Volume I

Comprehensive Building Assessment

Rentschler Field at Pratt & Whitney Stadium

September 7, 2022
DRAFT FOR
DISCUSSION ONLY

POPULOUS™

VENUE Solutions group

CRDA | Capital Region Development Authority

PRATT & WHITNEY STADIUM
RENTSCHLER FIELD

Table of Contents

Disclaimer

This report is not a warranty or guarantee of the items noted. The extent of our evaluation was limited and cannot guarantee that the condition assessment discovered or disclosed all possible latent conditions. The evaluation required that certain assumptions be made regarding existing conditions and some of these conditions cannot be verified without expending additional sums of money or destroying otherwise adequate or serviceable portions of the facility. In this study, we did not include inspection of concealed conditions. The assessment also does not provide specific repair details in some cases, construction contract documents, material specifications, details to develop construction cost, or information on means and methods of construction.

Any comment regarding concealed construction or subsurface conditions are our professional opinion, based on our team's experience and judgment, and derived in accordance with standard of care and professional practice.

Overview

Populous was engaged by the Capital Regional Development Authority (CRDA) to provide a comprehensive building system assessment for Pratt & Whitney Stadium at Rentschler Field that benchmarks the current condition of the facility. As part of the assessment, Venue Solutions Group, in partnership with the consultant team, has developed a 20-year capital expense matrix to assist the CRDA in establishing priorities for major repairs, potential upgrades and maintaining the facility in a professional manner. The ability to plan and maintain the stadium as it transitions from years 19 to 30 is crucial in extending the life of the facility as well as its relevance in the competitive and ever evolving regional and national marketplace.

As the stadium approaches its third decade of operation, its ability to deliver a positive guest experience is crucial for it to remain relevant both locally and nationally. It is important to keep the facility in a first class condition and well maintained for a great experience for fans, staff, and the University of Connecticut.

This Volume I of the project includes architecture/interiors, turf, major systems, technology, food service, life safety, vertical transportation, and structure. Volume II of this project contains a Civil and Exterior Assessment.

The consultant team includes national firms with specific expertise in the design and operations of large stadiums with collegiate and professional sport franchises as major tenants or operators. The team includes:

Firm	Discipline
Populous	Prime, architecture, interiors, turf and site
Venue Solutions Group	Assessment and CapEx
Smith Seckman Reid	Major systems
Wrightson, Johnson, Haddon and Williams	Technology, IT
S2O Consultants	Food service
Howe Engineering	Life Safety
VDA	Vertical transportation
Walter P Moore	Structure
Rider Levett Bucknall	Cost estimating[1]

The consultant team performed the on-site review February 8-10, 2022, with Walter P Moore visiting on March 2, 2022. The review consisted of a visual inspection of equipment and spaces along with interviews with staff and a document review. It should be noted that the stadium staff and their service providers afforded the review team with significant amounts of documentation. These individuals were available during the on-site review to answer questions from the team, and their assistance contributed significantly to the depth of the report.

The construct of this report is as follows:

Phase 1 is a summary of the major deficiencies in each discipline and potential issues if these deficiencies are not addressed in a timely manner.

Phase 2 is a detailed schedule of recommended repairs and replacements organized by critical need for each discipline. This represents the bulk of the report and includes an executive summary for each discipline.

Phase 3 is a detailed schedule of recommended code and facility upgrades organized by priority.

About Pratt & Whitney Stadium at Rentschler Field

Pratt & Whitney Stadium at Rentschler Field is a 38,000-seat, open-air facility located on the site of a former airfield in East Hartford, CT. Opened in 2003, the Stadium serves as the home field of the University of Connecticut Husky football program and hosts other athletic, cultural, entertainment and civic events throughout the year. Currently, the second largest natural grass facility in New England, the stadium has also welcomed a variety of international soccer matches, as well as rugby and lacrosse.

The stadium's upper and lower bowls include 31,700 bench seats and 4,000 premium chair backs. A wide concourse, ringed by 20 concession stands and restroom facilities, separates the two bowls. Locker rooms, as well as the stadium kitchen, administrative offices and storage, are located beneath the southeast side of the facility. The south side of the stadium is framed by the "Tower", a dramatic five-story structure which houses a 650-seat Club Room and 38 luxury suites, as well as press facilities and radio/TV broadcast rooms. The Club Room can seat up to 500 people in a banquet setting and is available year-round for catered events, corporate meetings and other functions.

[1] Cost estimating for architecture/interiors, major systems, civil and playing field

Phase 1
Major Deficiencies

This section is a summary of the major deficiencies in each discipline and potential issues if these deficiencies are not addressed in a timely manner.

Major deficiencies include:

- Architectural and structural deficiencies that will result in increased damage and significant cost increase if not addressed in the next 1 – 5 years.
- Fire Alarm & Fire Sprinkler deficiencies that compromise the building's life safety.
- Operational and security deficiencies that compromise the safety of the facility.
- Deficiencies in team and fan amenities that make the building less competitive.

Roofs

Please refer to the Roof Area Key Plans (**Appendix A**) to locate/identify specific buildings and roof areas.

The newly installed overlay roof covering systems on Buildings 1, 3, and 9 generally appear to be in good condition, with minimal deficiencies. The existing/original roof covering systems on Buildings 2 and 4-8 generally appear to be in fair-to-poor condition, with only a few minor deficiencies that, in our opinion, require immediate attention/repair/replacement, under Phase 1 (described in the section below).

There is one deficient condition (Buildings 5-6), that involves an expansion joint between the two adjoining buildings, with TPO membrane flashings atop parapets that are detached/ delaminated, and non-watertight.

The existing TPO single-ply membrane roof covering systems, on the main and east/west penthouse roofs, are generally in very poor condition (see description below). There are active leaks, with visible interior moisture damage (suspended ceilings), near the center of the building.

In our opinion, the single-ply membrane roof covering systems on the Tower Building require complete removal/replacement, as soon as fiscally possible.

It should also be noted that, in order to accommodate removal/replacement of the roof covering systems, it will require temporarily removing and reinstalling a myriad of telecom (cellular telephone/mobile data) equipment and associated cabling that is currently installed atop numerous areas of the roof covering systems, on the main roof and both (east/west) penthouse roofs, before the roofs can be properly accessed to perform the roof covering system replacement work.

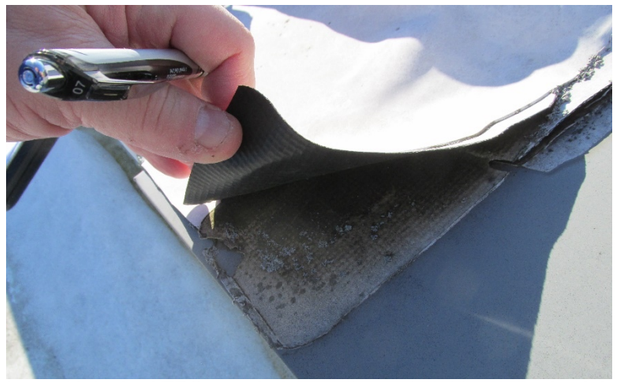
Description of Deficiencies

Buildings 1-4, 7-9: No major deficiencies that qualify under Phase 1 guidelines.

Buildings 5-6: An expansion joint is constructed between the two adjoining buildings, and an expansion joint cover assembly is installed atop the adjoining parapets. The expansion joint cover appears to have been fabricated on-site, from TPO membrane and other underlying materials. The multiple layers of TPO membrane that were originally adhered to the pre-finished sheet metal copings, are detached/delaminated and, as a result, the expansion joint is non-watertight.

This expansion joint cover is installed at the junction where Buildings 5 and 6 adjoin. The expansion joint cover is constructed atop the perimeter parapets, utilizing TPO membrane. The TPO membrane was originally adhered to the metal copings at both ends; however, the membrane is detached from the metal coping surface at the ends and, as a result, non-watertight.

TPO membrane, at ends of an expansion joint cover, is loose/detached/ non-watertight.



Loose/detached TPO membrane, at the end of this expansion joint cover, allows moisture infiltration into the roof covering systems and underlaying construction.

Overview of the main roof on the Tower Building, that utilizes a TPO single-ply membrane roof covering system.

Tower Building: The existing low-slope TPO single-ply membrane roof covering systems generally appear to be in very poor condition. There are active moisture leaks into the building interior that, we were informed, have not yet been addressed. We understand that the TPO roofing/flashing membrane has previously sustained burns/damage/leakage in many places, resulting from pyrotechnics/fireworks that were previously launched from the roofs. There are numerous patches/repaired areas throughout the Tower Building roofs. It was also noted that the membrane base flashings surrounding an equipment curb (west penthouse roof) are delaminated from the field roof membrane, and non-watertight. Based upon a visual examination of the roof covering system, it is evident that there is substantial moisture saturation of the roof insulation and roof deck substrate beneath the roof membrane, and it is very likely that an extensive portion of the roof insulation/underlayments and the concrete roof deck are moisture-saturated.

There are numerous small patches in the TPO roof membrane on the main roof of the Tower Building. We were informed that many such patches result from burns to the membrane from pyrotechnics/fireworks being detonated from the roof, as well as foot/equipment traffic on the roofs associated with the several cellular telephone/data system carriers and their equipment.

It should be noted that a significant portion of the Tower Building roof surfaces are covered with surface-mounted telecom equipment, antennae, and a labyrinth of cabling/cable trays, installed by several independent carriers. As a result, many areas of the roofs are currently inaccessible for repair/replacement, until the rooftop equipment is temporarily removed from the roof surfaces.

TPO membrane base flashings surrounding an equipment curb are delaminated from the roof membrane, and non-watertight.

Non-watertight TPO membrane base flashings surrounding an equipment curb on the west penthouse roof of the Tower Building.

A labyrinth of telecom equipment/cabling is installed atop the Tower Building roofs. The equipment is installed, operated, and maintained by several independent cellular carriers, and much of this equipment is installed directly atop the surface of the roof covering system, often with little or no protection of the roofing/flashing membrane.

A small portion of the rooftop telecom equipment is supported above the roof on steel dunnage; however, there is insufficient clearance beneath the equipment/dunnage to accommodate access to the roof covering systems for maintenance/repair/replacement.

Cable trays transverse the main roof on the Tower Building in several areas, impeding access to areas of the roof and other rooftop equipment.

Much of the east elevator penthouse roof surface is covered with telecom equipment.

Much of the west stair/elevator penthouse roof is covered with telecom equipment/antennae/cabling.

Numerous telecom cables are extended from equipment atop the west stair/elevator penthouse roof, over the roof edge, and downward to connect with other equipment installed in other areas of the building and/or grounds.

A significant portion of the Tower Building roof surfaces are covered with surface-mounted telecom equipment, antennae, and a labyrinth of cabling/cable trays, installed by several independent carriers. As a result, many areas of the roofs are currently inaccessible for repair/replacement, until the rooftop equipment is temporarily removed from the roof surfaces.

Metal Roof Covering Systems (Tower Building, Scoreboard, Video Booth): No major deficiencies that qualify under Phase 1 guidelines.

Asphalt Shingle Roof Covering Systems (Radio Broadcast Building, Storage Building): No major deficiencies that qualify under Phase 1 guidelines.

Recommendations and Repairs

1. Buildings 5-6: Completely remove the existing membrane expansion joint cover, and all associated materials. Remove the existing sheet metal copings and install new TPO membrane flashings (beneath the coping) that fully bridge the expansion joint. Install new pre-finished metal copings that incorporate an expansion joint cover, properly secured to the substrate.

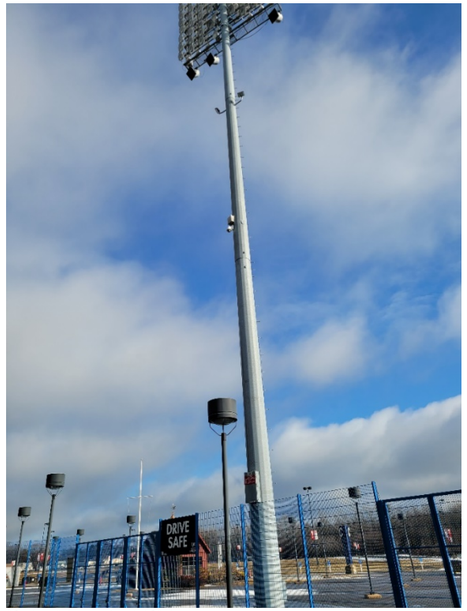
2. Tower Building: Coordinate with all telecom carriers with equipment/cabling on the roofs, for temporary removal/reinstallation of their equipment from the roofs, so as to provide full access to all areas of the roofs, for removal/replacement of the roof covering systems. Completely remove the existing roof covering systems, including all membrane, insulation/underlayments, sheet metal flashings, etc., down to the concrete roof deck. Make all necessary repairs to any damaged/deteriorated roof deck/ substrates. Allow the concrete roof deck to properly dry, prior to applying new insulation/roofing materials. Make repairs to the existing drainage elements or remove/replace the roof drains/overflow drains. Install a new roof insulation assembly, to meet current codes for thermal efficiency and wind uplift. Install a new single-ply membrane roof covering system that is fully-adhered to the roof insulation assembly/substrate, and to comply with current wind uplift requirements. Install all new pre-finished sheet metal flashings associated with the roof replacement. Design and install new fall protection equipment (that may also include reinstallation of exiting equipment, to meet current codes/safety requirements. Install safety/fall protection equipment, to comply with current codes/regulations.

Technology

Security

Description of Deficiencies

The video surveillance has been updated over the years in an ad hoc manner. It is comprised of both analog and IP-based cameras of which 18 of the 35 cameras on site are not currently functioning properly. This is due to either damage to the camera or cabling infrastructure to the camera. The parking lot cameras, which were installed in 2016, are configured as a “wireless-mesh” network and do not have reliable connectivity to the building network for monitoring. The four pole-mounted PTZ cameras are utilized the most, however they are mounted approximately 25’-30’ above grade and sway with the light pole to which they are affixed causing visibility and imagery issues.



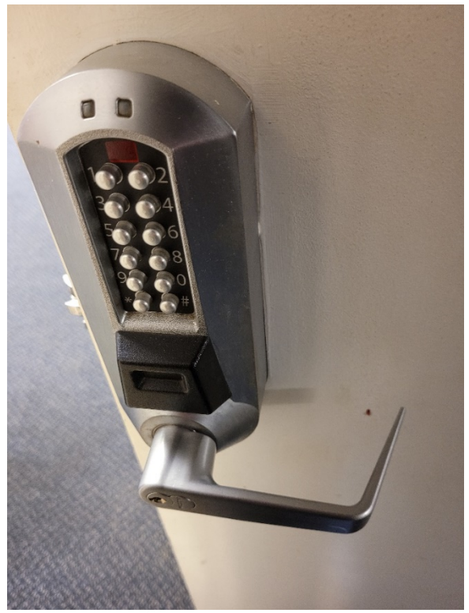
Pole-Mounted PTZ camera

Also, there is no active video recording system for surveillance, which poses an issue in operational functionality. Room Security/Fire CMND S113 houses the original camera monitoring system, however the monitors are no longer in use. Also, an existing PC operated Veracity Coldstore video surveillance storage recorder is located within IDF 5B, however it is outdated and not used in daily operations.

Room Security/Fire CMND S113 monitors

At similar venues, newer surveillance technology typically operates on a minimum of CAT 6 network cabling. The existing structured cabling plant is CAT 5e and appears original to the stadium’s 2003 construction. In addition, typically CAT 6 and better copper cabling, each supporting 1-gigabit bandwidth, aggregates multiple camera traffic to a 10-gigabit fiber optic backbone. The existing fiber optic backbone is capped at 1-gigabit, constraining resolution and frame rates for the cameras. The structured cabling backbone and horizontal systems must be upgraded to support any camera upgrades and meet future security expectations.

The access control system is original (2003) and used as a local means of access and not monitored. Lobby elevators on floors one and two have readers intended for “after hours” access, however they do not appear to be functioning allowing access at any time. The primary locking system is done through a “master” physical key. The facility maintenance contractors, police, and fire department all have physical master keys as means of access. The main offices for food service access are via a stand-alone non-networked keypad doorknob.


Food service office keypad

The original (2003) intrusion detection system can be armed; however, the operations team does not use it as it is prone to false activation and has non-functioning components in some areas. Pedestrians have worked their way into the stadium after hours at numerous occasions without security notification.

Recommendations

1. Recommend replacing video surveillance system management and adding new Network Video Recording (NVR). This scope of work would include the replacement of existing equipment, software, licensing, as well as providing new physical cabling plant as required.
2. Recommend manufacturer consolidation and replacement of cameras. At the stadium, this work would include camera replacement and physical cabling plant replacement as required. For the parking lot areas, this work would include new pole-mounted cameras, new exterior underground raceways, new composite fiber optic cable plant, as well as new combination POE/Media conversion equipment.
3. Recommend upgrading network structured cabling backbone and horizontal cabling plants to support newer video surveillance demands.
4. Recommend replacing intrusion detection panels, motion detectors, door switches, cables, and monitoring as the existing systems age exceeds the recommended “end-of-life” cycle.
5. Recommend adding intrusion detection at (2) locations with safes and at concession stands around concourse.
6. Recommend replacing access control panels, card readers, door switches, cables, and monitoring as the existing systems age exceeds the recommended “end-of-life” cycle.
7. Recommend adding access control card readers to back-of-house spaces including, electric rooms, mechanical rooms, MDF/IDFS, primary foodservice, emergency operations areas, main offices, and concession areas around the concourse.
8. Recommend adding access control visitor badging, security workstation, and monitors.
9. Recommend replacing intercom system with video intercom as the existing systems age exceeds the recommended “end-of-life” cycle.

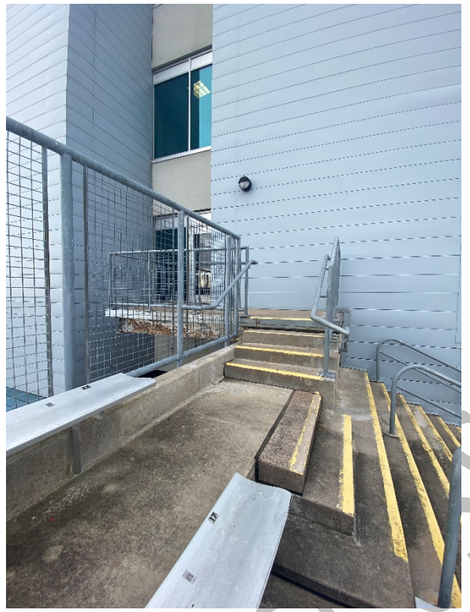
Architecture

Major architecture and interior findings from this assessment include cosmetic damage due to average wear and maintenance operations, system failure based on environmental exposure and end of life cycle for architectural finishes and systems.

Description of Deficiencies

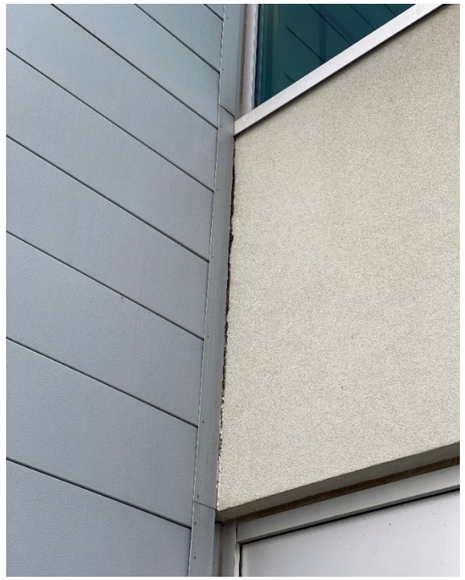
Club Level stair landing is showing signs of rust and water damage.

South/east exterior club level stair landing and exit door bowl facing; the steel support is showing rust and deterioration of concrete and sealant joints



South/east exterior club level stair landing and exit door bowl facing; the steel support is showing rust and deterioration of concrete and sealant joints

Exit door has air gaps to exterior at SE Club Level



Above SE Club Level Exit -gap at exterior finish system most likely allowing water to infiltrate.

Ticket Windows are located near entrance gates and are at end of life. There are 21 ticket windows in all. There are 12 windows at the main ticket office on the south and 3 remote ticket offices located around the stadium with 3 windows each. The interior of these spaces was not accessed during the site visit.

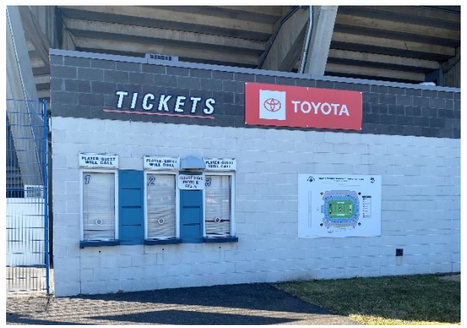
The guest service window is also at end of life and does look to be welcoming.

Ticket window at end of life.

Ticket window at end of life - rust observed; window shades at end of life

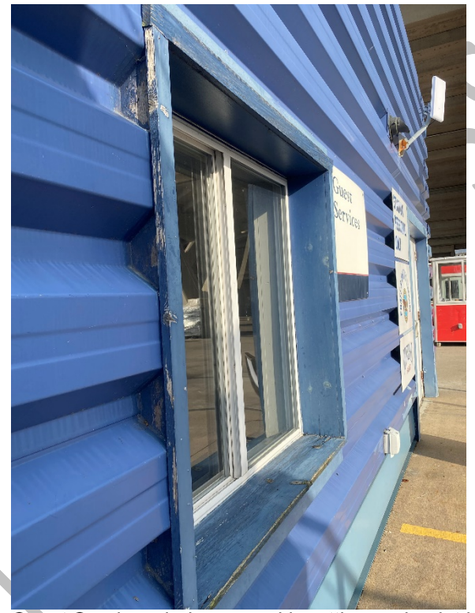
Ticket window at end of life - rust observed; window shades at end of life

Windows are rusted, rotting and sealant and signage is deficient



Windows are rusted; sealant and signage are deficient and at end of life

Determine current ticket office requirements; windows are rusted, rotting and sealant and signage is deficient and at end of life



Guest Service window- wood is rotting and paint is faded

Aisle Steps & Railings

Sealant maintenance/replacement required; sealant is pulling away from concrete

Sealant maintenance/replacement required

Sealant maintenance/replacement required

Sealant maintenance/replacement required

Sealant maintenance/replacement required

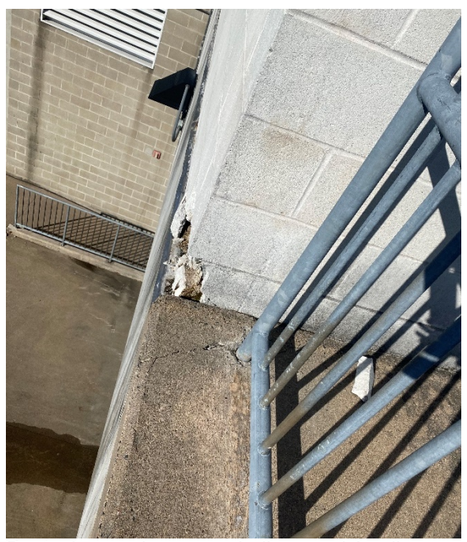
Sealant maintenance/replacement required

Rusting Guardrails

Rust observed on guardrail at back of bowl

Rust observed on guardrail at back of bowl

Rust observed on guardrail around loading area



Rust observed on guardrail around loading area; damage to concrete masonry above loading dock area


Guardrails and steel rust at scoreboard


Guardrails and steel rust at scoreboard

Asphalt Maintenance

The asphalt concourse has several large cracks.


