan in the original construction would have accommodated a 1/8 mile running track, with a clearance of only about 5 ft between the outer edge of the track and the innermost steel columns at the frames supporting the roof and elevated seating areas.

This sheet also shows the exterior perimeter walls of the Field House as cast-in-place concrete backup walls with stone veneer, matching what is shown on the architectural sections. Sheet 6 indicates the thickness of the backup walls. However, similar to the foundation walls below, it is unclear whether these walls have any steel reinforcing within them. Non-destructive testing could be conducted to determine if there is any reinforcing steel in these walls.

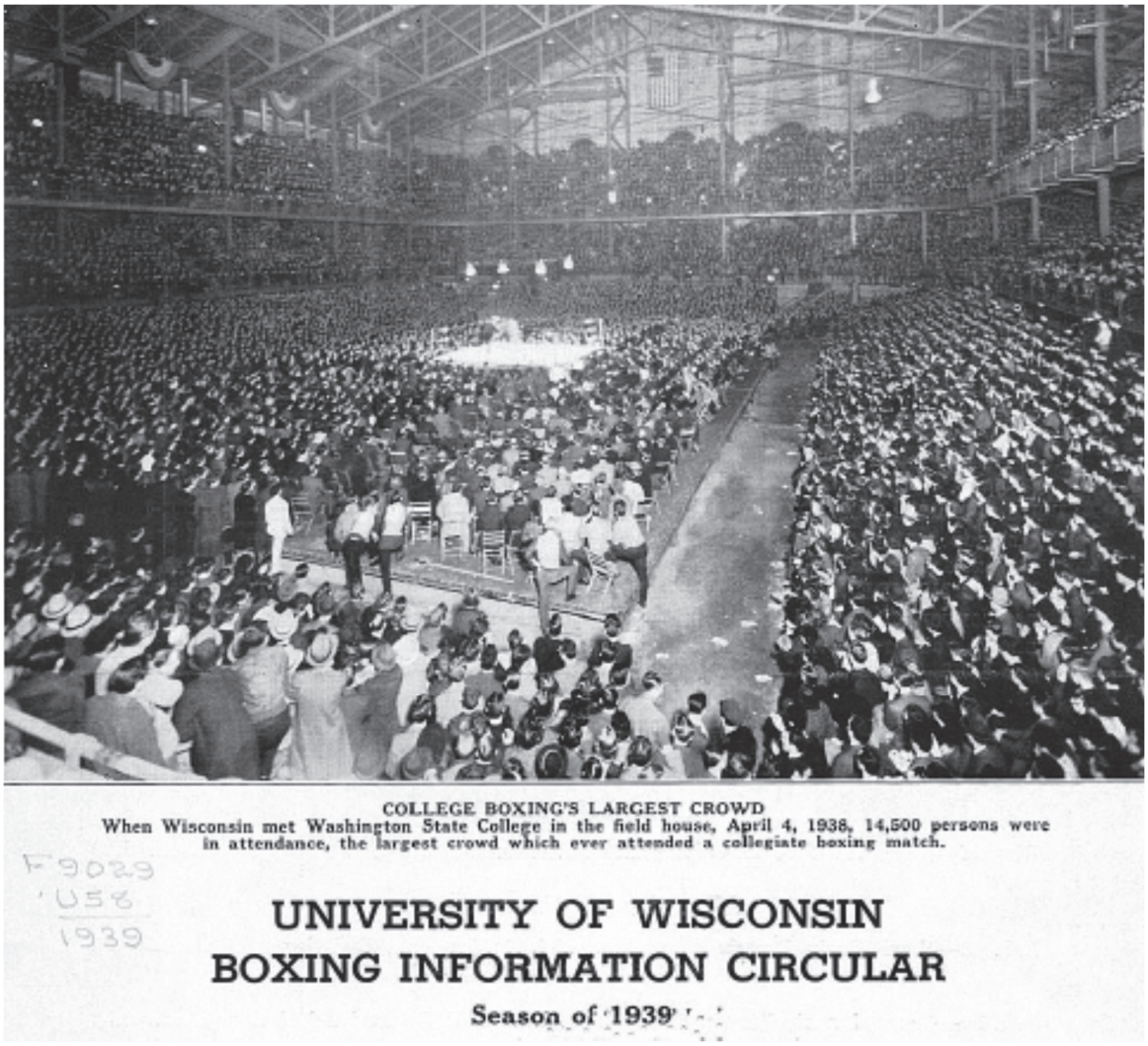


Figure 109: Field House with Bleachers and Floor Seating for Boxing Match (UW Archives 1938)