Asphalt crack on concourse


Asphalt crack on concourse


Asphalt crack on concourse

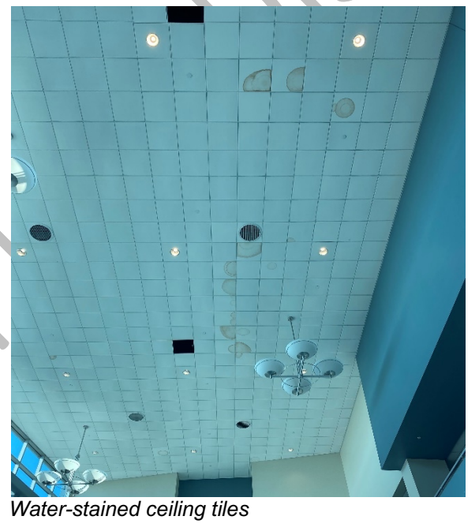
Concession 138

Club Entry

The club entry is currently very underwhelming.

Club Entry and signage need an update

Club Ceiling



Water-stained ceiling tiles

Recommendations

1. The rusting club level stair landing should be sanded, primed and painted. Any structural issue observed should be addressed as well.
2. Replace thermal gaskets at SE exterior club egress door.
3. Repair exterior finish system above club egress door.
4. Recommend the concession/restroom building downspouts should be hard piped to storm drainage system to mitigate further erosion and damage to building.
5. The ticket windows should be replaced and the signage updated. The exterior CMU walls need to be repainted. A canopy over the ticket windows could provide protection for ticket windows and provide a new elevated look to these areas. LED displays are often used above windows for messaging and could be considered if it is desirable. Stadiums are trending towards paperless tickets and often times the quantity of ticket windows can be reduced in a building of this age. Quantity of ticket windows should be considered based on ticketing system and future upgrades of ticketing system. A new window and signage are needed at the guest service window too.
6. Recommend removing rust from aisle railings and guardrails.
7. Recommend removing rust from scoreboard steel and guardrails.
8. Recommend replacement of concourse asphalt.
9. Recommend new graphics at both club entries along with a complete renovation of the lobby space. There is a great opportunity to provide a more elevated entry experience for suite and club patrons.
10. Recommend determining cause of water damage in club area ceiling and repairing.

Field and Site

Irrigation Piping

The irrigation piping from the original installation nearly 20 years ago remains today. The life expectancy of underground PVC irrigation piping is roughly 25 years, after which the material can become brittle, resulting in broken piping during the operation of the irrigation system.

During discussions with grounds staff, the age of the piping has become an issue when making repairs to the irrigation system. It was discussed that during a recent valve replacement, a section of piping broke while making repairs, causing a significant leak and resulting in the irrigation system being shut down until repairs were made.

Additionally, it was learned that the depth to the irrigation piping is inconsistent across the field, leading to irrigation piping being struck and damaged during routine maintenance tasks. This prevents certain standard maintenance practices from being implemented.

Subdrainage Piping

The subdrainage piping from the original installation nearly 20 years ago remains today. While the life expectancy of HDPE storm drainage pipe is roughly 75 years, often drain lines can collapse from traffic running over the top of the field. Additionally, joints and fittings can become separated over time. Both can lead to poor performance of the subdrainage system if not corrected.

Perimeter Trench Drains

The perimeter trench drains are significantly damaged, displaying broken drain edges and damaged grates. Additionally, the installed grates do not appear to be rated for truck traffic at the field access tunnel.

Broken trench drain edge

Damaged trench drain grates

Damaged trench drain grates

Damaged trench drain grates

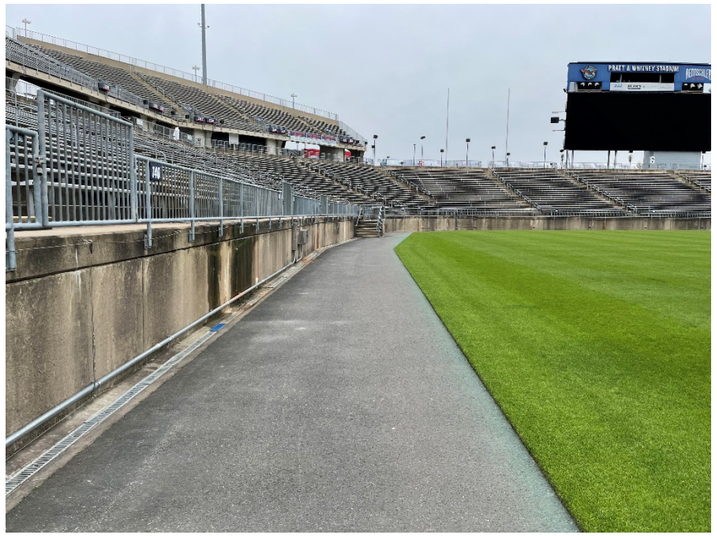
Perimeter Asphalt Track

The Perimeter Track displays significant cracking. There are significant gaps in the pavement where it has been cut out for the installation of conduits.

Perimeter track at Service Tunnel

Perimeter track at SW Stairs

Perimeter track – West Side



Perimeter track – West Side

Perimeter track – north side from NW corner

Perimeter track – NE corner

Perimeter track at NW Stairs

Perimeter track – sorth side from NE corner

Perimeter track at NE stairs

Perimeter track – east side

Perimeter track at SE stairs

Perimeter track – east side

Perimeter track – south side from SE corner

<u>Issues noted by Grounds Staff:</u>

- Due to the shape of the turf area, existing Irrigation patterns provide for overwatering in the corners of the field. Irrigation pattern has been adjusted to accommodate, however provides for excess overspray into the bleachers, thus wasting water.
- Shade patterns put much of the west and south sides of the natural grass area in the shade for much of the year, inhibiting turf growth during the spring and fall.
- Inconsistent depth of rootzone/placement of irrigation piping prohibits maintenance staff from performing routine deep tine aeration practices commonly associated with field maintenance.
- The presence of irrigation valve boxes and subdrainage pipe cleanout enclosures at the surface make it difficult to perform agronomic practices and require additional maintenance.
- The existing irrigation pump has never been utilized, and currently only one irrigation zone can operate at a time.
- Irrigation controller receives spotty Wi-Fi signal.
- The existing perimeter track does not provide adequate space for maintenance vehicles/equipment to clear obstacles without driving on the turf.
- There is a lack of storage space within the facility, causing field equipment to be stored in shipping containers located on site.
- Existing football goal posts difficult to install.

Recommendations

Due to the required process of playing field construction, the correction/replacement of these items should occur with the next field replacement.

Site Landscaping/Hardscape

There are areas at the stadium entries that potentially do not meet current ADA Standards, whether it be due to large cracks or non-compliant slopes. Please refer to the accompanying Civil report for a complete description.

IT/Video/Sound/Broadcast

No deficiencies identified.

Food Service Equipment

No deficiencies identified

Mechanical/Electrical/Plumbing

No deficiencies identified

Vertical Transportation

No deficiencies identified

Structure

No deficiencies identified

Life Safety

No deficiencies identified

Phase 2
Repairs

This section is a detailed schedule of recommended repairs and replacements organized by critical need for each discipline. The work needed is the result of equipment/systems a) nearing the end of their life, b) requiring frequent repairs and/or c) whose parts and supplies are difficult to locate due to advances in technology or design.

Structure

Executive Summary

Walter P Moore has completed a structural condition assessment of the Pratt and Whitney Stadium at Rentschler Field located in East Hartford, CT. Our assessment consisted of a walkthrough visual review of the stadium structure to identify structural, waterproofing, and other miscellaneous items in need of repair.

In an effort to provide context to descriptions of conditions, please note the following definitions. Note that when terms are applied to an overall system, certain portions of the system may be in a different condition.

GOOD: Component is in a "like new" condition requiring no rehabilitation and is performing its function as intended.

FAIR: Item is in sound condition and performing its function. The component is exhibiting some signs of normal wear and tear. Some incidental rehabilitation or maintenance work may be recommended.

POOR: Component is performing adequately at this time, but the component's rate of deterioration has begun to accelerate. Repair or maintenance is strongly recommended to prevent further deterioration.

FAILED: Component cannot be relied upon to continue performing its original function. Item exhibits deferred maintenance and repair or replacement is required.

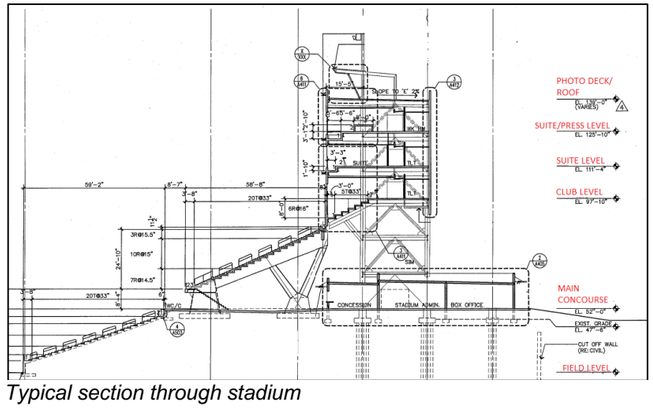
The stadium is currently exhibiting signs of deterioration and is considered to be in generally "Fair" condition, with isolated waterproofing elements in "Poor" condition. Typical distress items identified include concrete deterioration in the form of cracks, delaminations, and spalls, concrete-masonry unit (CMU) wall mortar cracking, and deterioration of joint sealants and expansion joints. Our opinion of probable construction costs for items in need of repair are noted in the Capital Expense Matrix.

Brief Description of Structure

The Pratt and Whitney Stadium at Rentschler Field was constructed in 2003.

The facility features six levels, as listed below:

- Field Level — Elevation 25'-6"
- Main Concourse Level — Elevation 52'-0"
- Club Level — Elevation 97'-10"
- Suite Level — Elevation 111'-4"
- Suite/Press Level — Elevation 125'-10"
- Photo Deck/Roof (Varies) — Elevation +/-139'-0"



Typical section through stadium

The **Upper Bowl** structure consists of precast concrete seating units supported by precast concrete raker beams, precast Y and sloped columns, and cast-in-place walls on concrete spread footings.

Typical Upper Bowl structure

The **Lower Bowl** structure consists of stepped cast-in-place concrete supported on grade. A cast-in-place, below-grade concrete wall is present along the base of the lower seating bowl.

The **Service Level** is a below-grade basement level at the southeast corner of the stadium consisting of interior CMU walls, cast-in-place foundation walls, beams, and columns supported on concrete spread footings, and a concrete slab on grade. A loading dock is located at the Service Level with access from the grade level.

The **Main Concourse Level** consists of an exterior elevated concrete slab above the Service Level at the southeast corner and a flexible paved slab supported on grade elsewhere. Concession stands, restrooms, and stadium facilities are located on the Main Concourse Level and consist of CMU walls with flat roofs supported by continuous wall footings.

The Club Level, Suite/Press Level, and Photo Deck Level are located on the south elevation of the stadium and consist of a steel-framed structure with concrete floor slabs on metal deck.

The scoreboard on the west elevation of the stadium consists of a steel-framed structure.


Structural steel frame for scoreboard

Project Background

The facilities personnel reported that upcoming maintenance of the stadium is scheduled to include joint sealant replacement, concrete spot repairs at stair handrail bases, loading dock concrete ramp repairs, and flexible pavement crack repairs. Continuous monitoring of reported settlement occurring at the stadium was also previously reported by the facilities personnel.

Visual Observations

Our observations consisted of a walk-through visual review of the stadium to identify structural and waterproofing items in need of repair. Our observations were made without the removal of finishes. No testing of exploratory openings was performed as part of this assessment. Our observations are as follows:

<u>Structural</u>

- Concrete wall and column cracks at isolated locations throughout the Service Level and Main Concourse as well as concrete wall cracks and delaminations throughout the below-grade field wall with water staining, including failure of previous concrete repairs at some locations. These cracks did not appear to be a result of overloading, but rather a result of differential movements (due to shrinkage and temperature) that are not properly accommodated by the structure.

  Recommendation: Epoxy inject cracks greater than 1/32-inch in width.

Overall view of previous repairs and delaminating concrete at field wall

Concrete wall cracks with water staining at the below-grade field wall

- Cracked, delaminated, and spalled concrete steps at multipole locations throughout Upper and Lower Bowls. Spalled concrete will result in trip hazards.

  Recommendation: Replace deteriorated concrete in steps in accordance with ICRI standards.

  Alternatively, replace entire step with a new precast concrete step.

Cracked and delaminated concrete step in seating bowl (typical throughout)

- Cracked mortar on CMU walls and cracked CMU at isolated locations on Service Level interior walls and Main Concourse concession and restroom walls. Cracks observed in the CMU walls are a result of movement in the structure that is not properly accommodated by the wall; however, they are not an indication of a structural deficiency.

  Recommendation: Replace cracks CMU and repoint cracks mortar joints.

Cracked mortar on CMU walls on Service Level (interior walls in hallway)

- Concrete floor slab delaminations and spalls at several locations on the Main Concourse. As mentioned above, concrete delaminations and spalls will likely result in trip hazards and will lead to faster deterioration of the concrete elements.

  Recommendation: Replace deteriorated concrete in steps in accordance with ICRI standards.

Concrete floor slab spall on Main Concourse near ramp on east end

Previous concrete floor slab repair, failed/delaminating, on Main Concourse near ramp on east end

- Corroded steel framing below Club Level, at Scoreboard, and at Roof Level structures. There was no evidence of significant section loss due to corrosion.

  Recommendation: Clean and recoat structural steel with evidence of corrosion.

Minor surface corrosion of steel framing below Club Level

Corroded steel framing at Roof Level canopy

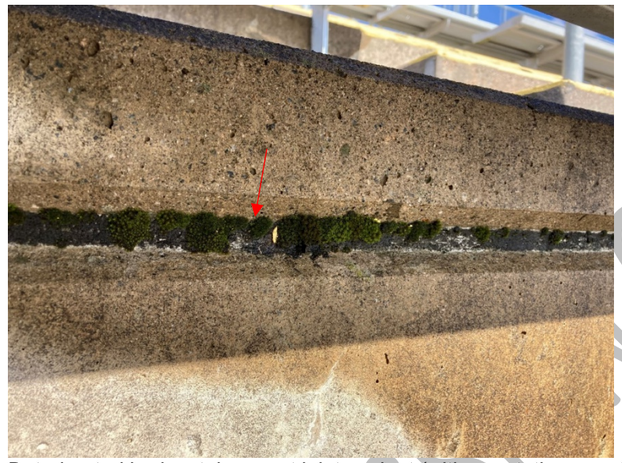
Evidence of settlement through step cracking at CMU wall near transition referenced above (within storage area of Restroom)

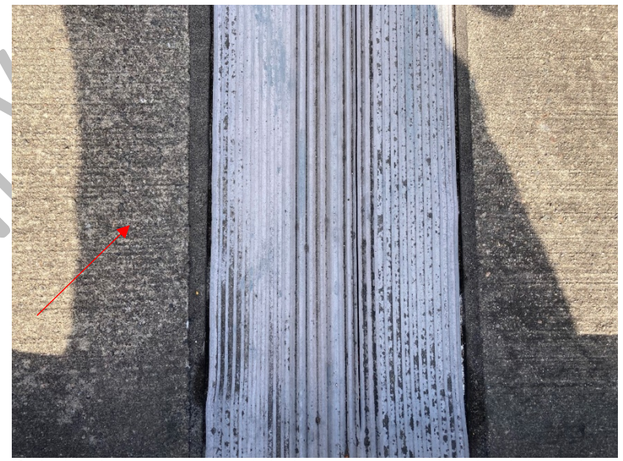
Waterproofing

- Active water is leaking below the Upper Bowl throughout the Main Concourse. The active water leaking is a result of failed sealant at the horizontal and vertical joints between the precast seating units, and failed expansion joint. Water penetration through the joints may lead to accelerated deterioration of the concrete elements

  Recommendation: Replace failed sealant joints and expansion joint systems.

Active water leaking from upper bowl to main concourse (typical throughout)


Deteriorated horizontal precast joint sealant (with vegetation growth) at upper bowl (typical throughout)


Deteriorated expansion joint at upper bowl (adhesive failure, typical throughout)


Deteriorated vertical precast joint sealant at upper bowl (cohesive and adhesive failure - typical throughout)

- Deteriorated joint sealants at control joints throughout Lower Bowl.

  Recommendation: Replace failed sealant joints and expansion joint systems.

Deteriorated joint sealants in lower bowl (typical throughout)

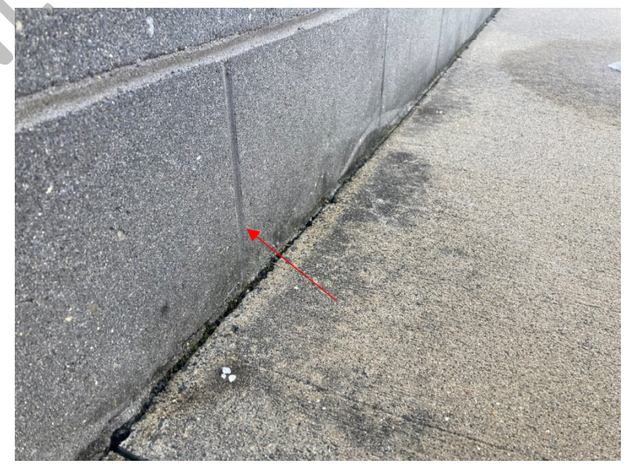
- Deteriorated joint sealants on CMU walls on Main Concourse. Deteriorated joint sealants will result in water infiltration through the walls.

Recommendation: Replace deteriorated joint sealants.

Deteriorated horizontal joint sealant on CMU wall on Main Concourse (typical throughout)

- No sealant observed at some cove joints between slabs and walls/columns on Main Concourse above the Service Level

  Recommendation: Install cove sealants.



No cove joints installed on Main Concourse above Service Level at base of Concession and Restroom walls

- Evidence of water ponding at isolated locations on the Main Concourse. Ponding water may result in trip hazards in the winter due to freezing water. In addition, it may lead to accelerated deterioration of the concrete surfaces.

  Recommendation: Provide concrete wash to properly slope slab towards drains.

Active water ponding and staining on Main Concourse near east end

- Overhead concrete slab cracks and overhead construction joints with efflorescence staining throughout Service Level in Rooms S107, S108, S109, and in tunnel/hallway areas. Properly sealing any cracks on level above will limit water intrusion through concrete slab.

  Recommendation: Rout and seal slab cracks above.

Overhead concrete slab crack with efflorescence in Room S108

- Concrete cracks on elevated floor slab of Main Concourse, above the Service Level. Cracks in the concrete slab may lead to water infiltration into lower levels and may also lead to future delaminations of the concrete.

  Recommendation: Rout and seal slab cracks.

Concrete cracks in elevated slab on Main Concourse above Service Level

Miscellaneous

- Cracking of slab-on-grade concrete slab and asphalt pavement on the Main Concourse.

  Recommendation: Rout and seal cracks in pavement that exceed approximately 1/8-inch to avoid potential trip hazards.

Slab-on-grade cracking on Main Concourse near scoreboard on west end (typical throughout)

Flexible pavement cracking on Main Concourse

Summary of Recommendations

Our repair recommendations are separated into high, medium, and low priority repairs, defined as follows:

- *High Priority*: High priority items are items that should be addressed immediately to maintain serviceability of the associated item and/or maintain the safety of the stadium.

- *Medium Priority*: Medium priority items are items that should be addressed in the near term to mitigate further deterioration of the item and ensure the overall serviceability of the structure is maintained.

- *Low Priority*: Low priority items are items that should be addressed once the high and medium priority items have been repaired to sustain the overall serviceability of the facility for the long-term.

High Priority

- Repair concrete delaminations and spalls at all overhead slabs and beams
- Repair concrete delaminations and spalls at walls, columns, and floor slabs
- Repair concrete delaminations and spalls at stairs in the seating bowls
- Repair concrete delaminations and spalls at the base of handrails in the seating bowl stairs
- Epoxy-inject concrete cracks greater than 1/32-inch in width at overhead slabs, walls, and columns
- Grout injection of concrete cracks at field wall where water staining is observed
- Remove and replace cracked CMU
- Repoint cracked CMU mortar
- Continue monitoring observed settlement at the transitions between elevated floor slab and slab-on-grade

Medium Priority

- Clean and coat corroded steel framing
- Remove and replace all joint sealants throughout Upper and Lower Bowls and Main Concourse
- Remove and replace expansion joints throughout Upper Bowl
- Install cove sealant at all horizontal-to-vertical transitions on Main Concourse areas above the Service Level
- Rout and seal concrete cracks on Main Concourse areas above the Service Level
- Re-slope floor surface on Main Concourse to slope properly towards floor drains where excessive ponding occurs

Low Priority

- Rout and seal concrete and flexible pavement slab-on-grade cracks
- Clean and coat corroded miscellaneous steel connections and components

Mechanical/Electrical/Plumbing

Executive Summary

Overall, the mechanical systems are original to the stadium and are 19 years old. The equipment has been maintained over the years and is good condition given the age and use of the building. It was noted that minor preventative maintenance and repairs are handled by building staff, while major repairs or replacements are handled by an outside contractor. Due to the regularly scheduled preventative maintenance on the equipment, it is anticipated that majority of the major mechanical equipment will continue to operate for the next several years. However, there is some equipment that should be considered for replacement soon.

A major upgrade to the stadium's Building Automation System (BAS) occurred in 2014 when an Alerton Direct Digital Control (DDC) system was installed. This BAS provides control for the Tower HVAC systems and equipment.

Estimates of equipment life referenced in this report are based on both the ASHRAE 2015 Handbook – HVAC Applications and the ASHRAE Owning and Operating Cost Database. Specifically, data from the ASHRAE Handbook is from the Akalin 1978 Study and, where available, from the 2005 Abramson data. The Database is an ongoing project and represents more up-to-date information, although the dataset in some cases is too small to be considered useful. Information is presented in the report as a range between the three, while in the capital expenditure table either the mean of the range or the best value from experience has been used. Link to database: http://xp20.ashrae.org/publicdatabase/.

Overall, the facility electrical systems appear to have been well maintained and are in good working order. Electrical items categorized under this phase fall into a few main groupings: Light sources, lighting controls, end-of-life replacements, and surge protection. Equipment was originally installed in 2002, which infers some components are approaching the end of an expected 20-year useful life.

Mechanical

Roof Top Air Handling Units

HVAC for the occupied areas of the facility is provided by packaged gas/electric rooftop units. The units have direct expansion (DX) cooling and natural gas fired furnaces for heating. The larger sized units are equiped with variable frequency drives (VFDs) and power exhaust fans to support economizer operation.

There are approximately sixteen (16) roof mounted air handling units located around the stadium. Five (5) of the units serve the stand-alone concession/restroom buildings located around the concourse and the the remaining eleven (11) units serve the stadium tower and connecting spaces.

Tower floors 3, 4, and 5 are served by five (5) Carrier brand air handing units located on the roof of the tower. Four (4) of the units are VAV systems, and the other is constant volume. The remaining air handling units in the facility are all constant volume.

The air handling unit serving the locker is a 100% outside air unit with no energy recovery wheel.

Due to the age, most of the equipment is R-22 refrigerant based. The refrigerant R-22 has been phased out by the Montreal Protocol and production of the refrigerant, even for use in existing equipment was halted in the year 2020. Because production is halted, the only source of R-22 is from reclaimed sources which has resulted in a sharp price increases.

Carrier roof top unit

During the walkthrough, the arena staff indicated that all of the units are on a preventative maintenance schedule. Each of the air handling units are original to the building and in good condition considering their age, but have had parts replaced over the years.

Facility staff indicated that space temperature was generally good for each unit with majority of the concerns coming during the shoulder seasons or during during periods of partial occupancy. Because the discharge air temperature from the constant volume units are controlled by staging on/off the electric compressors or gas heat, there is a large fluctuation of supply air temperatures serving each space.