Sheet 7 of the circa-1929 drawings shows seating at the lower level of the Field House. There is no seating shown on Sheet 7 inside of the upper balcony, although archival photos indicate that bleachers were used to provide additional seating for events where the 1/8 mile running track was not in use, as shown in Figure 4. We were unable to find information regarding these bleachers; it is possible that they were added after the original construction. The Wisconsin Historical Society shows some circa-1949 photos that indicate "new" wood bleachers, replacing whatever had been used up to that point. New permanent fixed seating on the north, west, and south sides of the Field House was added as part of circa-1976 renovations, along with retractable bleachers on the east side.

Sheet 7 also shows including permanent wood seating on iron chairs bolted to the reinforced concrete steps on the exterior of the building, facing the football field. Figure 5 below shows where the seating details shown on the lower-right corner of Sheet 7 would have applied.

Sheet 8 of the circa-1929 drawings shows the upper balcony and the roof, including double glazed skylights at the three center bays. The roof plan indicates a total of (20) 36" diameter ventilation hoods (ten on each side; the hoods on the west side of the building are visible in Figure 110 below).

Figure 110: Fixed Seating on North End of Field House
(Wisconsin Historical Society 1936)

Sheet 9 of the circa-1929 drawings shows details of construction for the balconies, with details on how the wood seating planks attach to the steel subframing. Several of the steel pieces shown in the details on Sheet 9 are marked as "BETH OR CAR BEAM", referring to two of the primary steel suppliers of the era from which the designer likely expected the steel to be sourced; "BETH" refers to the Bethlehem Steel Corporation, and "CAR" refers to the Carnegie Steel Company. Bethlehem Steel was in operation from 1904-2003 and at one time was America's second-largest steel company. The Carnegie Steel Company was formed in 1892 and sold in 1901 to become a subsidiary of the United States Steel Corporation, another major steel supplier of the 1920s and 1930s, which is still in operation today. Additional comments regarding the steel framing at the Field House are provided further on in this text.

Sheets 10-13 of the circa-1929 drawings show how the structural framing relates to the exterior facade. Sheet 10 and 11 show that the door frames were anchored into the cast-in-place concrete backup walls. Sheet 12 shows window and skylight framing. It is understood that the skylights were later filled in, but drawings have not yet been located showing such work. It is uncertain whether the infill could be easily removed if ever desired. See Figure 111.