Typical lifespan for a direct expansion (DX) air handler ranges from 15 – 20 years. DX coils are expected to last about 15 years and the fans will last about 20 years. All this equipment is nearing the end of its useful life but may be able to extend for a few more years due to proper maintenance but should be considered for replacement in the future.

VAV Boxes and Electric Heaters

There are approximately sixty-three (63) variable air volume (VAV) boxes serving the suite and press areas that operate in conjunction with localized electric baseboard heaters. Zone temperature control for each space is handled by a wall mounted sensor that controls both the VAV box and baseboard heater.

All VAV boxes are original to the building but had DDC control capability added during the installation of the Alerton BAS in 2014.

Most of the electric baseboard heaters are original to the building but a few were added for the common areas behind the suites and press areas around 2012.

Electric baseboard heater

Additionally, there are thirty-seven (37) duct mounted electric heaters that provide zone space control for spaces served by RTU-201, 202, 203, and 205.

During the site walkthrough, all the equipment appeared to be in good condition with no known issues.

Typical life span for a baseboard heater will be around 20-25 years. All this equipment may outlive its useful life if a preventative maintenance plan occurs but should be considered for replacement in 6 years and continuing over a span of five (5) years.

Exhaust and Grease Fans

General exhaust and grease exhaust fans make up a large portion of the facilities mechanical systems due to the quantity and locations of cooking concessions, general concessions, and large restrooms throughout the concourses. Due to this, there are many exhaust fans throughout the building. Most of the general exhaust and grease exhaust fans are manufactured by Cook and range from up-blast to belted vent sets and are located on the facility's roof areas.

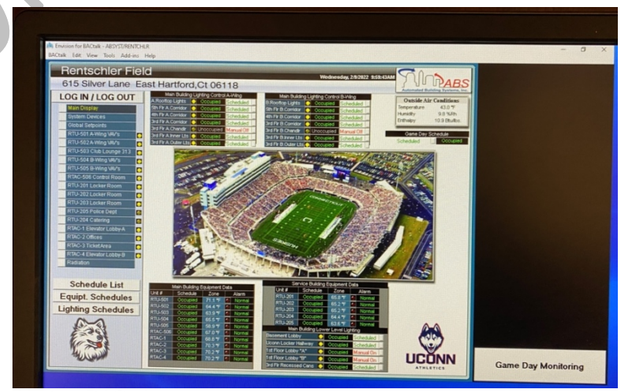
General exhaust fan

All equipment is original to the building and appears to be in a good working condition considering the age of the building. During the walkthrough there was an exhaust fan on the roof of the tower that was not operating due to a motor failure.

The life span of a general exhaust system should be between 15 and 30 years depending on the frequency of use and preventative maintenance.

Building Automation System

The Building Automation System (BAS) is an Alerton web-based BACnet system (refer to the following image). Due to the age of the building, there is a mixture of pneumatic and electronic actuators in the building controlled by the BAS. There has been no major upgrade to the system since first installed; however, the system is due for a software upgrade.



Alerton BAS view

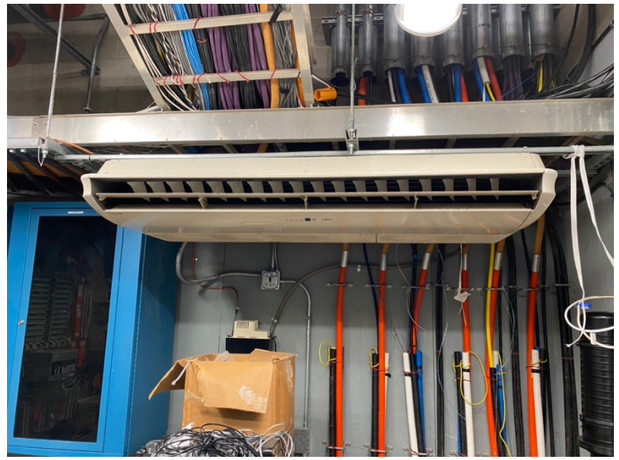
In order the access the BAS, the operators log into a central computer workstation located in the maintenance office area.

Currently only the roof top air handling units and VAV boxes are connected to the BAS and are able to be controlled and scheduled by the workstation.

Miscellaneous

Several electrical and IT rooms inside the facility were served by either ductless mini-splits or ventilated by exhaust fans.

On the day of the walkthrough, the temperatures in these spaces were well within comfort ranges and the facility operators did not report any temperature concerns.



Ductless mini split

During the walkthrough, the facility staff mentioned an expansion project to the main video production room that had occurred several years ago. As part of the expansion, a portion of the hallway outside the original video production room was enclosed to expand the area used for video production. Because the area was previously part of the common hallway, it is served by a different air handling unit than the rest of the video production room. This results in unbalanced space temperatures between the rooms.

Each of the concession stands and restrooms in the stand-alone buildings along the concourse were ventilated only by exhaust fans and heated by gas fired unit heaters. Make up air for the exhaust fans was provided by a wall mounted louver located in each space. No major mechanical or temperature issues were reported with these systems.

Restroom ventilation van and unit heater

Operations and Maintenance

The maintenance program uses in-house personnel for light, day-to-day work such as replacing fixtures and filters, with outside contractors doing most of the more skilled or heavy upkeep. Filters in each of the air handlers are replaced on a routine schedule and by accounts and observations; no major problems are noticed.

All the major repairs, replacements, and emergency work is done by a local mechanical contractor.

It appears that the operations and maintenance staff currently do have the required amount of people to upkeep the building on a daily basis as needed, however they currently require outside help for the larger items. This is in large part due to the knowledgeable and experienced staff that is currently maintaining the facility.

Recommendations

1. Due to the age of the equipment, planning and budgeting should be considered for replacement of components of the air handling equipment beginning in about two (2) years and continuing over a span of 5 years. The new air handling systems should consider the following strategies to reduce operation costs:
   a. Fans are one of the largest energy consumers in the facility. By adding variable speed drives to all air handling systems, energy use may be greatly reduced in part load conditions. It is also recommended replacing the existing VFDs with modern more efficient variable frequency drives.
   b. Another good way to reduce energy costs is by reducing the required outside air. This can be achieved through demand control ventilation. Demand control ventilation measures the indoor carbon dioxide levels as an indicator of contaminants and adjust the outside accordingly. This is acceptable by code in most jurisdictions and is further allowed by ASHRAE 60.1 and 90.1 standards.
   c. A large percentage of utility costs are associated with conditioning outside air and can be abated by about 50% through the use of an energy recovery wheel. The payback associated with an energy recovery wheel system is very fast with the increased energy savings in both heating and cooling modes. It is recommended to replace the high OA air handling units serving the locker rooms with energy recovery units.
   d. We recommend that when the locker room air handling units are replaced, that the units be equipped with bi-polar ionization devices. The bi-polar devices function continuously while the air handler is on and provides a healthier and fresher smelling environment. The cost estimate for this improvement should also include the cost of tube replacement ever two years.

2. We recommend that a phased plan is created to gradually replace all the VAV boxes in 7 years, continuing over a 5-year span. The phased approach will help spread out the high initial cost of replacement.
3. We recommend that a phased plan is created to replace all the general and grease exhaust fans in 11 years, continuing over a 5-year span.
4. We recommend that within the next 7 years the sensor and actuator inputs to the BAS be recommissioned to issue proper readings and to eliminate any actuator drift on the modulating dampers. This serves a number of purposes:
    a. It assures proper ventilation rates as required by code, even when supply airflow has been turned down;
    b. It helps in control of building pressurization
    c. It can save energy by preventing over-ventilation.
5. We also recommend adding all the building exhaust fans including those for restrooms and cooking, to the BAS, for enable/disable and status monitoring. In this way, the BAS may track the total exhaust from the building and, when combined with outdoor air measurement on major air handlers, offer direct control over building pressurization.
6. Add forty-eight (48) new space mounted CO2 sensors to areas served by the existing VAV boxes to allow for enhanced demand control ventilation (DCV) sequences.
7. Install forty-eight (48) infra-red motion sensors in the suites and club areas with associated BAS programming to allow the VAV boxes serving those spaces to have a standby unoccupied HVAC mode control.
8. It would be recommended to add an energy measurement component to the existing BAS system. By installing current sensing relays and tracking run times on critical and larger pieces of equipment, energy usage may be monitored and trended through the BAS. By making this information readily available and trended historically, baselines and goals may be set for operations and maintenance personnel. By the very fact that energy use is being monitored, it will raise the awareness of the staff to energy savings and will almost naturally create energy savings. This effect may be even further magnified when coupled with an incentive-based program to further reduce energy use. In the BAS, energy use may be organized by system and by each piece of equipment individually. This will further offer a maintenance tool which will help indicate diminished performance due to bearing failures, loss of refrigerant, clogged strainers, etc. before a catastrophic failure.
9. The air handling unit serving the video production room should upsized when replaced to allow for both spaces to be served by the same unit in order to provide proper temperature control.
10. All improvements listed above where motor replacements are being done should specify premium efficiency motors. With highest efficiency fan motors, the benefits are not only in reduced electric cost in operating equipment, but also in reduced waste heat to space that has to be conditioned. Additionally, we recommend specifying a fan power limitation requirement of FEG (Fan Efficiency Grade) 67 or better, particularly on larger air handling systems.
11. We highly recommend any work that is done be fully commissioned, and that ongoing commissioning (Cx) services be contracted for at least two years thereafter. Building commissioning typically provides significant savings in operating costs with a short payback period. According to a 2009 study from Lawrence Berkeley National Lab, design and installation (new construction) commissioning provides median whole-building energy savings of 13%, a benefit ratio of 1.1, and a cash-on-cash return of 23%. Ongoing commissioning (existing building commissioning) has shown median whole-building energy savings of 16%, a benefit ratio of 4.5, and a cash-on-cash return of 91%. We recommend the renovations be commissioned during design and installation phases based on new construction commissioning practices, and ongoing commissioning based on existing building commissioning practices. We also recommend that ongoing commissioning (OCx) be implemented post-installation of the renovations to There would be three phases to the commissioning process: first, design phase commissioning wherein the Cx provider would review the design documents for completeness, intent and adherence to owner requirements; the implementation phase in which the Cx provider would observe the construction process and review the final product for adherence to construction documents; and the ongoing commissioning process, in which the Cx provider would be present to give ongoing training to the building operations staff, track the operation of the building systems in all operating modes for consistency with design intent, and identify additional opportunities to improve the building's operations.

Repairs Required

1. Replace the fan motor on the general exhaust fan that was not operational during the site walkthrough.

Electrical

A majority of existing interior luminaires feature fluorescent lamps, which have a shorter lifespan and lower energy efficiency than equivalent LED light sources. As such, lamp replacements are a frequent task for facilities maintenance personnel, requiring time and expense to access light fixtures, remove lensing, and maintain a large stock of spare inventory.

Fluorescent luminaire in back-of-house equipment room

Failed lamps in back-of-house equipment room luminaire

Some emergency lighting units were not functioning when tested during the site visit. All emergency egress lighting should be routinely tested in accordance with NFPA 101. Any exit signs or emergency “unit equipment” lighting equipped with VRLA batteries are now at the end of expected 20-year nominal life and should be replaced.

Example of “unit equipment”, commonly referred to as “bug-eye” fixtures.

Controls for exterior lighting is primarily accomplished via manual switching of contactors and branch circuit breakers. During the site visit, maintenance personnel stated that contactors frequently fail, requiring replacement.

Manual contactor-based lighting circuit switching.

Sensitive electronics are susceptible to electrical surges, this type of equipment is integral to game-day operations. Maintenance personnel stated that equipment has been damaged on numerous occasions from surges, for example Technology and A/V Systems in the Suite/Press level P.A. Scoreboard / and AV Room. Additional uninterruptible power supply units (UPS) are recommended to protect electronic systems and critical plugloads throughout the facility (coordinate efforts with Technology section of the report).


Point-of-use UPS protecting equipment in PA/Scoreboard Room.

Acknowledging the electrical system panels and overcurrent protection devices original to the building are now 20 years old, it is prudent to comprehensively test them for safe and reliable operation. For example, low voltage molded case circuit breaker (MCCB) interior components such as copper contacts and spring-loaded operating mechanism lubrication can wear down over time, causing delayed trip clearing times and increasing risk of fire from an overload or fault condition. Similar testing and lubrication are recommended for medium voltage power circuit breakers located in unit substations and switchgear throughout the facility, with additional consideration given to replace any worn arcing contacts.


Typical distribution panel with MCCB breakers.

Recommendations

1. Replace all fluorescent lamp luminaires with LED light sources. 1-for-1 replacement with new LED luminaires recommended; alternate option to swap out existing lamps with LED-lamp retrofit kits.
2. Test exit signs and emergency egress lighting. Replace all failed units and/or 20-year old batteries with new.
3. Upgrade stadium and concourse lighting controls, replacing manual switching of contactors and circuit-breakers with relay-based lighting control panels equipped with remote control and scheduling capability (further discussed as part of Phase 3 upgrades)
4. Provide point-of-use uninterruptible power supply (UPS) equipment with local surge protection to safeguard sensitive electronics.

5. Test circuit breakers and replace all that fail to operate within design parameters.
6. Provide electrical connections associated with recommended Mechanical & Plumbing maintenance items (see respective discipline sections in this report).

Plumbing

A 10” Domestic water supply main is routed to the Mechanical Room at service level. All service entrances supplies are in a good condition. The main is then routed to the booster pump to serve the Press Box. The booster pump is not used; we recommend it’s removal.

Domestic hot water for locker rooms and service level kitchen is generated with (2) PVI gas fired hot water heaters. These hot water heaters are in good condition. Concession stands utilize local electric hot water heaters. These units are in good condition.

Most of the plumbing fixtures appear to be in good working condition. However, staff stated that the changing of Sloan flush valves at water closets and urinals is a constant occurrence.

The cold-water piping is mainly type “L” copper. The facility is in need of additional shut off valves for winterizing and general maintenance of systems.

Domestic Booster pump not in use

Roof

The building is equipped with a primary and secondary overflow scupper system where necessary. All primary storm water drainage piping is routed down through the building to discharge city storm sewer. All secondary overflow scupper spill to daylight. The ceiling in levels below appear to have leaks from the roof. Overall, roof drainage system appear to be in good condition.


Typical Primary and Secondary Roof Drains


Ceiling leaks from roof above

Plumbing Fixtures

Overall, plumbing fixtures appear to be in good condition. Sloan Sensor Flush Valves were referred as constant maintenance. The failure can be caused by water quality, high water pressure or manufacturer assembly.

Exterior hose bibbs appear to have extreme build up around the body. These at field level are not in use.

The majority of the floor sinks at food service areas appear to be in good condition.

Typical Sloan Flush valve

Sanitary Waste System

In general, the waste and vent system are in good condition.

All concessions have local grease traps at 3 compartment sinks. Grease interceptors at concessions appear to be in good condition.

Recommendations

1. Recommend removal of booster pump not in use. The current mechanical room appears to be congested; removal of pump would allow for clear floor space.
2. Recommend replacing sensor valves with manual valves or installing different manufactured valves at different areas of facility to test for failure.
3. Recommend replacing all hose bibbs at field level.
4. Replace grease interceptor at Club level with similar “Big Dipper” provided at concessions. We also recommend using New Age cast iron pipe or similar product for future p-trap replacements. The piping product is epoxy lined and would greatly increase the life of the fitting.

Fire Protection

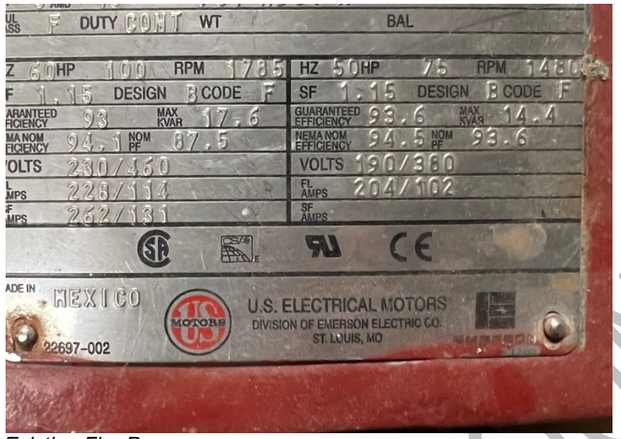
One (1) 10” Fire Protection service main enters the Fire Pump Room at Service Level. The main is routed through double check valve assembly, and the entrance is then routed to the existing 1500gpm 130 psi, 200hp fire pump.

The campus is a fully sprinkled building. The Pressbox/Tower building is a fully wet sprinkler system. A 3” dry system is routed underground to exterior buildings. All dry systems are located in Fire Pump Room at Service Level.

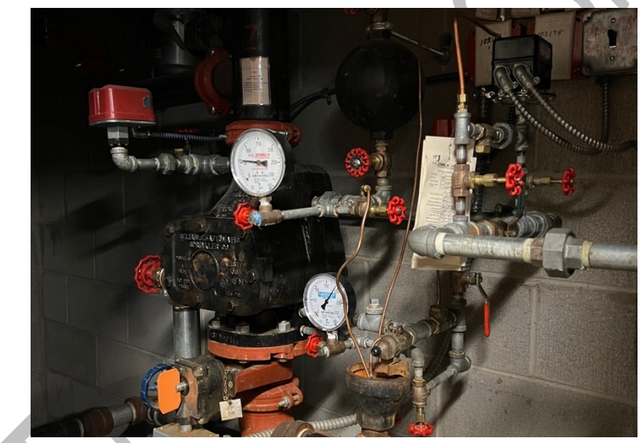
An electric driven fire pump with fire pump controller and transfer switch is provided in the service level fire pump room. The pump provides the necessary pressure to the fire protection systems in the Pressbox/Tower. A jockey pump and controller have also been provided with the fire pump system. Operations personnel stated that testing of the fire pump is occurring regularly, and no issues have been reported.

Fire extinguishers and fire department hose connections appear to be properly spaced throughout the facility to meet the requirements of the National Fire Protection Association.

Sprinkler piping, head type, and coverage is sufficient and is generally in compliance with National Fire Protection Association standards and general design practices for this type of facility.



Existing Fire Pump



Recommendations

1. The facility fire protection systems are generally in good condition and meet a sufficient level of coverage protection. We recommend continuing the routine testing, maintenance and cleaning of the system

Roofs

Executive Summary

The stadium facility has a total of 24 separate roof areas, on at least 11 various levels above grade. The buildings/roofs are divided and defined into four building/roof types, including the Concourse buildings (Buildings 1-9), for concession stands and toilet rooms; the Tower Building (5-story main building, with club seating, suites, offices, and press facilities); three small structures with metal panel roof covering systems (Video Platform Canopy Roof, on Tower Building, Scoreboard Roof, and Video Booth - upper bowl above east end zone); and two small buildings with asphalt shingle roof covering systems (Radio Broadcasting Building, AKA "The Dog House", and the Catering Building).

Please refer to the Roof Area Key Plans in Appendix A for identification and relative locations of the various roof areas.

Roof decks on the on the Concourse buildings utilize precast concrete hollow-core planks, with the exception of two small additions constructed onto Building 8 that appear to have fluted metal roof decks. Roof decks on the Tower Building utilize fluted metal decks. The roof deck on the Video Platform Canopy Roof (Tower Building) utilizes a fluted metal roof deck, overlain by a pre-manufactured pre-finished metal panel roof covering system, and the roofs on the Scoreboard and Video Booth roofs utilize pre-manufactured pre-finished metal roofing panels, mechanically attached to light-gauge steel roof framing. Roof decks on the Radio Broadcasting Building and Catering Building utilize wood products (typically plywood or oriented-strand board), and the roof covering systems on these buildings utilize laminated ("architectural") asphalt/fiberglass shingles that are nailed (typically through a felt underlayment), to the roof deck.

The original membrane roof covering systems on the Concourse buildings utilize TPO single-ply membrane roofing/ flashing systems that are adhered atop the roof insulation assembly (typically rigid roof insulation that is adhered to the concrete roof deck, and possibly an overlying cover board, such as gypsum board). The existing roof covering systems on the Tower Building utilize TPO single-ply membrane roofing/flashing systems, that are mechanically attached, along membrane seams, through the roof insulation assembly, to the metal roof deck. These roof covering systems are from original construction of the facility.

Two separate small additions were constructed onto Building 8 around 2015-2018, one of which utilizes what appears to be TPO single-ply membrane roofing flashing (similar to the adjacent buildings; Roof Area 8-C), while the other (Roof Area 8-D) utilizes an EPDM single-ply roofing/flashing membrane system.

In 2020, three of the original roof covering systems on the Concourse buildings (Buildings 1, 3, and 9) were recovered (overlain) with a single ply of white fleece-backed EPDM membrane that was adhered atop the original roof membrane/insulation assembly. In our opinion, the design of the recover roof covering systems was somewhat deficient, and the roofing/flashing membrane systems will require regular inspection/maintenance/repair.

The main roof of the Tower Building and the three Terraces (3rd, 4th, and 5th Floors) are accessible by doors from the building interior, and all other Tower Building roofs are accessible via a 10-foot stepladder from the Main Roof or from the ground. The Concourse building roofs, Video Booth Roof, Radio Broadcasting Building Roof, and Catering Building Roof are all accessible via a 28-foot extension ladder. The Scoreboard Roof is not accessible except with the use of special equipment, such as a tall personnel lift. Although the Scoreboard Roof and Video Booth Roofs were not physically accessed, we were able to view and photograph these roofs from atop the penthouse roofs on the Tower Building, utilizing a camera with a long-reach zoom lens.

Prior to our site visit, we were provided with electronic (PDF) copies of (what appears to be) a full set of original construction drawings for the facility, for our review and use while preparing for our site visit and while on-site.

During our site visit and visual observation of the roofs and exterior areas surrounding the building, we visually examined all of the various roof areas. We were also assisted by Mr. Alex Ross, of Ernest Peterson, Inc., of Hartford, the roofing contractor that installed the recover roof covering systems on Buildings 1, 3, and 9, and also has performed repair work on the Tower Building roofs.

Based upon visual observations of the existing roof covering systems around the facility, the general overall condition of the various TPO single-ply roofs range from fair-to-poor. As mentioned in Phase 1 of this report, the roof covering systems on the Tower Building appear to have reached the end of their useful service life, and are in immediate need of removal/replacement. The existing (original) roof covering systems on the Concourse buildings (Buildings 2 and 4-8), are approaching the end of their useful service life, and should be removed/replaced within the next 3-5 years. This type of roof covering system typically has a useful service life of 20-30 years, and these roofs have been in place for nearly 20 years.

The recovered roofs (Buildings 1, 3, and 9) generally appear to be in fair condition. Based upon our observations, it generally appears that some deficiencies from the original roof covering systems were not corrected when the roofs were recovered, including parapet height in some areas that are too low above the roof surface, and scuppers that are not properly sumped into the roof insulation and impede drainage or the roofs.

When the roof covering systems are replaced (Buildings 2 and 4-8), it is recommended that, in lieu of simply recovering the roofs (and existing deficiencies) with a new single-ply membrane system, the existing roof covering systems be completely removed, down to the concrete roof deck, that any necessary repairs be made to the roof decks/substrates, and installation of all new TPO single-ply membrane roof covering systems be installed. It is also recommended that the new roof covering systems include correction of existing deficiencies, such as lowering through-wall scuppers to provide positive drainage of the roofs, raising parapets to the minimum height of 8 inches above the finished roof surface,

and installing new tapered insulation crickets along equipment curbs, to shed water towards the drainage elements.

The existing metal and asphalt shingle roof covering systems generally appear to be in fair-to-good condition.