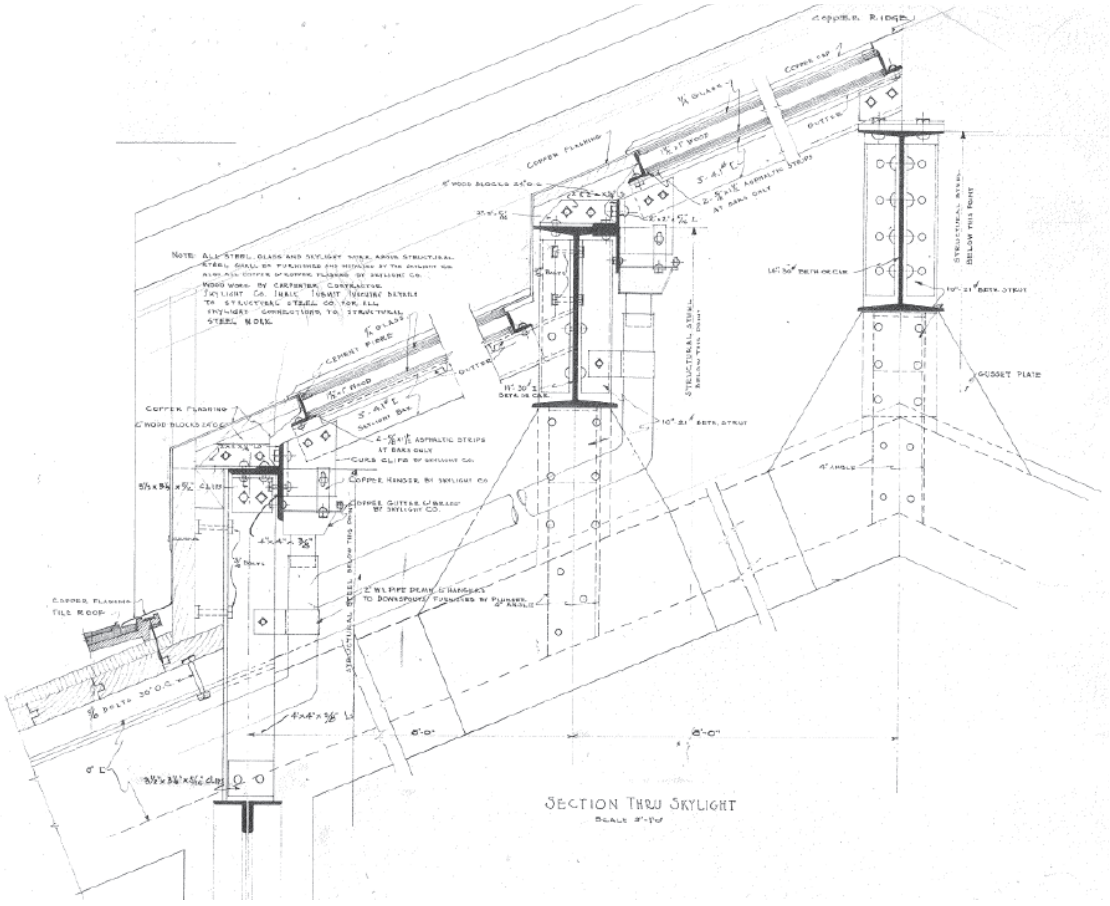


Figure 111: Skylight Framing (Original Construction Drawings 1929)

STEEL BEAM SCHEDULE

BEAM NUMBERS	BETHLEHEM SECTION	CARNEGIE SECTION	STANDARD SECTION
B1, B3	22"@58#	21"@50#	
B2	24"@84.5#	24"@80#	
B4	28"@175#	27"@175#	
B5	22"@77#	21"@80#	
B6	16"@35#	16"@35#	
B7	25"@145#	27"@145#	
B8	22"@82.5#	21"@64#	
B9	25"@104#	27"@112#	
B10	28"@165#	27"@160#	
B11	16"@35#	16"@35#	
B12, B13	14"@30#	14"@30#	
B14			8" I @11.5#
B15	16"@45#	16"@45#	
B16	16"@35#	16"@35#	
B18	21"@58#	21"@58#	
B17, B19, B20	12"@25#	12"@25#	
S1	14"H@55#	14"@61#	PLUS 2-6"CS SEE DETAIL
S1A	"	"	
S2	14"@30#	14"@30#	
S3	10"@21#	10"@21#	
S4	"	"	
S5	14"@30#	14"@30#	PLUS 2-6"CS SEE DETAIL
S6	8"@17.5#	8"@17.5#	
S7	14"@30#	14"@30#	PLUS 2-6"CS SEE DETAIL
S8	8"@17.5#	8"@17.5#	

Figure 112: Steel Beam Schedule (Original Construction Drawings 1929)

Sheet 14 of the circa-1929 drawings shows framing at the first and second balcony levels. Steel beams are coded on the plans as B1-B20, and beams used as stringers are coded S1-S8. The beam schedule, reproduced here as Figure 7, lists section sizes for both Bethlehem Steel and Carnegie Steel, two major producers of steel at the time the Field House was constructed. Currently, steel production is standardized throughout the US, so that beams and other shapes can be selected from a uniform list of options. However, at the time the Field House was constructed, steel sizes were not yet standardized across different suppliers; instead, each steel company typically produced a broad range of different shapes and sizes, not necessarily identical to the sizes being produced by their competitors.