Some of the deficiencies that were noted on the roofs, include the following items:

- *Numerous sealant joints are badly deteriorated/cracked/ non-watertight; few roof penetrations appear to have never had any sealant applied; such deficient sealant joints require removal/replacement as soon as possible.*

- *The steel support frame for a rooftop mechanical unit (Roof Area 8-D) is improperly fastened to the roof with screws penetrating the EPDM roof membrane, with not protection or means to waterproof the fastener holes.*

In addition to correcting the deficient conditions as outlined in this report, it is also recommended that management design and implement a comprehensive Preventive Maintenance Plan for the roof systems that outlines and schedules regular periodic inspections, maintenance, and repair/upkeep of the existing roof covering systems, to maintain clean roofs and drainage elements, to maintain the watertight integrity of the roofs, and to help preserve and prolong the useful service life of the existing roof covering systems.

There are several other deficiencies that are summarized below in the Findings and Comments, Recommendations, and Repairs Required sections of this report. Budget cost figures for recommended roof replacements and repair items are include in the Capital Expense Matrix.

Findings and Comments

Prior to visiting the site, MTD was provided with an electronic set of original construction drawings for the stadium facility, including full sets of architectural, structural, and other drawings, for our reference. The drawings, labeled "Record Documents", were prepared by Ellerbe Becket, Inc., of Kansas City Missouri, dated August 30, 2003.

It should generally be understood that our findings, comments, and recommendations, as presented in this report, are based upon visual observations while on-site, verbal information provided by the facility management/maintenance staff, from review of the original construction drawings made available, and from copies of roofing warranties that were provided. No type of destructive investigation (such as roof test cuts) were performed to verify existing conditions.

During the site visit, we also were met by Mr. Alex Ross, of Ernest Peterson, Inc., of Hartford. It is understood that Ernest Peterson, Inc., has performed roof covering system repairs at the stadium facility for a number of years, and they also installed the overlay roofing/flashing membrane systems on Buildings 1, 3, and 9, in 2020. Mr. Ross stated that he was responsible for management/oversight of numerous repairs to the existing roof covering systems on the facility, as well as installation of new overlay roofing/flashing membrane systems on Buildings 1, 3, and 9 (concessions/toilet room buildings). Mr. Ross walked the main roof of the Tower Building with us, and he provided verbal information regarding the types of repairs made to the roofs, and commented about the probable causes of many of the leaks and deficiencies repaired. He also provided a verbal description of the overlay systems. Mr. Ross also provided electronic copies of written documentation from Carlisle Syntec Systems (manufacturer of the overlay roofing/flashing membrane systems on Buildings 1, 3, and 9), including a general design letter, a flashing detail, and the 20-year Membrane Roofing System Warranty from Carlisle for the overlay systems, dated 7/8/2020.

Based upon information provided in the original drawings and visual observations on-site, the concession/toilet room buildings (1-9) utilize concrete slab-on-grade floors, concrete block (CMU) exterior and interior walls, and precast hollow-core concrete plank roof decks. The Tower Building utilizes (primarily) steel framing and has a concrete slab-on-grade floor (First Floor), a combination of CMU and metal exterior wall siding, and composite concrete (concrete, poured-in-place atop a fluted metal form pan) floors (above the First Floor), and fluted metal roof decks. Original roof covering systems on Buildings 1-9 and the Tower Building utilize a TPO single-ply membrane that is adhered to the underlying roof insulation assembly (that typically includes one or more layers of rigid roof insulation (presumably polyisocyanurate), and possibly a cover board (such as gypsum board), that is adhered to the roof deck/substrate. The existing roof covering systems on the Tower Building utilize a TPO single-ply membrane that is mechanically attached (along membrane seams), through the underlying roof insulation assembly (that typically includes one or more layers of rigid roof insulation (presumably polyisocyanurate), and possibly a cover board (such as gypsum board), to the metal roof deck/substrate.

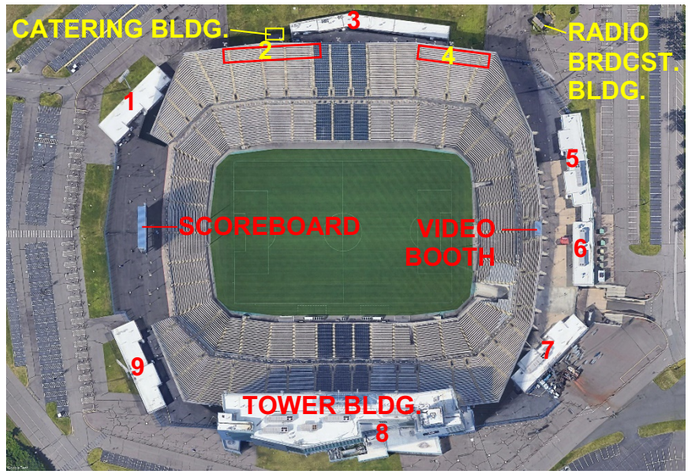
The Video Platform Roof (Tower Building, above the main roof) utilizes steel framing, a corrugated metal roof deck, and prefabricated, pre-finished metal roofing panels, mechanically attached to the roof deck. The metal roof deck is painted (at least on the underside).

The Scoreboard and Video Booth Buildings utilize steel framing, metal siding, and pre-fabricated pre-finished metal panel roof covering systems.

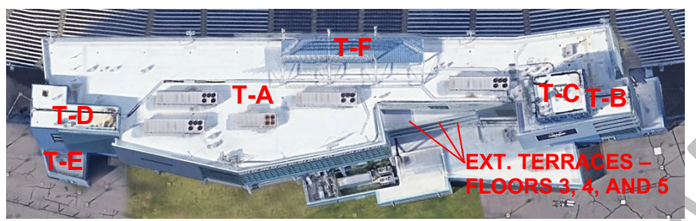
The Radio Broadcasting Building (referred to as the "Dog House") and the Catering Building utilize wood framing, plywood floors and plywood (or OSB) roof deck sheathing. The Radio Broadcast Building utilizes T1-11 exterior siding, and the Catering Building utilizes conventional vinyl siding. Roof covering systems on both building utilize laminated ("architectural") asphalt/fiberglass shingles, that are (typically) nailed, through a felt underlayment, to the plywood roof deck sheathing.

Water is (primarily) removed from the roof surfaces on Buildings 1-7 and 9 via through-wall scuppers, conductor heads, and downspouts, that discharge onto grade. These buildings also utilize through-wall overflow scuppers as a secondary, emergency drainage system.

Primary drainage of the roofs on Building 8 and the Tower Building is achieved with internal roof drains, that drain via the storm drainage plumbing. Secondary drainage on these roofs utilizes a combination of interior overflow drains, and through-wall overflow scuppers.



*Aerial view of the Pratt & Whitney Stadium facility. **NOTE**: Some Concourse-Level buildings are concealed beneath the Upper Bowl and the Tower Building, but are shown as yellow shapes on the photos. Refer to Table R-1, below, for the roof covering system type, and area (sq. ft.), for each roof area/type. See Table R-2 for basic descriptions of roof covering system types.*



Aerial view of the Tower Building roofs. The Tower Building is constructed above Building 8. Roof Area T-A is the main roof on the building; Roof Areas T-B, T-C, and T-D are above stair and elevator penthouses; Roof Area T-E is above the southwest building entrance; and Roof Area T-F is a metal roof above the rooftop video platform (above the main roof).

TABLE R-1: ROOF AREAS/TYPES/QUANTITIES

Roof Areas	Roof/Level Description	Roof Type*	Area (sq. ft.)
1	Building 1	TPO-R	4,750
2	Building 2 (Beneath Bowl)	TPO	3,350
3	Building 3	TPO-R	4,750
4	Building 4 (Beneath Bowl)	TPO	2.400
5	Building 5	TPO	4,900
6	Building 6	TPO	3,600
7	Building 7	TPO	4,900
8-A	Building 8 – East	TPO	14,900
8-B	Building 8 – West	TPO	1,800
8-C	Building 8 – Addition 1	TPO	1,000
8-D	Building 8 – Addition 2	EPDM	400
9	Building 9	TPO-R	5,000
T-A	Tower Building – Main Roof	TPO-M	24,250
T-B	Tower – Stair P-H – East	TPO-M	500
T-C	Tower – Elev. P-H – East	TPO-M	950
T-D	Tower – Elev. P-H – West	TPO-M	1,250
T-E	Tower – Entrance – West	TPO-M	500
T-F	Tower – Video Platform Roof	MTL-D	1,200
SB	Scoreboard Roof	MTL-P	850
VB	Video Booth – East	MTL-P	200
CB	Radio Broadcasting Building	AFS	350
RBB	Catering Building	AFS	300
TOTAL ROOF AREA (sq. ft.)			**82,100**

*Refer to Table R-2 (below), for basic descriptions of each type of existing roof covering system type/assembly.

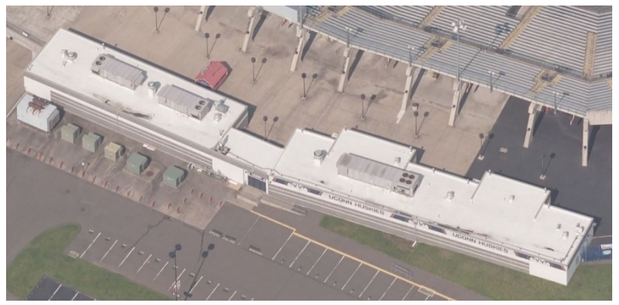
TABLE R-2: ROOF TYPE/ASSEMBLY DESCRIPTIONS

Roof Type	Roof Covering System Assembly Description
TPO	Thermoplastic Polyolefin (TPO) single-ply thermoplastic (heat-welded) roof membrane, atop rigid roof insulation board assembly, adhered to concrete roof deck.
TPO-R	Original TPO system and roof insulation assembly (as described above), recovered (overlain) with new ply of .115”-thick fleece-backed EPDM membrane, adhered atop original membrane surface.
TPO-M	TPO single-ply membrane, mechanically attached (along membrane seams) through rigid roof insulation board assembly, to metal roof deck
EPDM	Ethylene Propylene Diene Monomer (EPDM) (synthetic rubber) single-ply roof membrane, adhered to rigid roof insulation board assembly, mechanically fastened (with screws and plates) to metal roof deck.
MTL-D	Prefabricated, pre-finished metal roofing panels, mechanically attached to corrugated metal roof deck (painted).
MTL-P	Prefabricated, pre-finished metal roofing panels, mechanically fastened to light-gauge steel roof framing.
AFS	Laminated (“architectural”) asphalt/fiberglass shingles, nailed (through a felt underlayment), to plywood roof deck sheathing.

More detailed descriptions, findings, and comments for the roof covering systems are presented below.

Buildings 1-9

Description: The original roof covering systems on these buildings utilize a TPO single-ply membrane that is adhered to the roof insulation assembly. Joints/seams on this type of roofing/flashing membrane system are typically hot-air welded. No destructive testing, roof cuts, or other invasive investigation was performed during our site visit, so it is presumed that the roof insulation assembly consists of one or more layers of rigid roof insulation board (most likely polyisocyanurate), that are adhered to the concrete roof deck/substrate. It is also possible that the roof insulation assembly may include a rigid cover board (such as gypsum board), adhered atop the insulation.



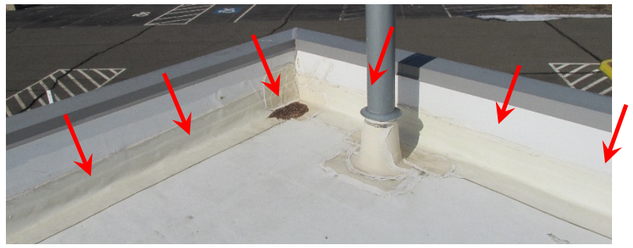
Bird's eye view of a typical Concourse-Level concession/toilet room building (Buildings 5 and 6 shown here). Roof covering systems on these buildings utilize TPO single-ply membrane.

Overview of the roof on a typical Concourse-Level building (Building 4 shown here). The TPO single-ply membrane roof covering system on this building is from original construction of the facility.

It is understood that the existing roof covering systems (Buildings 2 and 4-8) are from original construction of the facility.

In 2020, the original roof covering systems on Buildings 1, 3, and 9 were recovered (overlain) with a new ply of EPDM roof membrane. It is understood that the overlay utilizes .115-inch-thick fleece-backed (white) EPDM membrane, as manufactured by Carlisle Syntec Systems, of Carlisle, Pennsylvania. Based upon verbal and written information provided by the contractor that installed the overlay roof covering systems, the original TPO membrane system was cleaned and inspected, but left in place. It is also understood that the existing sheet metal copings were left in place, and the new EPDM field membrane turned-up vertically along the interior parapet base and mechanically fastened 12 inches on-center. The field membrane was then terminated with pressure sensitive EPDM flashing membrane and elastomeric sealant below the sheet metal coping. It was also noted that base flashings along equipment curbs were treated similarly.

Overview of a typical Concourse-level building with the 2020 EPDM overlay roof covering system. The new, additional ply of fleece-backed EPDM roof membrane was adhered atop the original TPO membrane system.



When the overlay roof covering systems were installed (in 2020), the new EPDM roof membrane was turned up onto the face of perimeter parapets, and flashed with a strip of self-adhering flashing membrane (see arrows). Edges of the flashing membrane are caulked with elastomeric sealant.

According to written information provided, the overlay roof covering systems on Buildings 1, 3, and 9 are covered by a manufacturer's (Carlisle) warranty against leakage (associated with the new EPDM membrane only) for a period of 20 years, that expires on July 9, 2040.

When the 2020 overlay roof covering systems were installed (Buildings 1, 3, and 9), the original TPO membrane parapet and curb flashings were left in place, and new self-adhering membrane was turned up vertically onto curbs, and flashed with a strip of self-adhering flashing membrane. Edges of the flashing membrane are caulked with elastomeric sealant.

Condition: The general, overall condition of the existing (original) roof covering systems on Buildings 2 and 4-8 range from fair-to-poor. The existing TPO roofing/flashing membrane generally appears to be serviceable and watertight; however, there are many deficiencies that require attention. General and specific deficiencies are summarized below.

The general, overall condition of the overlay roof covering systems on Buildings 1, 3, and 9 is fair. It generally appears that the overlay roof covering systems were installed with a minimally evasive design, as evidenced by the base flashing design that avoided removal/reinstallation (or replacement) of metal copings on parapets, and leaving all curb-mounted rooftop equipment in place. As a result, the original base flashing membrane is still exposed along upper portions of parapets and curbs, and the new membrane is not properly counterflashed by the original membrane. In our opinion, this type of recover roof covering system design and application is less than ideal, and vulnerable to premature deterioration along the "back-water" lapping of the new membrane in front of (rather than behind) the original membrane. It is also a concern that lap seams (many of which are up-facing) are somewhat dependent upon caulk/sealant for watertightness.

When the overlay roof covering systems were installed in 2020, some deficiencies that existed in the original TPO roof covering system were left in place, and covered over with the new EPDM membrane system, such as through-wall scuppers not being properly sumped below the surface of the roof membrane (photo above). As a result, the roof continues to retain water at the scuppers.

Through-wall scuppers (Buildings 1-7 and 9) are not properly sumped below the roof surface level and, as a result, water is retained (ponding) on the roof at many of the scuppers. This deficiency was not corrected when the new overlay roof membranes were installed on Buildings 1, 3, and 9, and can contribute to premature aging of the roof covering system.

It was also noted that, when the overlay roofing/flashing membrane systems were installed, certain existing deficiencies were not addressed or corrected; in particular, the existing scupper openings were not properly lowered and, as a result, they continue to impede the outflow of water from the roof surfaces (see additional description below).

As a result of through-wall scupper openings not being sufficiently sumped below the surface level of the roof membrane, water is ponding on the roofs around many of the scuppers. Water retention on roofs can potentially cause premature deterioration of the roofing/flashing membrane.

Deficiencies - Buildings 1-9 (General): It was noted that, generally, the existing through-wall scuppers on these buildings (Buildings 1-7 and 9) are not properly sumped below the surface level of the roof covering system and, therefore, impede the flow of water through the scuppers and into the conductor heads/downspouts (see photos above).

Several large rooftop mechanical units are curb-mounted on the roofs of Buildings 5, 6, and 7; however, the roof insulation assemblies on these buildings lack proper crickets along the up-slope side of the equipment curbs, to direct the flow of rooftop water around the equipment curbs. As a result, water is ponding along the base of the equipment curbs.

It was noted that the height of the parapets along the up-slope roof perimeters does not meet the minimum industry-standard height of 8 inches above the finished roof surface.

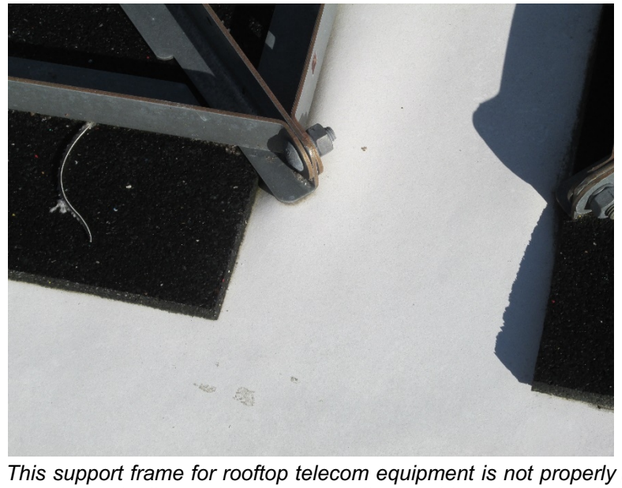
Large curb-mounted rooftop mechanical units (Buildings 5, 6, and 7) lack proper crickets to direct the flow of water, up-slope from the curb, around the curb, and down-slope to the drainage elements. As a result, water is retained against the up-slope side of the equipment curb.

Perimeter parapets, along the up-slope perimeters of some roofs, do not meet the minimum industry-standard height of 8 inches above the finished roof surface. As a result, water/snow/ice may enter beneath the metal coping, potentially damaging the roof covering system and structural/interior elements below.

The parapet height in this corner appears to be no more than 5-6 inches, less than the minimum industry-standard 8 inch height.

Supports for many pieces of telecom equipment, and associated cables and conduits, are surface-mounted on the roofs. Most equipment is placed atop some type of protection course, such as walk pads or an additional layer(s) of membrane, to protect the underlying roof membrane from damage. It was noted that some equipment or cable/conduit supports lack any type of protection course, or the protection course is out of place and portions of the equipment supports are bearing directly on the roof membrane surface.

Numerous roof areas have telecom equipment that is mounted onto a support frame that is installed atop the roof surface. Typically, some type of protection course, such as walk pads, rubber padding, or extra plies of membrane are installed beneath the equipment/support frames.



This support frame for rooftop telecom equipment is not properly placed atop the protection mat and, as a result, part of the steel frame is bearing directly on the surface of the roof membrane, potentially damaging and/or puncturing the roof membrane.

Conduits are supported above the roof surface on wood sleepers. In this area, many of the sleepers are resting directly on the (unprotected) surface of the roof membrane.

It was generally noted that many sealant joints, associated with rooftop equipment and flashings, are deteriorated, and some are not watertight. It was also noted that existing sealants are more severely deteriorated around flashing membrane terminations and metal storm collars on metal flue stacks (“hot pipes”); it is possible that common sealant materials are utilizes around the flue stacks, rather than sealants that are formulated to withstand the high temperatures of metal flue stacks.

Sealants surrounding some roof penetrations, such as metal flue stacks, are severely deteriorated and non-watertight. Flue stacks and other roof penetrations that reach high temperatures typically require sealant materials that are specifically formulated for high-temperature applications.

Pipes, conduits, and other round items that penetrate the roof are flashed with a premanufactured TPO flashing boot that is heat-welded to the roof membrane, and terminated at the top with a metal draw band and an application of elastomeric sealant. The existing sealant on some roof penetrations is poorly installed and/or deteriorated, and potentially non-watertight.

It appears that some type of elastomeric sealer/coating material is applied around this insulated roof penetration/flashing. It appears that the sealant is not properly bonded to the roof penetration insulation, and does not appear to be watertight (see arrows).

The metal storm collar surrounding this metal flue stack lacks any type of sealant around the joint between the storm collar and the flue stack. As a result, moisture may potentially enter behind the membrane base flashing and damage the roof covering system and/or structural/interior elements.

Deficiencies – Buildings 1-9 (Specific/Localized):

Building 1: There are several wrinkles in the roof membrane, and some areas where it appears that the roof membrane was not properly embedded in the adhesive at the time of original installation. The wrinkled membrane can impede the flow of water to the drainage elements, and is also vulnerable to damage from foot/equipment traffic on the roof, and if the wrinkled membrane is not properly adhered, and may potentially become susceptible to wind uplift/damage.

The EPDM overlay roof membrane (Building 1) is significantly wrinkled in this area. This area of roof membrane generally appears to have been improperly installed.

It appears that the wrinkling in the overlay roof membrane (Building 1) is the result of a workmanship deficiency during installation, and/or the roof membrane/adhesive being installed at a time when atmospheric conditions were not suitable for roofing application.

Building 3: Rooftop exhaust fan units above cooking areas (such as kitchens for concession stands) typically are equipped with collector systems for kitchen grease, to help prevent food grease contamination of the roofing materials surrounding the fan unit. Kitchen grease can potentially damage the roofing/flashing membrane. It was observed that the grease collector on one such exhaust fan is improperly installed/aligned, and may allow grease onto the roof surface.

The outflow pipe for the kitchen grease collector on this rooftop exhaust fan is displaced (Building 3), potentially allowing grease contamination/ damage to the roof membrane.

Another rooftop exhaust fan above a concession stand kitchen is equipped with a grease collector; however, the container (presumably some type of screw-on plastic receptacle) is broken/missing. As a result, kitchen grease may drop directly onto the roof surface, causing damage to the roofing/ flashing membrane.

This type of rooftop exhaust fan is typically fitted with a container/receptacle to hold the kitchen grease effluent; however, the grease receptacle appears to be broken or missing from this fan (Building 3).

The kitchen grease container, which is normally attached to the screw-top flange, appears to be broken off or missing from this exhaust fan unit (Building 3), thus potentially allowing food grease to drip onto the roof surface, causing damage.

A membrane expansion joint cover is installed over an opening where two parapets meet. The expansion joint cover appears to be fabricated of single-ply membrane that is adhered to a foam backer rod spanning the expansion joint opening. The flashing membrane is not extended fully across the perpendicular parapets at the ends. The flashing membrane is vulnerable to delaminating from the painted metal coping.

The flashing membrane atop an expansion joint cover is terminated on a flat surface atop a metal parapet coping (Building 3); however, the membrane is not extended over the edge and onto the face of the coping, so as to shed water from stop the membrane.

Building 6: A metal flue stack is apparently leaking or otherwise faulty, and is covered with polyethylene sheeting. The exact deficiency could not be determined.

A metal flue stack (Building 6) appears to be leaking moisture or is faulty in some other manner, as evidenced by it being covered over with polyethylene sheeting.

Building 8 has at least six distinctive roof areas. Two roof areas are atop additions constructed onto the building at some time since original construction. Significant portions of these roofs are at least partially concealed beneath the upper floors of the Tower Building.

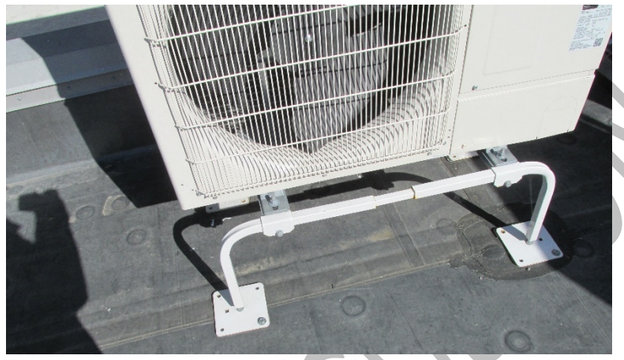
There is a significant open gap between the roofs of Building 8 and the underside of the Third Floor on the Tower Building.

The existing roof covering systems on Building 8 appear to be identical to those on Buildings 2, 4-7, and 9, in type and construction, with the exception of one small addition (Roof Area 8-D), that utilizes an adhered EPDM single-ply membrane system.

The acidity of bird droppings causes damage to paint/finishes on sheet metal flashings, as well as conduits and steel structural members. Once the paint/coatings on metals/steel are eroded through, bird feces typically will cause corrosion of the underlying metal/steel.

The paint on the top surface of this steel structural member is significantly eroded and, as a result, the steel is rusting. Many exposed steel members are in need of being cleaned, prepared, primed, and painted,

A steel support frame for a rooftop mechanical unit is installed directly atop the (unprotected) surface of the EPDM roof membrane, and secured with screws installed directly through the roof membrane. There is no sealant or other means to waterproof the fastener holes through the roof membrane and, as a result, the roof is non-watertight in this area.



Flanges of a steel support frame, for a rooftop mechanical unit, are installed directly atop the (unprotected) surface of the EPDM roof membrane, and secured to the roof with screws installed directly through the roof membrane. There is no sealant or any other means to protect the fastener holes from moisture infiltration/leakage (see next 2 photos).

Steel flanges for a rooftop mechanical unit support frame are screw-fastened directly through the roof membrane, with no means in place to make the fastener penetrations through the roof membrane watertight.

A section of TPO flashing membrane is loose/detached/non-watertight, at the junction of parapets/walls along the south building perimeter (Roof Area 8-D). It appears likely that the membrane may have never been properly adhered to the substrates at the time of original installation. It was also noted that this section of membrane appears to be TPO; however, the adjacent roof covering system is constructed with EPDM membrane, which is incompatible with TPO, unless the TPO were to be simply adhered (rather than heat-welded) to the EPDM membrane.

A section of TPO membrane is loosely installed in a corner at the junction of a wall and two perpendicular parapets (Roof Area 8-D). The TPO membrane is not adhered in place, and is not watertight. The roof covering system on this area utilizes EPDM membrane, which is not compatible with TPO for heat-welded seams.

A crossover platform, to provide access on foot between Roof Areas 8-A and 8-B, utilizes wood planks that are loosely laid across the two parapets. The two wood planks are not properly secured to each other or to the substrate. They also have no railing or other means for fall protection. This “makeshift” installation generally appears to pose a potential safety hazard.

Tower Building: It should be understood that the majority of roof covering system maintenance/repair/replacement work for the Tower Building roofs are covered under Phase 1 of this report.

Metal Roof Covering Systems (Tower Building Video Platform Canopy, Scoreboard, Video Booth): Physical access to these roofs was not possible without the use of special equipment (that was unavailable); however, the metal roofs were visually observed and photographed from a distance.
The Tower Building Video Platform Canopy (Roof Area T-F) extends above the main roof on the Tower Building. The canopy roof utilizes steel framing, and a structural metal roof deck, that is overlain by a pre-manufactured, pre-finished metal panel roof covering system.

The Video Platform Canopy is constructed above the main roof of the Tower Building. The roof utilizes steel framing, a fluted metal roof deck, and a pre-manufactured, pre-finished metal panel roof covering system.

The existing metal panel roof covering system on the Video Platform Canopy Roof generally appears to be in fair-to-good condition. There was no visible damage to the metal roofing panels, nor was there any visible rusting or deterioration of the paint/coating on the metal panels.

The underside of the Video Platform Canopy Roof shows the fluted metal roof deck (to the right), and the metal panel roof covering system (to the left).

The paint/finish on the top surface of the pre-manufactured metal panel roof covering system generally appears to be in fair-to-good condition. There was no visible rusting or deterioration of the metal or the paint/finish.

The Scoreboard is located at the west end of the stadium, and is constructed above grade on the Concourse. The building utilizes steel framing and pre-manufactured, pre-finished metal siding. The roof covering system utilizes pre-manufactured pre-finished metal roofing panels that appear to be mechanically fastened to the roof framing.

The Scoreboard is constructed on the Concourse Level, beyond the west end zone. The structure utilizes steel framing and pre-finished metal siding. The roof covering system is described in the next photo, below.

The Scoreboard roof utilizes pre-manufactured pre-finished metal roofing panels that are mechanically fastened to the roof framing.

The existing metal panel roof covering system on the Scoreboard generally appears to be in fair-to-good condition. There was no visible damage, rusting, or deterioration of the metal roofing panels.

The paint/finish on the Scoreboard roof generally appears to be in fair-to-good condition. Based upon a visual observation from a distance, there is no visible rust or other damage to the metal panel roof covering system.

The Video Booth is located at the top perimeter of the upper bowl, above the east end zone of the field. Based upon information in the original construction drawings, the building utilizes steel framing, light-gauge metal roof framing, and pre-finished metal siding. The roof covering system utilize pre-manufactured, pre-finished metal roofing panels that are mechanically fastened to the metal roof framing.

The Video Booth is located at the top of the upper bowl, off the east end zone. The "shed" building appears to be constructed with light-gauge steel stud framing, and utilizes a pre-manufactured pre-finished metal panel roof covering system that is mechanically fastened to the roof framing (similar to that on the Scoreboard Roof).

As viewed/photographed from a distance, the existing paint/coating on the Video Booth roof generally appears to be in fair-to-good condition, and no rusting, damage, or other deficiencies were noted.

Generally, the metal roofs appear to be in fair-to-good condition, and essentially free of rust/damage. The existing paint/ coatings on the metal roofs generally appears to be in fair, serviceable condition. As viewed from some distance, there were no visible deficiencies associated with the metal roofs.

Asphalt Shingle Roofs (Radio Broadcasting Building, Catering Building): The two buildings at the facility that utilize asphalt shingle roof covering systems are relatively small in area, and comprise a small percentage of the total facility roof area.

The Radio Broadcasting Building (also referred to as "The Dog House") is located at the northeast perimeter of the facility, outside the perimeter fencing. It is understood that the building is utilized for game-day radio broadcasting during UConn football games.

The Radio Broadcasting Building appears to have been constructed at some time later than original construction of the stadium facility, and it is not included on the original construction drawings. The building appears to utilize wood framing, T1-11 (plywood) exterior wall sheathing, and either plywood or OSB roof deck sheathing. The roof covering system utilizes laminated ("architectural") asphalt/fiberglass shingles, that are nailed (presumably through a felt underlayment) to the roof deck sheathing.

The Radio Broadcasting Building (also referred to as "The Dog House") is a wood-framed building with T1-11 exterior siding and (presumably) plywood roof deck sheathing. The roof covering system utilizes laminated ("architectural") asphalt/fiberglass shingles that are nailed (presumably through a felt underlayment), to the roof deck. A metal-clad cupola is constructed at the center of the roof ridge.

The asphalt shingle Radio Broadcasting Building roof generally appears to be in good condition. The roof has a steep slope, to shed water. There were no visible deficiencies.

The metal-clad cupola, at the center of the Radio Broadcasting Building roof utilizes a copper roof covering system. The cupola and copper roof generally appear to be in good condition.

The Catering Building appears to be a factory-constructed building that was delivered and set up at the site. Based upon historical photography, it appears that the building was delivered around 2018-19, and appears to sit on grade. The building utilizes wood framing, conventional vinyl siding, and plywood or OSB roof deck sheathing. The roof covering system utilizes laminated asphalt/fiberglass shingles that are nailed (presumably through a felt underlayment) to the roof deck.

The Catering Building visually appears to be a factory-fabricated and delivered building. The building rests on grade, and it utilizes wood framing, vinyl exterior siding, and plywood or OSB roof deck sheathing. The roof covering system utilizes laminated asphalt/fiberglass shingles that are nailed (presumably through a felt underlayment), to the roof deck.

The existing asphalt shingle roof covering system on the Catering Building generally appears to be in good condition, and no deficiencies were noted. It was noted; however, that the roof lacks gutters/downspouts, or any means to control water run-off from the roof surfaces and, as a result, the ground is eroded along a line directly below the roof eaves.

The asphalt shingle roof covering system on the Catering Building generally appears to be in good condition, and it is believed that the building/roof have been in place for approximately 3-4 years.

The existing asphalt/fiberglass shingle roof covering systems on these two small roofs generally appear to be in good condition, and here were no visible deficiencies associated with these roofs. The Catering Building and roof have only been in place for approximately 3-4 years.

The only item noted that, in our opinion, needs attention, is that the roofs on these two buildings lack gutters/downspouts, or other means to control water run-off from the roofs. As a result, it was noted that the ground surface is eroded along lines directly beneath the eaves of the Catering Building. Shrubbery is planted along the base of the Radio Broadcasting Building so any existing ground erosion there may not be readily visible.

Recommendations

Generally, it is our opinion that the roof covering systems currently in the worst condition are the main and penthouse roofs on the Tower Building; these were addressed in Phase 1 of this report.

Furthermore, it is our opinion that the existing roof covering systems on Buildings 2 and 4-9 are generally in fair-to-poor condition. The existing roof covering systems on these roofs (with the exception of two small additions to Building 8) are from original construction of the facility, have been in place for nearly 20 years, and are generally nearing the end of their useful service life. It is understood that facility management has plans to recover or replace the remainder of the roof covering systems on the Concourse buildings (Buildings 2, and 4-8) within the near future. It is our recommendation that management complete replacements of the existing roof covering systems on Buildings 2 and 4-8 within the next 3 to 5 years. As presented in Item 4, below, it is our opinion that complete removal and replacement of the roof covering systems on these buildings would be a significantly better option over simply recovering the existing roof covering systems with a ply of membrane, and that proper design and complete removal/replacement of the roof covering systems would correct the existing deficiencies and could provide a new roof covering system with up to a 30-year no-dollar-limit manufacturer's warranty of materials and workmanship, and with a service life that could potentially reach up to 35 years.

It should be noted and understood that, in our opinion, there are many existing deficiencies related to the roof covering systems, some of which are from the original design and construction of the buildings and roof covering systems, and some of which were neglected when roof covering systems were repaired or recovered; some that have resulted from inadequate maintenance/upkeep of the roof covering systems; and others that appear to have been caused by careless workmanship by contractors and other trades performing work on/above the roofs.

In our opinion, when the roof covering systems on Buildings 1, 3, and 9 were recovered (overlain) with a new, additional ply of EPDM roof membrane, some rather important existing deficient conditions (that existed prior to installation of the overlay roof covering systems) were not properly addressed or corrected, including through-walls scuppers that continue to retain water; and parapets that do not reach the industry-standard height of 8 inches above the roof surface. It is also our opinion that the design of a flashing detail for the recover roof covering system did not include removal of sheet metal copings and/or installation of extended metal flashings/counterflashings along parapets and curb-mounted equipment. This type of flashing detail creates "back-water" (upward-facing) lap seams on vertical surfaces of parapets and curbs, and lap seams that are somewhat dependent upon caulk/ sealant for watertightness — two conditions that, in our opinion, are generally to be avoided as much as possible in roofing/flashing applications. In our opinion, these three roof covering systems may require more frequent inspection, maintenance, and repair, to monitor the conditions of the membrane flashings and to detect, maintain, and repair the membrane flashings in order to maintain/prolong the watertight integrity and service life of these roof covering systems.

Based upon observations of the general, overall appearance and conditions of the existing roofs on Buildings 1-9, it generally appears that there needs to be a greater level of basic inspection, cleaning, maintenance, and repair of the existing roof covering systems, as evidenced by the soiled, unkept conditions of the roof surfaces and contamination of some roof areas (particularly Building 8) with bird droppings and spreads of vines/ vegetation on the roof surfaces. In our opinion, the current level of attention to maintenance/repair of the existing roof covering systems has generally not been sufficient, at least over the past several years. Please note and review the recommendations that are summarized in Items 1-21, below, and particularly those that address maintenance issues.

It was also noted that the are some deficiencies related to the roof covering systems that are more related to rooftop work performed by outside contractors that, in our opinion, has been detrimental to the watertight integrity and service life of

the roof covering system, with particular attention being given to Items 4, 7, 11, and 15, below.

Summarized below are several recommendations regarding the existing roof covering systems. Some items are very general and affect all of the Concourse building roofs, while others are more specific to only a single or small number of items. The recommendations below include inspection, maintenance, repair, redesign, and replacement of the roof covering systems addressed in Phase 2 of this report:

Buildings 1-9 (General Conditions):

1. Thoroughly clear the roofs of all loose leaves, trash, and debris, from all roof surfaces, on all roof areas. It is further recommended to carefully and professionally clean all surfaces of sheet metal flashings, pipes, conduits, structural steel above the roofs (Building 8), to remove all bird droppings and resultant contamination. It is also recommended to professionally clean all surfaces of roofing/flashing membrane, to remove all dirt, silt, and bird droppings/residue from the roof surfaces and drainage elements.

2. Install additional bird deterrent strips, netting, or other practical means to prevent bird infestation on and above the roofs (Building 8).

3. Replace the original roof covering systems (Buildings 2 and 4-8) with new TPO single-ply roof covering systems. Furthermore, it is not recommended to overlay the existing roof covering systems with a new single-ply membrane (as was done in 2020 on Buildings 1, 3, and 9). In our opinion, completely removing all components of the existing roof covering systems, ensuring that the roof decks/substrates are dry and in good repair, and correcting other existing deficiencies (such as lowering through-wall scupper openings to improve roof drainage, and raising parapet heights to a minimum of 8 inches above the finished roof surface), will be effective to produce a much higher-quality and longer-lasting new roof covering system, for the remainder of the Concourse building roofs.

4. All through-wall scuppers and conductor heads should be modified/lowered (Buildings 1, 3, and 9), as necessary to sump the scupper openings and associated flashings below the surface of the roof membrane, to properly drain the roof areas. It is recommended that the scuppers be re-flashed with new EPDM membrane, in kind, in a manner that the flashings do not impede the flow of storm water into the drainage elements, and so as to achieve positive drainage of all roof areas. **NOTE**: It should be understood that the existing "recover" roof covering systems on Buildings 1, 3, and 9 are currently covered under a 20-year manufacturer's (Carlisle Syntec Systems) warranty; therefore, all work (other than routine maintenance/cleaning) must be performed by the roofing contractor that installed the overlay roof covering systems, or by another contractor that is qualified/licensed by Carlisle to perform work on their warranted roofs, in order to preserve the integrity of the warranty.

5. When the existing roof covering systems on Buildings 5-7 are replaced (or recovered), new tapered insulation crickets should be installed along all large equipment curbs, to effectively direct the flow of drainage around the curbs, to promote positive drainage.

6. Thoroughly inspect all rooftop surface-mounted equipment and equipment supports; reposition existing protection course materials, and/or install new, additional protection materials, to ensure that all existing roofing/flashing materials beneath all surface-mounted rooftop equipment are properly protected from damage/puncture.
7. Carefully inspect all sealant joints associated with all roofing, flashings, and equipment on/ above the roofs, and remove/replace any sealants that are damaged, deteriorated, or otherwise non-watertight, with new elastomeric sealant that is appropriate for the application.

8. Thoroughly inspect all existing metal conductor heads and downspouts, and repair/replace damaged/deficient units, as necessary to make watertight from the scupper to the discharge (onto grade or into a storm sewer inlet).

9. Inspect the discharge area surrounding all downspouts that discharge onto grade, surrounding all Concourse buildings, for ground erosion and/or misplaced/missing splash blocks, to repair all areas of ground erosion, as necessary, and to properly reposition splash blocks and replace any missing splash blocks.

Buildings 1-9 (Specific/Localized Conditions):

10. Regularly monitor all areas of wrinkled roof membrane (Building 1) for any conditions that may indicate delamination of the roof membrane from the substrate and for any other deficient condition, and make repairs. as necessary.

11. Thoroughly inspect all rooftop exhaust fans that are equipped with food grease collectors (Buildings 1-9), and repair/readjust all components of the grease collectors, so as to properly contain all food grease discharge from the fan units. Additionally, it is recommended to replace any broken/missing grease receptacles on fan units, as needed.

12. Inspect all existing expansion joint covers atop perimeter parapets (Buildings 1-9) for loose/ detached/non-watertight conditions, and to make repairs, as necessary.

13. Make repairs to the existing metal flue stack (Building 6), to ensure that the stack is properly functional, and not allowing moisture infiltration into the duct system and/or building interior. **NOTE**: This item may require the services of a mechanical contractor.

14. Temporarily remove the rooftop mechanical unit (Roof Area 8-D), to repair the fastener holes in the EPDM roof membrane (to make watertight), to install a new protection course atop the roof membrane, and reinstall the rooftop unit/support frame. **NOTE**: The existing EPDM roof covering system may be covered under a

manufacturer's warranty; it is recommended to thoroughly investigate records for any such warranty, and perform all repair work on the roof membrane in strict accordance with the requirements of the warranty, if such exists.

15. In our opinion, the existing wood plank "crossover" platform, loosely installed atop perimeter parapets between Roof Areas 8-A and 8-B, is unsafe for pedestrian access between the two roof areas. We recommended that the existing wood planks be removed, and replaced with a new wood platform structure, or a new (pre-manufactured or shop-fabricated) galvanized steel platform assembly, with proper safety railings. The new platform assembly should be properly supported atop the parapets or on the roof surfaces, with proper protection course, and that the platform be properly secured to adjacent structural members.

Metal Roof Covering Systems: (Video Platform Canopy Roof on Tower Building, Scoreboard Roof, and Video Booth Roof):

16. No existing deficiencies that qualify under Phase 2.

Asphalt Shingle Roof Covering Systems (Radio Broadcasting Building, Catering Building):

17: No existing deficiencies that qualify under Phase 2.

General – All Roof Areas, Facility-Wide:

18. We recommend a more intensive and comprehensive Preventive Maintenance Program be developed and implemented for all roof covering systems, facility-wide. The program should include regular cleaning of the roof surfaces to remove dirt, silt, debris, bird droppings, etc.; inspect/clean all drainage elements; visual inspections of all roof areas, to note and repair or replace any damaged/deteriorated/non-watertight roofing/flashing materials, sheet metal flashings, sealant joints, and rooftop equipment. It is also recommended that a written procedural manual be developed and implemented, to include listings of items to be addressed and charts for periodical and regular scheduling and tracking of roof covering system inspection/maintenance work. It is further recommended that a qualified member of the facility maintenance/management be charged with oversight of the Preventive Maintenance Program, to ensure that all items are properly completed on a timely basis.

19. In addition to the maintenance/repair/replacement work described in the items above, we recommend that facility management contract with a roof consulting professional to conduct inspections semi-annually (or at least, annually). It is recommended that the roof consultant inspect not only the roofs, but all building surfaces that can have any impact on the roofs. It is recommended that the consultant perform the regular inspections and prepare scopes of work for any required repair/replacement work. More importantly, the consultant can establish a baseline for the existing roofing systems' conditions, as well as monitor deterioration, or lack thereof, to help determine the expected service life of each roof covering system more accurately. Financial benefit can be realized by extending the service life of a roof covering system, whether old or new.

Technology

Executive Summary

The physical security system is comprised of the following three separate systems:

- *Video Surveillance*
- *Intrusion Detection*
- *Access Control*

The stadium is equipped with a network-based video surveillance system which includes approximately 31 fixed cameras and 4 pan-tilt-zoom (PTZ) cameras which are a combination of Vicon series IQEye and Panasonic. The fixed cameras provide general coverage and are positioned at various locations including the main ticketing box offices, entrance lobbies, elevator lobbies, vehicle loading bay, exterior concourse gates, and parking lot. The PTZ cameras are mounted to the high-mast lighting poles that are located at each corner of the stadium. The cameras are locally monitored through Panasonics Video Insight Management Software.

The existing intrusion detection system is primarily located within the tower and comprised of motion detectors in first floor lobbies, corridors, and elevator lobbies as well as door contact switches at the main exterior entrances.

The access control system consists of approximately five proximity key-fob and keypad combination-type readers that accommodate credentialed access at the main lobbies, ticketing booth, and 1st and 2nd floor elevator lobbies. Also, the main lobby and loading bay entrances are equipped with doorbell/intercom stations for visitors.

Each of the security systems is locally monitored by either the local controller or IP surveillance software for the cameras. On gameday emergency operations are manned with both police and fire fighters in the service level. Each group brings in their own equipment and has access to the surveillance systems through a network connection within their respective rooms. Each of three thee holding cells in the police suite are monitored via a small CCTV system and not connected to the main surveillance system. Fans entering the stadium on game day either pass through portable metal detectors when accessing the tower suites or are scanned with handheld scanners at the gates.

The sound system and AV systems are comprised of the following:

- *Bowl PA system*
- *Main club sound and AV*
- *Club seating sound and AV*
- *Writing Press Sound*
- *Press Level booths Sound*

Most of the systems appear original to the building, apart from notable upgrades to the bowl sound processing and distribution. The systems have been maintained quite well and were operational at the time of observation.

The bowl loudspeakers are the most susceptible to increased failures, as the components have been frozen and baked for many years.

The stadium's information technology system is configured in a hierarchal star topology with the main distribution frame (MDF) located in the service level of the main tower and intermediate distribution frames (IDF) on the upper levels of the tower and around the concourse. The facility demarcation is located within the MDF and is made up of multiple internet service provider (ISP) connections, some of which are legacy and not currently being utilized. The ISP external cabling is routed through an underground duct bank, around the southeast of the stadium, then heads north towards the Silver Lane right-of-way.

The MDF contains the primary network equipment, fiber optic patching, POTS lines and protection, as well as the legacy analog telephone system. The network equipment is consolidated of two racks within the space and is backed up by a small rack-mounted UPS. There is a single managed local area network core switch which provides connectivity to the access switches located throughout the IDFs around the site. The interbuilding structured cabling backbone primarily consists of both 62.5/125um multimode fiber optic (OM1) and multipair copper telephone (Category 3) lines which originate at the facility demarcation. The legacy analog telephone system remains operational and is currently the means of voice connectivity throughout the stadium.

Broadcast cable and connections serving the TV truck are original to the building. It is comprised of copper cabling (triax, analog audio, coax video) that is largely outdated and unused. Triax camera cabling, while a standard at the time of the building's opening, is becoming obsolete as TV trucks are more fiber-based in their broadcast transport medium. Most coax video cable is unable to transport HD video due to cable lengths and thus rendered unusable. Some of the existing analog audio connections are serviceable.

Daktronics is the supplier of the LED and clock displays throughout the facility. The system was upgraded in 2012 with control system upgrades currently being completed. The main display is a 28' x 73' HD15 product which is arguably Daktronics most popular product, and it is approaching the end of its useful life. It utilizes pixel sharing technology which allows a perceivable better resolution with less pixels. There are three LED ribbon which are showing uniformity issues in several modules. The play clocks are exhibiting nonfunctioning LEDs within the segments. The numbers from the field are perceivable, but these clocks are slowly losing pixels.

Security

All Security items were identified and described in the Phase 1 section of the report.

Sound

Noted Defects & Issues

The bowl loudspeakers are original to the venue according to the operator. Many seasons of freezing and heating are taking their toll on the internal components of the speakers, including possible crossover network failures, high frequency and low frequency driver failures to material and adhesive issues. For high frequency failures, this significantly compromises speech intelligibility, which is obviously desirable for entertainment events but critically important during emergency and inclement weather for providing direction to patrons seated in the bowl.

During our bowl walk, we noted several high frequency driver or cross over issues for one or more loudspeakers at the press box (section 239), and at the light poles covering sections 130, 211, 212, 233. Several loudspeakers at the scoreboard covering the deck area appear to have high frequency loss (not totally failed).