As noted previously, the structural engineers who designed the Field House provided Bethlehem and Carnegie size options, since those were two of the most common steel suppliers of the era. For both producers, the first number in the beam schedule shown in Figure 112 is the approximate depth of the section, in inches, while the second number is the weight in pounds for a linear foot of the given size. There are slight variations between the two producers, for example Beam B10 would be 28 inches deep weighing 165 pounds per linear foot if obtained from Bethlehem, whereas it would be 27 inches deep weighing only 160 pounds per linear foot if obtained from Carnegie.

Field verification was conducted of the beam depths at several instances of beams B1, B4, B9, and B10, and found that the beam depths matched the shallower values indicated in the schedule for the Carnegie options. However, we cannot conclusively confirm that the steel sections actually came from a Carnegie mill. None of the beams (or columns) that we could access were found to bear a mark confirming their source of origin. In fact, the only marks we could find were that channel sections at the first balcony level and above were typically marked with ILLINOIS-S-USA.

For additional insight into the possible source of the beams at the Field House, research was conducted of the Historical Record document published by the American Institute of Steel Construction (AISC), the title page of which is reproduced alongside notes regarding our findings.

- Beam "B1" was field-measured at 21". The Carnegie section listed in the Steel Beam Schedule is 21@58. The AISC summary indicates a matching size in Carnegie catalogs from 1927, (not 1928) 1929, and 1931, as well as Illinois catalogs from 1925 and 1932.

- Beam B4 was measured at 27" Based on the 175 plf beam weight, matching sections are listed in the AISC publication for Carnegie 1927, 1928, 1929, 1931, and Illinois 1932.

- Beam B9 was measured at 27". Based on the 112 plf beam weight, matching sections are listed in the AISC publication for Carnegie 1927, 1928, 1929, 1931, and Illinois 1932.

- Beam B10 was measured at 27". Based on the 112 plf beam weight, matching sections are listed in the AISC publication for Carnegie 1927, 1928, 1929. No Illinois shape in AISC's summary matches the 160 plf weight indicated in the Beam Schedule for this size. No information available for Carnegie's production in 1930. By 1931 there was no matching Carnegie shape either, instead the nearest options were a166 and 156 plf.

Based on the information in the AISC Historical Record, we assume that the structural engineers would likely have been referencing either the 1927 or 1929 Carnegie Steel catalog when specifying Carnegie Steel sizes (it is unknown if the 1929 catalog was available to the engineers before they had completed their design). AISC maintains an online database of historical reference manuals which includes both the 1927 and 1929 Carnegie catalogs.

AISC's online database also includes various editions of Carnegie's corresponding reference documents which includes extensive commentary on recommended structural engineering design assumptions and methods, including appropriate values to assume for material strength in different applications. These types of documents are a great resource for any structural assessments of existing conditions, or evaluation of proposed modifications. However, it is not always possible to know if the documents that have been preserved in these online archives are the same as what was used by the actual designer, and for the Field House there is some uncertainty on this subject.

Historical photos show steel erection occurring in early 1930, see Figures 113 and 114, which means the steel was likely produced in 1929. Although Carnegie Steel catalogs from 1927, 1928, and 1929 are all available online, there is a gap in terms of which editions of the corresponding reference manual are available in the AISC online database.

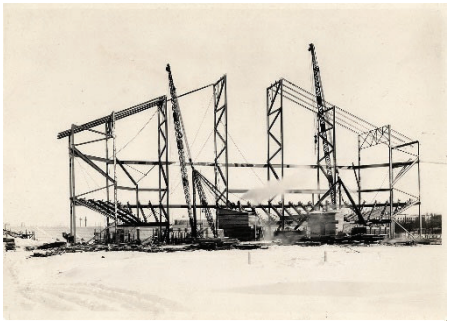


Figure 113: Steel erection during construction (UW Archives c.1930)

Figure 114: Steel erection during construction (Wisconsin Historical Society March 12, 1930)