Pole loudspeakers (example)

Scoreboard & loudspeakers

During the site visit, we discovered that the entire NE seating and concourse had no sound. The operator discovered a UPS (Battery backup power unit) in the AV closet ER-10 serving that seating, which had failed since the facility was last used the previous fall. He bypassed the UPS to restore power to the processing equipment and return sound to those bowl sections.

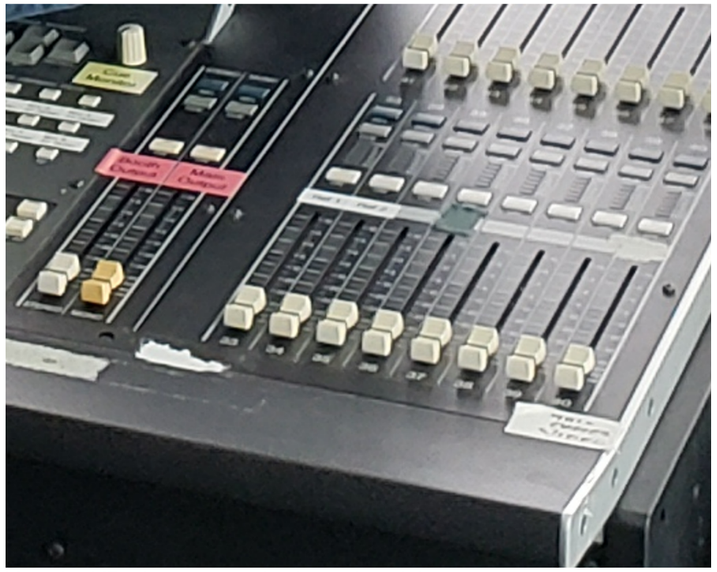
We also discovered many other failed UPS units, with several others that had very short backup power sustain time due to tired batteries. The consequence of bypassing the UPS' is even with small blips in mains power, the processing equipment in those equipment racks will power down and require several minutes to reboot, come back online and deliver sound to the loudspeakers they control.

Failed UPS (multiple locations)

The bowl sound mixing equipment is near or at the end of service life. The QSC CX series amplifiers, while known for very long service life, are likely to require repair or replacement in the next five years. The operator could not confirm whether the various AV closets around the bowl were on emergency power, so as to maintain bowl audio for emergency announcements.

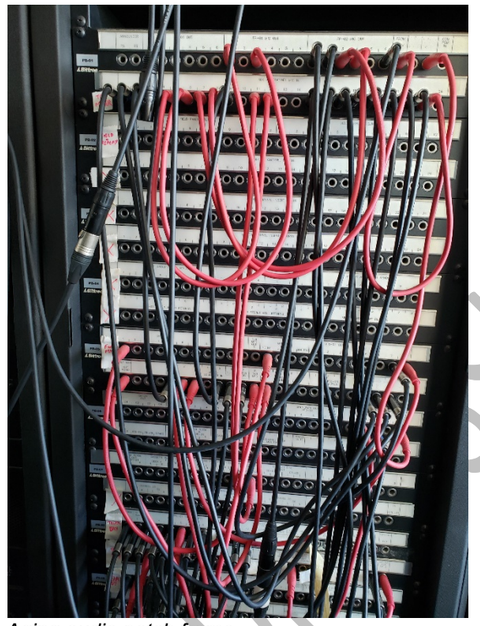
Aging amplifiers

The Yamaha M7 console is about 15 years old, with several unusable/failed channel strips and intermittent main faders. Service parts may not be available past 2025.



Yamaha M7 mixer – example channel modules

The audio patch frame has development significant signal crosstalk, making sections of it unreliable.



Aging audio patch frame

The FM transmitting equipment near the audio patch frames causes interference and should be relocated.

Poorly located FM transmitting equipment

The sound mix room does not have a dedicated Windows PC to make system configuration changes more convenient and faster during events.

The player interview room has no light bar or permanent fill and key lighting locations for the head table.

The loudspeakers directly over the head table spill into the head table microphone and muddy the broadcast sound.

Interview Room

The locker room ceiling speakers do work, but haven't been used for some time, based on current athletics' direction.

None of the ticketing windows appear to have an Assistive Listening inductive loop; a common accommodation for hearing impaired patrons with T-coil equipped hearing aids.

Ticket Windows

In the main club room, the three large ceiling speakers provide clear speech and good music quality but aesthetically don't blend with the ceiling. There are a series of water-stained ceiling tiles near the loudspeakers. We were unable to inspect the loudspeaker enclosures for any water damage.

Club room ceiling speakers and water damaged tiles

The operator commented that there is no means to plug in microphones or other devices at the center column, near the windows; a common location for the head table.

Center column in club room

The televisions in the main club room are in various conditions of very old, to newer.

The home locker room television system is in very poor condition, with older televisions, intermittent cable TV reception, and unsightly installation of power and cable connections.

Home locker room televisions

The RF/Coax system is original to the building and in severe decline; reception at some televisions is very poor.

Deteriorating RF components

During our walk on the event level, we noticed numerous Wi-Fi & DAS antenna and transmission devices located directly under or adjacent to the low voltage cable tray. The operator believes these to be the source of various “gremlins” in the systems which have cabling in these trays.

Event Level cable tray with DAS antennas mounted to it

Main Club Room

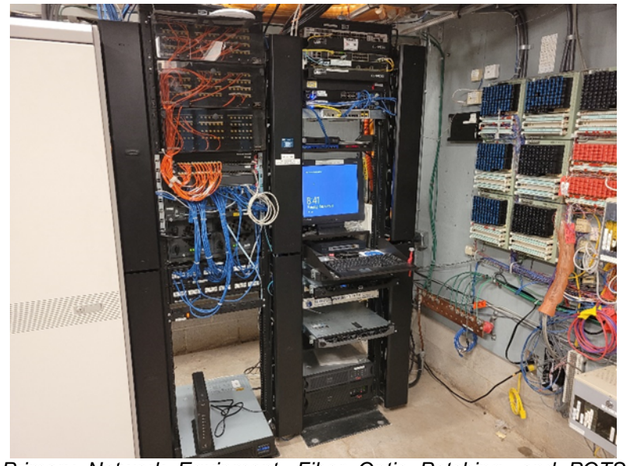
Recommendations

1. Repair defective existing bowl loudspeakers until full replacement can be done.
    a. If the fidelity and performance of the current bowl loudspeakers (in good repair) are adequate to stakeholders and patrons, then new, updated versions of the loudspeaker product would be a cost effective solution.
2. Replace all of the bowl AV closet UPS units that power the QSC processing equipment. Load test/replace batteries on no less than 2 year schedule.
3. If the bowl AV closets are not on generator/Emergency power, consider that supplement.
4. Replace the aging, partially defective Yamaha M7 bowl sound mixer with a more cost effective model; Yamaha CL series, A&H QU or SQ series.
5. Consider replacing defective televisions on a per space strategy for a more unified aesthetic, setup and control.
6. For the interview room disable the loudspeakers over the interview table.
7. Relocate (or eliminate if abandoned) FM transmitting equipment near sensitive equipment in the main bowl control room rack.
8. Replace the quickly deteriorating cable/RF channel stack equipment in the bowl control room. There are modem compact and versatile methods to create a channel lineup or lineups for venue televisions.
9. Relocate DAS and Wifi antennas away from the event level low voltage cable tray. Across to the opposite wall in the hallway would be sufficient separation.
10. Consider adding an inductive loop and placards at one of the ticket windows, to accommodate those with T-coil hearing aids.

Information Technology

The stadium's information technology system is configured in a hierarchal star topology with the main distribution frame (MDF) located in the service level of the main tower and intermediate distribution frames (IDF) on the upper levels of the tower and around the concourse. The facility demarcation is located within the MDF and is made up of multiple internet service provider (ISP) connections, some of which are legacy and not currently being utilized. The ISP external cabling is routed through an underground duct bank, around the southeast of the stadium, then heads north towards the Silver Lane right-of-way.

The MDF contains the primary network equipment, fiber optic patching, POTS lines and protection, as well as the legacy analog telephone system. The network equipment is consolidated of two racks within the space and is backed up by a small rack-mounted UPS. There is a single managed local area network core switch which provides connectivity to the access switches located throughout the IDFs around the site. The interbuilding structured cabling backbone primarily consists of both 62.5/125um multimode fiber optic (OM1) and multipair copper telephone (Category 3) lines which originate at the facility demarcation. The legacy analog telephone system remains operational and is currently the means of voice connectivity throughout the stadium.



Primary Network Equipment, Fiber Optic Patching, and POTS line Protectors (MDF)

Legacy telephone system (MDF)

There is a total of fifteen (15) IDFs strategically placed around the stadium to keep structured cabling distances below the maximum allowed. Each IDF contained two wall-mounted racks, one of which is empty, and the other is loaded with a fiber optic patch panel, local area network access switch, and rack mounted UPS.

Racks and equipment are bonded to properly sized bus bars that are bonded to building ground. Each MDF/IDFs contains dedicated cooling and power for the active equipment. There is adequate physical space around racks for maintenance as well as space within the racks for added equipment.

Access network equipment (IDF)

Horizontal structured cabling consists of both category 5 and 5e cable plants. All systems such as the local area network, wireless network, telephones system, and IP security cameras reside on the 5e deployment. Category 5 cables are used for analog plain old telephone system (POTS) lines. Cable pathways around the site consist of a combination of ladder-rack cable trays and conduit with innerducts. It appears that there is sufficient space within these building components to allow cabling additions/reconfigurations. It also appears that the installed cabling is rated for the environment in which it resides.

The plain old telephone (POTS) system throughout the site consisted of multipair copper backbone cables cross connected to category 5 cables at the MDF and each IDF. The multi-pair quantity from the MDF to IDFs varies from 50 pairs to 400 pairs. This system is primarily used for analog emergency communication at a few select points such as the elevator control panels, fire alarm control panel, and emergency telephones. Most of the installed pairs are not used.

In addition to the local area network (LAN), a small wireless local area network (W-LAN) system has been deployed at back of house spaces within the tower, concession stands, and at various gates around the concourse. The system is secured and dedicated to the stadium operations group rather than fans or civilians. It is comprised of both WIFI 5 APs with switching and consolidation through the converged network. AP deployment is minimal and has been configured in an ad-hoc coverage configuration allowing select users' wireless connectivity. Applications such as point of sale reside on a wireless connection.

Wireless LAN access point

Wireless cellphone coverage for fans around the concourse and bowl is reliant on the existing distributed antenna system (DAS). Currently three providers (Verizon, AT&T, and T-Mobile) have systems installed. Both Verizon and AT&T have a dedicated headend room at the south side of the tower on the first level Their cabling distribution is comprised of mixed fiber/copper solution. Antennas are placed within the tower, around the second level bowl, around the concourse, and up behind the bowl seating. The T-Mobile DAS does not distribute antennas around the stadium but consists of a microcell antenna on the Main tower.

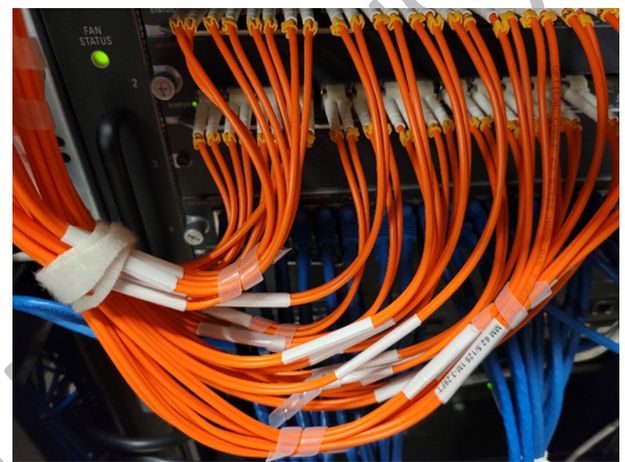
DAS antennas around 2nd Level and outside bowl.

Description of Deficiencies

Overall, the environmental conditions of the MDF and IDFs throughout the stadium are decent. Within the MDF, various cabling/equipment installations have occurred by different vendors in the space, some of which left cabling/connectors abandoned in place. Additionally, there is some but relatively minimal clutter in the MDF and a few IDFs, however with proper storage management these items can be sorted and stored.

The existing fiber optic backbone cabling appears to have been installed at the time of the original 2003 construction. Being a legacy OM1 multimode cable plant, it limits the entire information technology system to 1GB ethernet. Most similar stadiums operate at 10GB minimum. The 5e horizontal cabling is also another legacy item that limits the capability of connected devices such as IP cameras, network interface cards, and wireless access points.

Additionally, there were a few areas which need additional internet connectivity. The 50-yard line has no existing internet connectivity, and the truck bay has very limited internet access. It was discussed that new horizontal fiber optic cabling be provided to each location which would allow the user flexible connectivity at each location. IDF-2F is currently connected through an adjacent access switch which limits the number of users. Ideally this IDF would have a dedicated fiber optic backbone from the MDF.



OM1 fiber optic cabling

The existing LAN core and edge switches were last upgraded in September 2013. The server that runs DNS / DHCP / Wireless controller for the stadium was last upgraded September 2013 as well. Switches that have failed are being replaced with refurbished switches of the same model. Due to the age of this equipment, the networks are limited for expansion.

It appears that the legacy phone system was also installed in 2003 and remains functional; however due to its age it is also limited in its capabilities. More recent installations consolidate the phones to a converged network through voice over internet protocol (VOIP).

Legacy phone

The original Cisco W-LAN deployment was upgraded to Ubiquity Unifi 802.11ac in September 2016 with minor expansions in 2017. The primary areas of coverage were some back of house, concessions, and at each concourse gate. The exterior directional APs at the gates were updated in September of 2021. With the access points operating at 5GHz, the overall coverage is limited and spotty in several

locations. There is no bowl or concourse WIFI coverage for fans. The fans primarily utilize the stadiums DAS systems for cellular wireless access. Similar college stadiums are seeing an uptick in WIFI demand, and the course of action is typically an increase AP coverage and WIFI throughput. By upgrading the IT network from 1GB to 10GB minimum, replacing the existing WIFI 802.11ac with WIFI 802.11ax, and adding APs throughout the stadium where coverage is needed, the demand for wireless will dramatically increase throughout the stadium. WIFI 6 offers the latest physical and virtual layering as well as WPA3 secured protocol allowing the ultimate WIFI flexibility.

Each of the existing IT racks contains a minimum of 1 APC uninterrupted power supply (UPS) as a “safe shutdown” backup for active IT equipment. The APC batteries were last replaced in September 2013, and as needed when they have failed. The primary issue with having inadequate UPS batteries is the shortened time the equipment will have to properly shut down.

Recommendations

1. Recommend identifying and removing abandoned cabling/equipment in MDF/IDFs as well as cleaning out any clutter or storage in these rooms.
2. Recommend upgrading network fiber optic multi-mode OM1 backbone to single-mode OS2 to increase bandwidth from 1GB to 10GB.
3. Recommend upgrading category horizontal cabling plants from CAT5e to CAT6 to support newer information technology demands.
4. Recommend adding 12 strands of distribution fiber-optic cabling to truck bay and 50-yard line.
5. Recommend providing dedicated fiber-optic backbone from MDF to IDF-2F.
6. Recommend replacing existing core, access switching, and server to expand the overall IT infrastructure.
7. Recommend replacing end-of-life legacy phone system with voice over internet protocol (VOIP) telephone system.
8. Recommend replacement of Wireless LAN system with the most current industry standard WIFI 6, 802.11ax.
9. Recommend adding Wireless LAN for fan/customers in towers, concourse, parking areas, and in bowl.
10. Recommend replacement of UPS batteries which are at end-of-life expectancy.

Broadcast

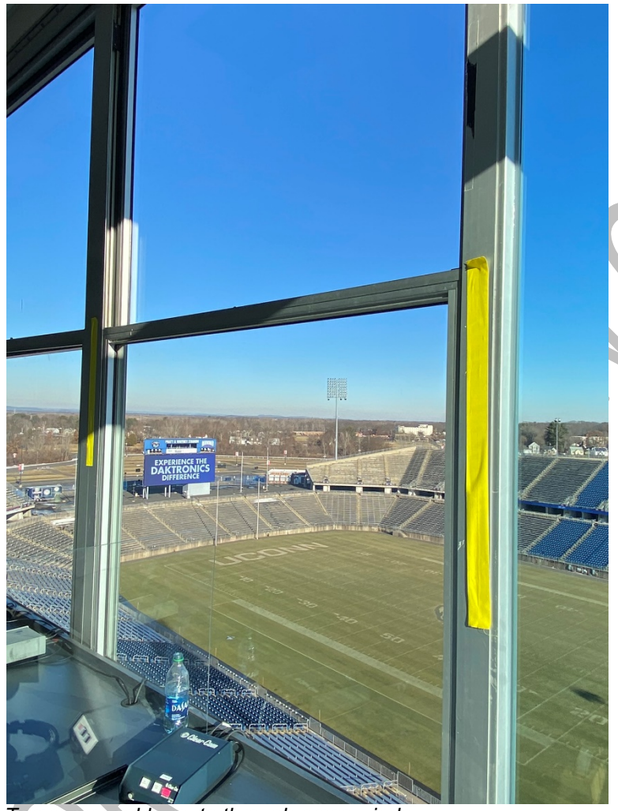
The broadcast cable plant currently installed for the network TV trucks and in-house LED display production was reviewed with the following observations:

- Broadcast cable and connections serving the TV truck are original to the building. It is comprised of copper cabling (triax, analog audio, coax video) that is largely outdated and unused. Triax camera cabling, while a standard at the time of the building’s opening, is becoming obsolete as TV trucks are more fiber-based in their broadcast transport medium. Most coax video cable is unable to transport HD video due to cable lengths and thus rendered unusable. Some of the existing analog audio connections are serviceable.

Representative indoor broadcast box position

- No SMFO (single mode fiber optic) cabling is installed. When the TV trucks are present, cabling to satisfy their broadcast requirements is run in a temporary fashion up the side of the building, through windows, over concourses, across walkways, etc. to the broadcast camera positions.

TV truck temporary cable routing



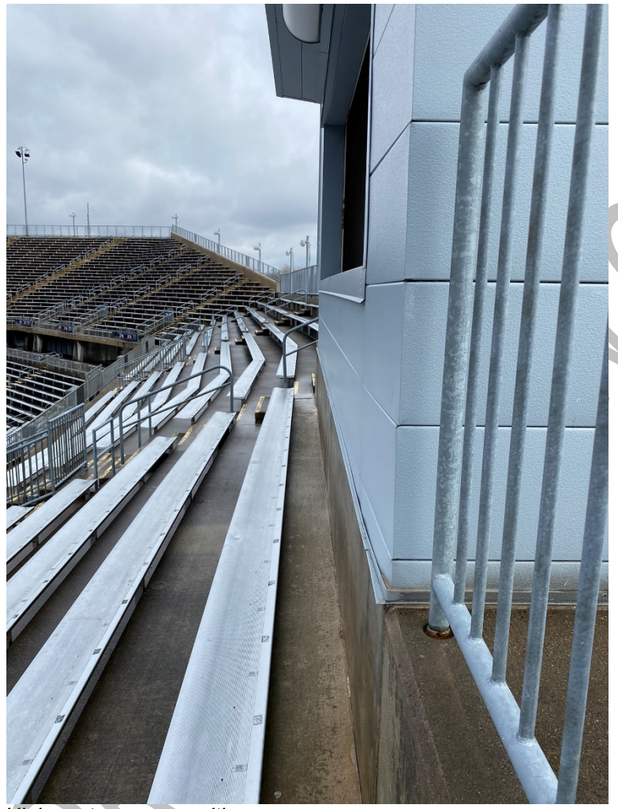
Temporary cable route through press window

- The outdoor broadcast boxes have suffered years of moisture penetration and lack of appropriate operation in opening/closing of the protective doors. The interior of most of the boxes are corroded, rusted, and littered. The only connections that might be used are some of the analog audio connections.

Representative outdoor broadcast box position

Representative outdoor broadcast box position

Representative outdoor broadcast box position



High east camera position

- The main follow camera position is undersized. It is unable to support more than one camera. A typically sized high 50-yard line position will be wide enough to accommodate five positions. Any camera position wanting to be in a main follow position is relegated to the roof which is a different camera angle. At minimum, the main follow position should handle a game follow, tight follow and in-house production position. Those relegated to the roof are two (2) coaching cameras, All-22, in-house and one of the game or tight follow. The roof position is a unique method for accommodating manned cameras. A covered platform and canopy slides towards the parapet. No camera tie downs, and railing was observed. This appears to be a potential safety hazard.

Main follow camera position and broadcast booth

- While the conduit infrastructure supporting the broadcast cable plant is sufficiently sized, there is no cable tray at the Press Level broadcast booths. This is typically seen on most stadium projects for efficiency, flexibility, and ease of adding temporary cables.
- The high east broadcast booth likely experiences inadequate camera shots when patrons are standing. Standing on the bleachers would block camera shots.

Roof top High 50 camera position

Roof top high 50 camera position

- The TV Announce Booth is not very secluded and secure and offers the potential of noise penetrating the space from the press dining area. It also shares space with the instant replay booth.

- The ENG pedestal at the truck parking area is not used, opening the possibility of removing in lieu of offering more space in the plaza.

Unused ENG pedestal at truck parking plaza

- One noticeably absent broadcast position is behind the east end zone. Any cabling for that position would have to be run from one of the sidelines.

West end zone with no broadcast capabilities

- When hosting soccer and lacrosse events, broadcasters set up camera positions on raised platforms along the concourse due to the inadequacy of the current camera positions in the facility. This causes seat kill (including ADA seating) and possible congestion along those areas of the concourse. There is no power and camera cabling, so all of that is run on a temporary basis.

Soccer/Lacrosse camera position

Soccer/Lacrosse camera position

Recommendations

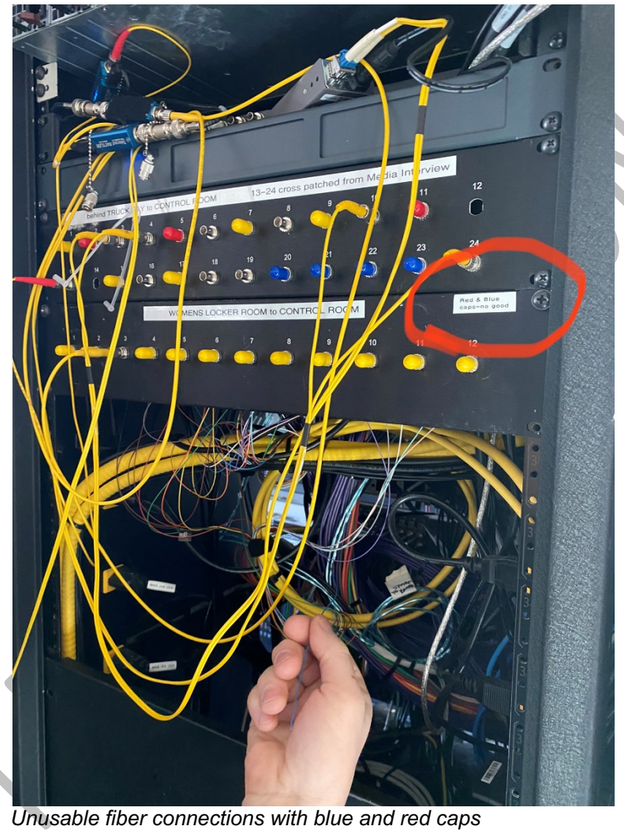
It is recommended that the cable plant (cabling, connection, and enclosures) be replaced and upgraded to meet modern broadcasting requirements and remove the requirement for a TV truck to run their own cabling in a temporary fashion.

Estimated Costs - $675,000 - $850,000

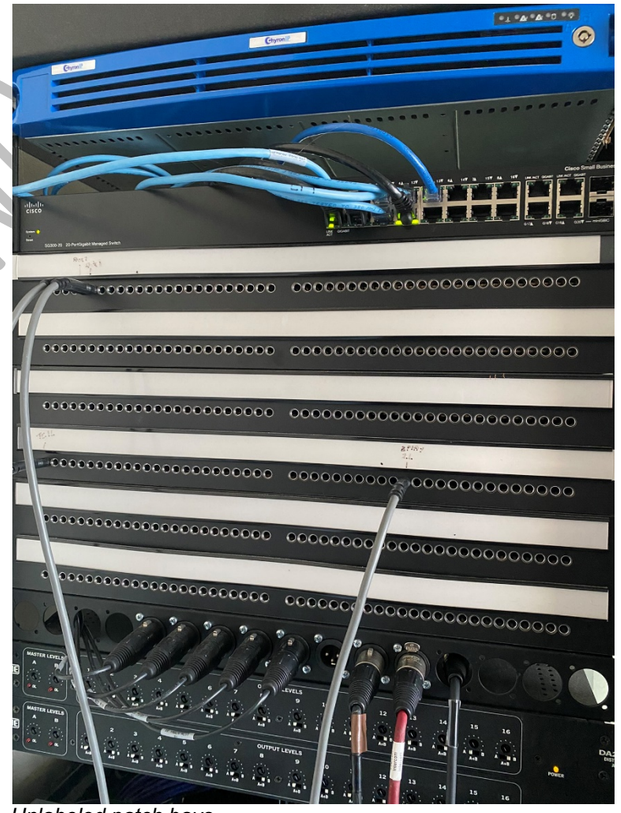
Video

The video production system provides the content that is displayed on the main LED display as well as a stadium TV channel and a streaming broadcast. It is operated by a third party. The review of this system provided the following observations:

- Like the broadcast cabling plant, all camera cables are run on a per event basis. No installed cabling is utilized.
- Around 2018, the system was upgraded with apparently no input from the production company. This was a partial upgrade with most of the system inadequate or not needed by the production company.
- Although there are four (4) broadcast cameras (JVC ProHD 1/3") as part of the system (apparently shared with the XL Center with one housed at the XL Center), the production company still brings in their own cameras per event for a six-camera shoot. There is no wireless camera which is generally used for crowd interaction in a production.
- The production switcher (Newtek Tricaster) is not functioning, so a Ross Carbonite is brought in per event.
- The existing character generator (CG) is a Newtek Live Text which is inadequate for the production. They bring in a Ross XPression to handle CG duties.
- The Blackmagic router is unreliable as it has broken inputs and outputs and patches become unconnected.
- Not all the fiber patch lines are functional.



Unusable fiber connections with blue and red caps



Unlabeled patch bays

There is a ProMax content storage device that we are unsure is used. The only upgraded components in use are the Newtek 3Play and the existing, old intercom system.

Recommendations

The system is a hodgepodge of components and functionality on par with A and AA minor league baseball or large high school productions. Some components work and some are broken. Overall, the system is inadequate to meet the in-house production needs of a venue that hosts Division I college events and pro sports events. If a third party is to continue to contract the game production, they should just provide all the components to make it fully functional. If the venue is to provide the game production, an estimated opinion of probable cost would be $850K-$1M.

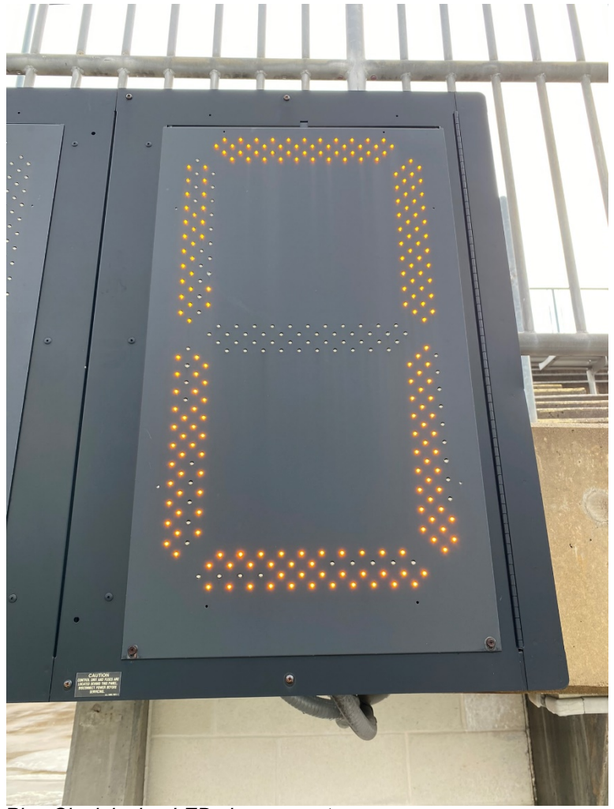
LED DISPLAY AND TIMING SYSTEM

Daktronics is the supplier of the LED and clock displays throughout the facility. The review of this system provided the following observations:

- The system was upgraded in 2012 with control system upgrades currently being completed. While control systems typically last 5-7 years (similar to PCs) the displays themselves typically have a useful life of 9-12 years which means these displays would be candidates for upgrades.
- The main display is a 28’ x 73’ HD15 product which is arguably Daktronics most popular product. It utilizes pixel sharing technology which allows a perceivable better resolution with less pixels. The structure is exhibiting signs of rust. When the display is replaced, we recommend addressing the rusted areas.

Rust at main display

- There are three LED ribbon boards – (2) 2’ x 210’ and (1) 2’ x 73’ 20mm products which are showing uniformity issues in several modules around the various lengths/locations. Dark and light modules is apparent throughout the ribbons.
- The play clocks are exhibiting nonfunctioning LEDs within the segments. The numbers from the field are perceivable, but these clocks are slowly losing pixels.



Play Clock losing LEDs in segments

- When hosting lacrosse events, the existing clocks can't be used, so temporary clocks and cabling are brought in.

Recommendations

The LED Displays are approaching end of serviceable life. The products (particularly the ribbons) as are exhibiting signs of uniformity and module issues.

Estimated Costs to replace displays:

- Main Display - $750K-$800K
- Ribbon Displays - $350K-$375K
- Play Clocks - $25K

Architecture

The architectural integrity and interior design of Pratt & Whitney Stadium at Rentschler Field were observed on-site for functionality, durability, and aesthetics.

Overall, the stadium is well maintained and wearing well for a facility of its era. It is apparent that the operator has been executing ongoing maintenance and made some upgrades in areas to enhance the fan experience.

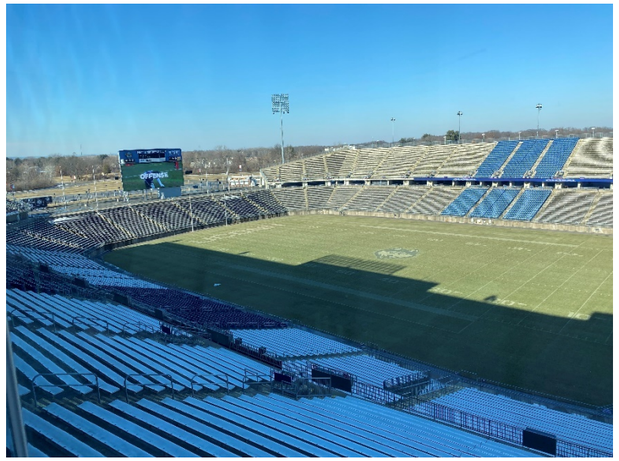
Description of Deficiencies

Expansion Joints
The expansion joints in the seating bowl appear to still be in working condition but are showing signs of age from degradation from exposure to weather. One area of concern observed is at mid field where seating was installed and appear to be screwed into the expansion joint.

Sealants
Cracking and separation joints are observed throughout the bowl. These joints were observed on a day when snow was melting. The water is making its way through to the underside of the bowl in areas and should be addressed. Generally, it appears there has been an ongoing maintenance program of exterior sealants.

Bowl Seating Replacement

The bowl seating is predominantly aluminum bench seating that is attached to the vertical face of the bow risers. There are a few sections where the bench was warped/bent from abuse and need to be replaced.

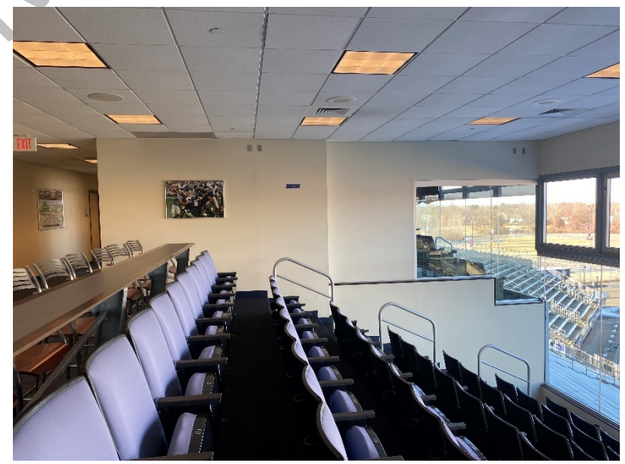


Overall view of seating

Bench seating is bent and damaged

Graphics/Wayfinding Improvements

The stadium wayfinding in interior spaces is becoming outdated with additions and modification that may have been made over time. Wayfinding must be clear and should reinforce current brand. The wayfinding for interior club seating was hard to locate and read from a distance.



View of wayfinding signage for club seating section

Concessions/Restrooms

The concession on the main concourse had unique branding for each concession that offered various food options to patrons. The menu boards are fixed menu signs that are back lit above the POS stations. The menu boards are static and are not easily updated and should be replaced. It was observed that coolers are installed on the concourse adjacent to most concessions in full view of patrons.

Suites and Club

The 46 suites are generally in good condition, but finishes are dated. Carpet and countertops are showing the most wear.

Typical installation of TV's in suites

Typical suite

Recommendations

1. Recommend ongoing maintenance program for expansion joints and sealants.
2. To improve comfort and elevate the fan experience of stadium, the bench seating should be replaced with seats with backs. This will reduce the seat count of the overall stadium. While there is certainly usable life left in the bench seating, consideration for replacement and a replacement schedule should be studied and implemented.
3. Recommend new wayfinding signage for club seating.
4. Recommend an upgraded POS system, menu boards and some updates to concession front are recommended to speed up transactions and align with industry best practices. Refer to Food Service portion for additional recommendations related to concessions.
5. Recommend restroom floors to be resealed and part of a maintenance plan.
6. Recommend replacing toilet fixtures that are not working or rusted.
7. Recommend adding a diaper changing station in each family restrooms.
8. Recommend finish updates to suites. A minimal approach would be to replace carpet, countertop, sink, and faucet. The translucent panels are beginning to show signs of UV damage (yellowing) and should be removed. The TV above the coat closet should be relocated to provide a more cohesive solution. Walls to receive fresh paint. Refer to electrical for lighting upgrades that could require ceiling updates.

Vertical Transportation

Executive Summary

VDA surveyed the four (4) overhead geared traction elevators, at the referenced property on Wednesday, February 9, 2022. The purpose of the audit and systems analysis was to identify the primary equipment, determine the maintained condition of major components and evaluate the vertical transportation based on applicable industry and code standard. The areas observed for all elevators were machine rooms, hoistways and pits. The current maintenance provider, Otis Elevator, provided personnel to assist with our evaluation.

Overall, the existing elevator systems were found to be good condition (based on age), consisting of good quality components. All the elevators operate at running speeds of 350 feet per minute. Two units serve four (4) of the building's landings (1, 3, 4, 5) and have a load capacity of 4,000 lbs. The other two serve all six (6) of the building's landings (S, 1, 3-6) and have a load capacity of 4.500 lbs. All these devices utilize Otis GEM (Geared Elevonic Model) microprocessor based motion/signal controllers with an Otis OVF 30 solid-state VVVF type motor drives and an Otis 18ATF overhead geared traction AC hoist machines.

All four (4) elevator systems were originally manufactured and installed by the Otis Elevator Company at the time of the building's initial construction in approximately 2003. Subsequently, all the elevators had their drives upgraded by Otis Elevator. Otis Elevator remains today as the incumbent elevator maintenance provider.

Estimated life expectancy for typical elevators of this type is twenty to twenty-five (20-25) years under normal conditions. These units are approximately 18 years old. With proper maintenance, your current elevators should operate reliably for another five to seven (5-7) years, but parts availability may become an issue before the units wear out completely. Parts availability or obsolescence for the GEM controller boards, OVF drives, and the 18 ATF machines will typically become the bigger issue. While the current controllers, drives and machines are operational, replacement parts or repairs could become an issue, leading to extended shutdown times required for lengthy repairs and resulting in mandatory upgrades or replacement. It is our recommendation that you plan for modernization within the next 5 to 7 years.

Equipment Specific Concerns

1. Otis Lambda detector edge is no longer supported by Otis Elevator and requires upgrade if failure occurs. (The electronic detector edges are the Lambda line of edges manufactured by Otis Elevator. The edges were deemed commercially obsolete by Otis several years ago and upon failure will be replaced with another production model, which will lead to an obsolescence claim. We estimate the cost of this upgrade to be $4K - $6K per car door per elevator).

2. Otis OVF Drives are no longer supported by Otis Elevator and requires upgrade if failure occurs. (The existing drive is commercially obsolete by manufacturer and could lead to long lead times for repair and or replacement if failure occurs to this component. We estimate the cost of this upgrade to be $35K - $45K per elevator).

3. Otis I-Motion Door Operators are no longer supported by Otis Elevator and may require an upgrade if failures occurs or long repair time due to individual parts availability.

4. Certain Otis GEM controller components are obsolete and will require an upgrade to a newer design since these controllers were installed.

5. Current operating fixtures, indicator, and buttons have exceeded their useful life and are prone to failure.

Food Service Equipment

Executive Summary

The foodservice consulting firm S2O Consultants, Inc. (S2O) was engaged to inspect the food and beverage areas inside Pratt & Whitney Stadium, which is home to the University of Connecticut's football program in East Hartford, CT. S2O was to provide a comprehensive report of their findings at the stadium including the condition of the equipment and maintenance of the related spaces.

The concession areas, vendor commissaries, club kitchen and all pantries and bars were dated, which is to be expected in a facility of this age. Some concessions were dirtier than others, some had newer equipment, but nothing that could be defined as a major concern or something that needed immediate attention.

Findings

The care and maintenance of the foodservice equipment and spaces within the stadium is the responsibility of Spectra, the operator, who does appear to be doing a fair job of it. In our professional opinion, we found the foodservice areas of Pratt & Whitney Stadium to be in decent condition, considering the age of the facility.

There are some pieces of equipment that need extra cleaning, and some spaces that need updates to the finishes.

Note that for any equipment that does need to be replaced, in this very tumultuous time we are experiencing significant supply chair shortages. Lead times for even non-custom equipment has grown by months and/or quarters.

It was noted during the inspection that the refrigeration evaporators in the commissary beer cooler will need replacing. This comment was made by the building managers.

The electrical chases at all the center island tables in all the concession stands are badly rusted as well. These should be painted or sealed to keep water from getting into the electrical components inside.

Sample of rusted electrical chases

Field and Site

Playing Field/Perimeter Track

Due to the existing working systems reaching the end of their life cycle, and the processes required for their replacement, it is recommended that a full field replacement occur in the near future, within the next five (5) year.

Removals/Demolition:
The existing playing surface should be stripped entirely down to subgrade, removing all rootzone, sod, drainage gravel, and irrigation equipment and piping. Gravel and subdrainage piping should be removed from the drainage trenches and trenches backfilled with clean, compacted fill. The perimeter asphalt track should be removed in its entirety, as well as the existing perimeter trench drain and associated concrete encasement. Existing goal post footings should be removed in their entirety.

It is recommended that the subgrade be scraped an additional 2 inches to accommodate a 12-inch depth rootzone layer in lieu of the currently designed 10-inch depth. This will provide additional rootzone material for turf rooting, as well as lower the working systems of the playing field, allowing for maintenance practices that currently cannot be implemented, to be implemented.

Replacement of Perimeter Trench Drain and Track:
A new perimeter trench drain should be installed at the base of the field wall within a concrete encasement. Because the seating bowl drains to the perimeter track area, it is recommended that the existing 4-inch drain be replaced with an 8-inch width trench drain. This will also assist in the maintenance and cleaning of the drain as well as provide additional drainage capacity. Catch basins should be installed every 50 meters along the length of the trench drain to aid in cleaning of debris. Slotted Ductile Iron grates rated for vehicular traffic should be utilized in lieu of the galvanized steel slotted grates that exist today.

The perimeter track should be replaced with concrete or heavy-duty asphalt within its current extents and be expanded as noted in Appendix A to allow the passage of maintenance equipment/vehicles without impeding on the turf area. It is recommended that the pavement be covered with a synthetic running track material along the sidelines where soccer player benches will reside as to prevent slippage of players wearing cleats. The track should slope from the field edge to the field wall to accommodate drainage.

Perimeter track with synthetic topping – Canvas Stadium – Colorado State University

Synthetic Turf Apron
To provide relief from shade issues, and to provide a surface more durable to the heavy usage that occurs on the perimeter of the field during events, it is recommended that a synthetic turf apron be provided between the perimeter track and a line 3' from the perimeter of the desired soccer pitch dimensions. This has become standard practice of NFL, MLS, and other major sporting leagues around the world. This will also square up the natural grass area, providing more even distribution of irrigation, alleviating the issues that exist today.

Synthetic turf apron – Geodis Park – Nashville SC

Replacement of Goal Post Sleeves/Footings

It is recommended that new goal post footings be provided for the football goal posts, accommodating a base plate mounted goal post in lieu of the current in ground sleeve. This will provide for easier installation of the goal posts when compared to the existing installation. Goal post access frames should be provided at the football goal post location only. Access frame plugs should be provided for both in-use and out-of-use conditions.

Given that soccer tenants quite often occupy the building, it is recommended that permanent goal post sleeves be provided for competition soccer goals, consistent with industry standards for the highest levels of soccer play. This will require a lengthening of the soccer markings to accommodate a pitch length of 360 feet in lieu of the current 345 feet, as to not provide player safety issues during football events. There is sufficient room within the turf area for this to occur.

It is recommended that the existing rugby goal post sleeves be replaced. It was discussed that the existing sleeves have been struck during maintenance practices and may be damaged as a result.

Subdrainage

It is recommended that the existing subdrainge system be replaced with new piping and configuration.

Collector piping should be extended along the sidelines in lieu of only being placed on the south end, as is current, and be sized according to local stormwater intensity data. This will result in an increase in pipe size and provide for additional drainage capacity. Subdrainage collector piping should be installed within gravel filled trenches with a minimum width of two times the size of the pipe diameter. Collector piping should have a minimum slope of 0.5%. Should it be desired that the subdrainage system be designed to accommodate subsurface aeration capability, the minimum collector pipe size should be 24 inches.

Nyloplast drain basin cleanouts should be provided at the high end of each collector pipe run and at each change in direction. The rim elevations of each cleanout should be set at the top of the drainage gravel layer, eliminating surface obstructions.

6-inch perforated lateral piping should be installed within 12-inch width gravel filled trenches on 20-foot centers and run perpendicular to or at 45 degrees to the sidelines with a minimum slope of 0.5%. Should it be desired that the subdrainage system be designed to accommodate subsurface aeration capability, the frequency of the lateral pipe placement shall be increased to 10-foot centers. The high ends of each lateral pipe run should be capped within the trench, eliminating surface obstructions. Lateral piping should be connected to the perimeter collector piping via Insert-A-Tee connections.

Atop the subgrade, a 4-inch depth pea gravel layer should be placed to provide for lateral movement of stormwater runoff to the subdrainage piping.

Irrigation

It is recommended that new irrigation heads, valves, and piping be provided.

The existing irrigation pump should be evaluated for functionality and pressure and flow capabilities. Should the existing pump be deemed inoperable, it is recommended that a new pump be provided, sized to be capable of irrigating up to 300 GPM with a sustained outlet pressure of 90 PSI. This will allow for the watering of multiple zones at once, thus reducing the amount of time required to provide adequate irrigation to the playing field.

It is recommended that a 2-inch DR11 HDPE quick coupler mainline be provided around the perimeter of the turf area, within the synthetic turf apron, to provide for manual irrigation and washdown operations. Quick couplers should be placed near each football goal post and at each 25-yard line on each sideline of the field.

It is recommended that irrigation heads be Hunter I-40 6-inch pop up gear driven rotors with stainless steel risers, or similar. Nozzles should be selected to provide even distribution of irrigation water. Dual Opposing Nozzles should be utilized on all full circle zones. Irrigation heads should be placed vertically so that the top of the head resides 1/2 inch below the finished surface elevation.

It is recommended that new irrigation remote control valves be Hunter IBV, ICV, or similar with a minimum valve size of 2 inches. Ball valves should be placed at each remote control valve to provide the capability of shutting off a single zone in the event repairs are needed.

It is highly recommended that the irrigation valves be removed from the turf area and placed in a single location in a manifold configuration. The manifold configuration should be housed in a precast concrete vault with diamond plate stainless steel hydraulic lids, similar to those being utilized at the existing stormwater ejection pump vault. The manifold should be located within the perimeter track area, near the existing mainline entrance to the playing field area between sections 103 and 104. The mainline serving the irrigation

manifold from the point of connection through the valves should be DR11 HDPE. Unions should be provided on each side of each remote control valve, providing for easy replacement/repair of the individual valves without requiring the entire system be shut down. Placement of the irrigation valves in this manner will allow for simpler winterization practices, shorter wire runs, and will ensure that there are no irrigation related obstructions within the turf, thus eliminating player safety issues, as well as providing for simpler maintenance of the natural grass surface.

Irrigation valve manifold in vault – Audi Field – DC United

The existing Hunter HCC Hydrawise controller is adequate for the operation of the irrigation system and is Wi-Fi capable, however it is currently placed outside on the field wall and does not achieve strong Wi-Fi signal. It is recommended that it be relocated indoors, within the conditioned grounds storage area, where stronger Wi-Fi signal can be achieved. Additionally, it should be converted to a 2-wire function using the Hunter EZ-Decoder system in lieu of the traditional wiring as exists today. This provides for less wire and easier accommodation of expansion should it be required/desired in the future. The existing controller has remote control capability; however the remote control currently does not work, and therefore should be replaced like and kind. A new antenna routing will be required from the new location to the exterior.

Existing irrigation controller

It is recommended that all post remote control valve irrigation piping be Schedule 40 PVC, sized according to designed flows, and reside within the pea gravel layer directly atop the subgrade. Placing as such will eliminate the possibility of irrigation piping being struck and damaged during routine maintenance operations, as well as provide for the capability to implement maintenance practices that currently cannot be implemented, such as deep tine aeration.

Rootzone Material

It is recommended that a new USGA rootzone be established atop the gravel layer to a 12-inch depth. All rootzone materials should meet the requirements outlined in the USGA Recommendations for the Construction of a Putting Green and be tested according to the 2018 USGA Testing Protocol. It is recommended that the USGA rootzone not exceed a ratio of 90% sand to 10% peat, however an A2LA Certified, USGA recommended test laboratory should determine the final ratio based upon the actual materials to be used in the construction of the field.

Sod

It is recommended that the natural grass portion of the playing field be sodded with sports rated Kentucky Bluegrass Sod grown in a sand based growing medium that is compatible with the recommended USGA rootzone material.

Depending on the timing of the installation, there are two recommendation options for the thickness of sod to be installed. First, should the timing of the sod installation provide for a minimum of 30 days grow-in period prior to the first usage of the field, a traditional 3/4 inch sod thickness may be used. To utilize this sod, construction would need to commence in the spring and provide for a sod date in late summer. The second recommended option would be to utilize thick cut sod grown on a plastic sheet, commonly referred to as “lay and play” sod. This is commonly implemented when construction timing does not allow for a minimum of 30 days grow-in, or when sod installation takes place outside of the growing season. This type of sod provides for instant stability and playability, however, comes with a significant increase in cost when compared to standard thickness sod.

Netting

The existing netting poles function, however are scuffed/damaged from being hit by equipment. Additionally, the footings of the netting poles are exposed within the perimeter track. It is recommended that the netting system be replaced and new footings be poured to provide a flush/seamless condition with the surrounding perimeter track surface.

Site Landscaping

At a minimum, it is recommended that current turf areas adjacent to the stadium be deweeded and reestablished with new Kentucky Bluegrass Sod as to enhance the appearance of the stadium landscape. Routine maintenance (aeration, overseeding, weed control, dethatching, manual irrigation) should be performed throughout the year to maintain healthy dense turfgrass in high visibility areas.

Phase 3
Code and Facility Upgrades

This section is a detailed schedule of recommended code and facility upgrades organized by priority. The upgrades recommended are based on discussions with stadium staff, UConn representatives, and our assessment team members' experience in working with and designing similar venues.

Life Safety

Executive Summary

The Howe Engineers, Inc. conducted a walkthrough of the Pratt and Whitney Stadium at Rentschler field to evaluate the existing means of egress, building construction, and life safety components of the facility with respect to the current applicable codes and standards. The current applicable standards for this facility are as follows:

- *2018 Connecticut State Building code (CSBC)*
  Adopted from the following:
  - *2015 International Building Code*
  - *2015 International Existing Building Code*
  - *2017 National Electrical Code (NPFA 70)*
- *2018 Connecticut State Fire Prevention Code*
  Adopted from the following:
  - *2015 Fire Code (NFPA 1)*
- *2018 Connecticut State Fire Safety Code*
  Adopted from the following:
  - *2015 International Fire Code*

Below are terms used with each comment that will allow the CRDA to better understand the implications of future renovation scenarios; each Level is per the Existing Building Code.

Level 1 Alteration:
Includes the removal and replacement or the covering of existing materials, elements, equipment, or fixtures using new materials, elements, equipment, or fixtures that serve the same purpose.

Level 2 Alteration:
Includes the reconfiguration of space, the addition or elimination of any door or window, the reconfiguration or extension of any system, or the installation of any additional equipment.

Level 3 Alteration:
Applies where the work area exceeds 50 percent of the building area.

General Comments

Comment 1:
The stadium is not equipped with an automatic mass notification system for evacuation of the seating bowl. Per the approved Emergency Response Plan, the current steps to notify the occupants with the seating bowl during and event are as follows:

- Fire alarm signal is received in the Fire command center
- The information is radioed to the Emergency Command Team (ECT)
- ECT and East Hartford Fire will determine if an evacuation of that area of a full evacuation of the facility is required.
- The ECT directs the PA announcer to read from a script that instructs the occupants to exit the building.

This existing sequence has been approved by the local Authorities Having Jurisdiction; however, the current Connecticut State Building Code requires notification to be automatic.

This is an existing condition that may need to be addressed if a Level 2 or 3 alteration occurs in the area.

Comment 2:

The enclosed exit stairs do not have intermediate handrails. Per the CSBC, intermediate shall be located such that all portions of the stairway's minimum width or required capacity are within 30 inches of a handrail. Without the intermediate handrails, the full width of the stair cannot be utilized which could create capacity issues on some of the levels.

This is an existing condition that may need to be addressed if a Level 2 or 3 alteration occurs in the area.

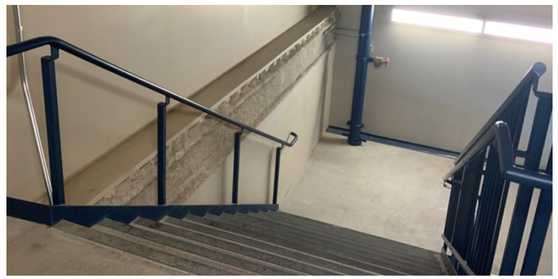


Figure 1: Exit Stair Enclosure

Comment 3:

The walls within the enclosed the exit stairs that the handrails are mounted to are not continuously smooth. Per the CSBC, the wall adjacent to the handrail shall be free of any sharp or abrasive elements. The spray foam on the structural steel creates a rough surface and a sharp corner that does not comply with the CSBC.

This is an existing condition and will need to be addressed if a Level 2 or 3 alteration occurs in the area.

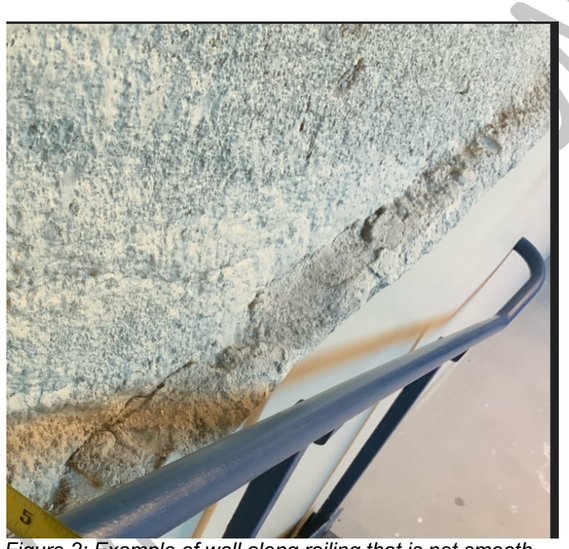


Figure 2: Example of wall along railing that is not smooth

Comment 4:

Visual notifications devices are located within the exit stair enclosures. Per NFPA 72, visible signals shall not be required in exit stair enclosures due to the potential for light intensity from the device to cause confusion and impede egress.

This is an existing condition and may need to be addressed if a Level 2 or 3 alteration occurs in the area.

Lower Bowl

Comment 5:

The transition between stepped aisles and stairways is provided with the same marking strip as the remainder of the stair and aisle. The building code requires a marking stripe be provided on the nosing or leading edge adjacent to each transition that is distinctively different from the stepped aisle marking stripe. This is a typical comment throughout the lower bowl.

This is an existing condition and will need to be addressed if a Level 2 or 3 alteration occurs in the area.

Figure 3: Example of aisle transition striping

Upper Bowl

Comment 6:

Guards at the end of aisles/top of vomitory shall be not less than 36 inches high and shall provide not less than 42 inches measured diagonally between the top of the rail and the nosing of the nearest tread, per the building code. It was noted that there were several instances around the upper bowl that do not comply with the current requirements.

This is an existing condition and will need to be addressed if a Level 2 or 3 alteration occurs in the area.

Figure 4: Guard at bottom of aisle/top of vomitory

Comment 7:

The aisles along the sides of the vomitories are not provided with handrails. This condition is acceptable if provided with a guard that meets the requirements of the building code. It was noted that several instances around the upper bowl where the guards are not a minimum of 42 inches as required by the building code.

This is an existing condition and will need to be addressed if a Level 2 or 3 alteration occurs in the area.

Figure 2: Example of guard along upper bowl vomitory

Field Level

Comment 8:

There are a few locations within the locker rooms and corridors where exit signs missing or not readily visible along the egress path.

This is an existing condition and will need to be addressed if a Level 2 or 3 alteration occurs in the area.

Figure 3: Example of egress door without an Exit Sign

Comment 9:

Sprinkler coverage is not currently provided under both exit stairs at the lowest level. NFPA 13 requires sprinkler coverage under the lowest landing.

This is an existing condition and will need to be addressed if a Level 2 or 3 alteration occurs in the area.

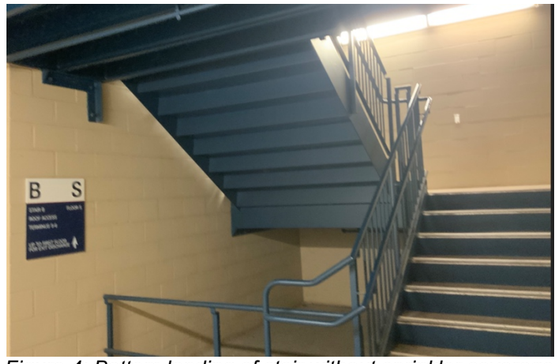


Figure 4: Bottom landing of stair without sprinkler coverage

Comment 10:

The ramp from the field that leads to the two open stairs appears to be too steep. In accordance with the CSBC, ramps used as a part of a means of egress shall have a running slope not steeper than 1 in 12 (8% slope).

This is an existing condition and will need to be addressed if a Level 2 or 3 alteration occurs in the area.

Figure 5: Ramp leading from field to monumental stairs

Concourse Level

Comment 11:

Gates are provided within the stair on the level of exit discharge to prevent persons from unintentionally continuing into levels below. However, the gates are not self-closing and could be an obstruction the clear width of the stair. In addition, the gates are provided with a bar lock that cannot be release upon pushing the gate. Gates and doors serving more than 50 occupants shall be free swinging or be provided with panic hardware.

This is an existing condition and will need to be addressed if a Level 2 or 3 alteration occurs in the area.

Figure 6: Gates at stair discharge level

Press Level

Comment 12:

The large garage door within the broadcast booth does not have a sidewall sprinkler under the garage door when it's in the opened position. Per NFPA 13, sprinklers shall be installed under fixed obstructions over 4 ft wide such as overhead doors.

This is an existing condition and will need to be addressed if a Level 2 or 3 alteration occurs in the area.

Figure 7: Overhead garage door with sprinkler coverage

Roof Level

Comment 13:

The top of the standpipe stops at the intermediate landing below the roof level. Per NFPA 14, hose connections shall be provided at the highest landing of stairways with stairway access to a roof.

This is an existing condition and will need to be addressed if a Level 2 or 3 alteration occurs in the area.

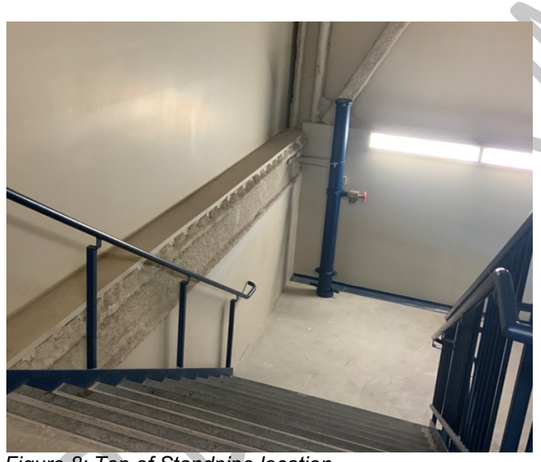


Figure 8: Top of Standpipe location

Note: Capital expenses for these items have not been provided, as the modifications are not required at this time and would only come into play in the event of a Level 2 or 3 alteration. Should either of those types of alteration be sought, the cost to remedy the items above should be built into the overall project cost.

Architecture

Facility upgrades should improve both the perception and reality regarding quality of the athletic facilities. The approach to upgrades should be prioritized to best align with the CRDA's, and by extension, the University's vision to improve the fan, athlete and staff experience while maintaining the stadium in first-class condition. The stadium should continue to deliver a positive guest experience to remain relevant both locally and nationally.

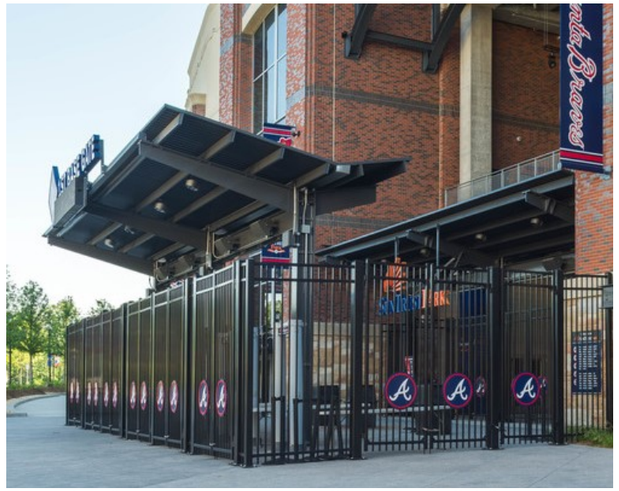
Recommendations

1. Consider end zone improvements to enhance fan experience before, during and after games. Tailgating is a special component of a college football gameday. End zone improvement could be used for pregame and postgame activities. With staggered entry and exit times of fans it could help reduce parking lot congestion and generate revenue through rentals and additional food & beverage sales. The space could also be rented out on nongame days for a unique experience and opportunity for surrounding community and the University of Connecticut. There is infrastructure in place to build upon. The area is flanked by concessions and restrooms that can be accessed from outside the secure line of the stadium as well as inside. Paved walkways could be added to outside of stadium to existing door to provide code compliant access to the restrooms and become part of that amenity.

2. Improve on the current recruit experience by providing a permanent space in lieu of the current approach of using a tent. It is the University's desire to elevate the recruiting experience by enhancing the student-athlete recruit accommodation at Rentschler Field. This could be incorporated into an end zone improvement or be an addition to the stadium.

3. Permanent canopies could be added at the 4 entrances to protect staff from rain & bright sunshine when trying to scan mobile tickets. Canopies are common at entries to help visually enforce the entry points to the stadium. Graphic messaging (including sponsorships) can be added to help orientate and direct people into the stadium.

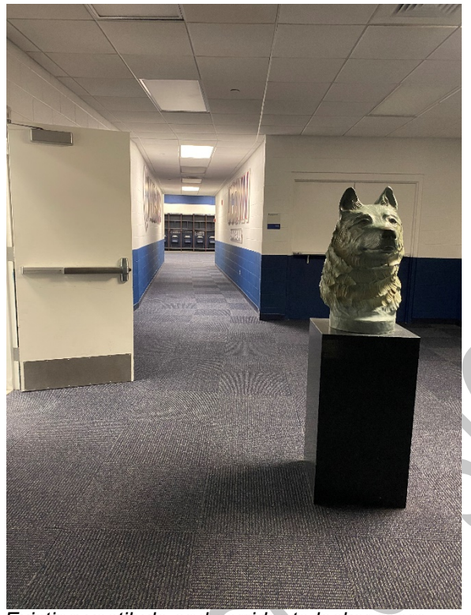
Existing entry gate



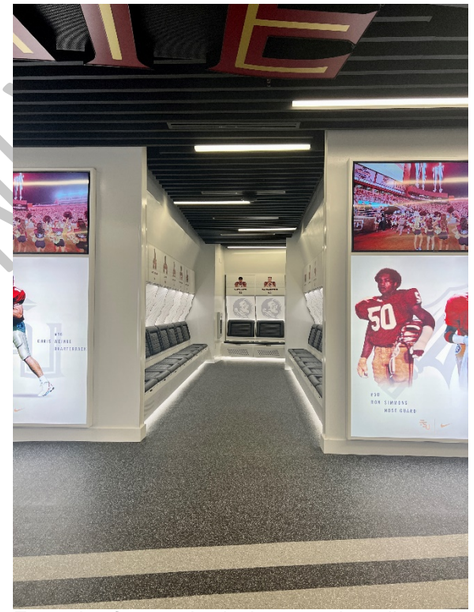
Example of entry gate canopy with signage, lighting, small LED messaging component

4. The home team locker room is adequate but beginning to show wear. There is a great opportunity to improve the home team locker room branding and elevate the player experience Improvements should include branding features. Replace lockers with the latest locker fabrication and electronic/outlet options, update finishes and fixtures throughout including all wet areas and ancillary. Training area/medical could be reconfigured to better utilize space and add player amenities like small club/lounge space with smoothie bar, etc. The entrance design of the home locker room includes an entry vestibule and corridor to access home locker room. There is another entry to the home locker room that has direct access to the field. Both could be activated with branding to motivate and inspire players.

Existing Home Team Locker Room



Existing vestibule and corridor to locker room



Example of game day locker room branding

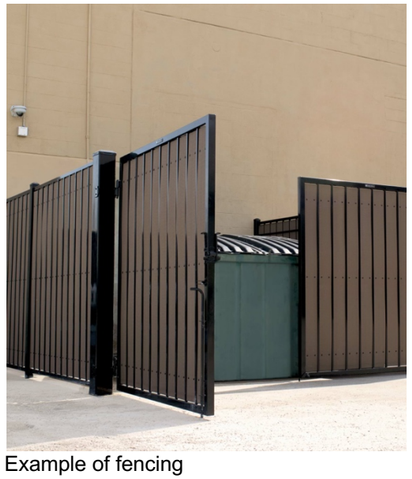
Example of Game Day locker

Example of Game Day locker with integral storage for pads, helmet and lockable compartment; applied player graphic is easily changed

Example of game day locker with cup holders, pop up power with USB and wireless charging pad

Example of game day locker room

5. Recommend adding fencing around the dumpsters located in the parking lot to screen from patron's view and while making it look more intentional.



Example of fencing

6. Recommend removing or screening coolers on the concourse from patrons' view.

Technology

IT/Video/Sound

1. Replace the bowl loudspeaker amplifiers with like kind versions from QSC to maintain compatibility with existing processing system, if network condition monitoring of the amplifiers is not a requirement. If network monitoring is desired, there are a variety of choices.
2. Consider a few 85” class large television of specialized carts for presentations in the main club room or other open spaces.
   a. Alternatively, the club space would greatly benefit from a dedicated high resolution projection system using a high output, laser-engine, low maintenance projector. The screen could be portable or integrated into a horizontal window mullion, and the projector possibly integrated into the opposing wall.
3. Replace main club room televisions with larger and more neatly installed televisions.
4. Consider upgrading the current QAM/Coax distribution system to a hybrid of IPTV/Digital signage front end, IP delivery to selected areas where granularity of TV control is desired, and reliable full HD and 4k resolution QAM/coax distribution to concourses and similar areas. The IPTV head end will provide the content creation, scheduling, event customization and monetization opportunities.
5. For the interview room, consider a simple schedule 80 pipe bar in front of, and extending to the sidewalls. Add power outlets to the ceiling. This would considerably reduce or eliminate floor clutter from portable lights, and would enhance the broadcast camera images.
6. Consider adding HDMI, microphone, line level and PIN-credentialed Bluetooth connections at the club room center column in front of the windows.
7. Consider a more versatile digital signage or IPTV hybrid system for engaging, event-specific and scheduled content.
8. In the sound control room, consider a dedicated audio control computer for easier and faster system adjustment prior to and during events. A modest small form factor computer would suffice, along with wireless mouse, keyboard and monitor.
9. Replace the aging and partially failing M7 Mixing console with like kind.

Mechanical/Electrical/Plumbing

Summary

The existing electrical systems have served the facility well over the years, but a few key areas warrant upgrades to maintain a safe code-compliant installation and/or improve facility services.

Findings

Code: Bowl emergency lighting
Existing bowl emergency egress lighting fixtures are metal-halide and original to the facility. The lamps themselves have remaining life because of infrequent use, however, the bullhorn attachment brackets holding the fixtures to field lighting poles are failing from high wind loads. There have been ad-hoc mitigation efforts to chain down the fixture housings and prevent rotation, but a more permanent solution is needed.

Original metal-halide emergency lights mounted on sports lighting poles.

Upgrade: Bowl sports/event lighting
Existing bowl event lighting fixtures are metal-halide and original to the facility. While still operational, these fixtures are nearing end of life and replacement with a new LED sports lighting system would provide enhanced performance with lower energy use, improved controls, and fewer lamp replacements.

Original metal-halide sports lighting

Upgrade: Concessions power
A key limiting factor noted during the facility assessment was the lack of power availability at concourse interior walls. 120V power at these locations is necessary to provide refrigeration and mobile concessions activations as operations move away from keeping ice bins in kiosks. Facilities staff have already been very resourceful in loading up nearby circuits to free up new spares in prior years, but unfortunately the nearby panels have no more available branch circuits. Dealing with the concrete surfaces and large, open-air spans between concessions buildings to the underside of bowl seating is an added challenge.

Limited options for sourcing and routing new concessions power at concourse levels

Similarly, the remote panels serving each of the stand-alone concessions buildings along the concourse were either tapped out of spare breakers, or close to the limit. The limited power availability makes it challenging to upgrade and/or add food service equipment. A few recent examples were replacing failing grease traps with automatic powered units and adding pizza ovens. Fluorescent lamps illuminate the existing static concessions signage. Replacing with digital signage could improve operations and save on maintenance upkeep. Additionally, the concessions buildings are considered commercial cooking spaces and the circuit breakers were missing GFCI protection as required by code.

Fluorescent illuminated concessions signage

The last area for concessions upgrade is the food truck power connections. Two 50A 120/208V outlets and a handful of 120V outlets are provided behind the scoreboard for food trucks to plug in, but have proven insufficient and the trucks resort to running off portable generators.

Code: Generator load bank testing
It was noted by maintenance staff that generator testing has not been kept up on an annual basis, as required by NFPA 110.

Unable to access interior of generator enclosure; visible rust runoff from diesel generator muffler on exterior

Recommendations:

1. Replace pole-mounted metal-halide bowl Emergency lighting with new LED luminaires equipped with robust mounting kits.
2. Replace metal-halide bowl event lighting with LED sports lighting system and upgraded controls.
3. Install new 120/208V panelboards in strategic concourse-level locations to provide additional branch circuits for concessions / refrigeration / temporary retail activations. An alternative solution could be to re-feed pedestrian pole lighting at 120V and provide GFCI receptacles in the pole bases for extension cords.
4. Replace concessions signage with digital monitors.
5. Provide additional dedicated 208V circuits and outlets for food trucks.
6. Expanding on the lighting controls recommendations provided in Phase 2, a few other upgrades to the facility lighting controls are provided below that would improve facility operations as well as reduce energy consumption:
   a. Replace manually switched contactors and circuit-breakers with relay-based lighting control panel(s) that can be either integrated with BMS or operated remotely via mobile app on an authorized user's device.
   b. Add occupancy sensors in interior spaces (e.g. offices, corridors) to reduce lighting power when unoccupied. Occupancy sensors can also be integrated with the BMS to trigger HVAC temperature/ventilation setback.
7. Considering the age of the generator, it is recommended to put in a place a preventative maintenance plan for the facility emergency generator to avoid issues when called upon.

Other MEP Observations

- High surge event counts:
  The facility's main utility service entrance switchboards are equipped with surge protection devices (SPDs), and the surge events recorded on switchboard MSM were significantly higher than others. The SPDs are doing their job and protecting the facility, but their lifespan is measured in joules and each surge event reduces the remaining amount of protection. SPD ratings were not able to be visually confirmed during the site visit, but on average, 250kA/phase rated SPDs have a life expectancy >25years.

6,365 surge events recorded at main switchboard MSM

- Busway:
  Recommend including infrared thermal scanning and re-torquing of all busway joints (and busplugs) for hotspots as part of annual preventative maintenance and IR scanning of other points in the electrical distribution system (e.g., switchboards).


Busway distributes power vertically in the stadium tower.

- Parking lot lighting:
  During the site visit it was reported by maintenance staff that parking pole lights occasionally short out due to a pole design flaw which causes excessive strain on conductor insulation at the fixture arm joint, cutting through the cable. This creates a short circuit event which blows the fuse in the pole base and creates an extra maintenance task to replace the cable and add strain relief at the joint. It is recommended to replace the existing poles or retrofit the arm joints with additional cable protection to avoid future events. This also offers an opportunity to replace the site lighting fixture heads with LED sources.

- Scoreboard electrical distribution equipment:
  The stadium scoreboard and electronics were upgraded in 2013, however the electrical panels and transformers providing power to it are original to the stadium and near end of life. The electrical equipment is still operational, but due to their age, warrant close monitoring for replacement at the first signs of overheating or unstable power delivery to this key stadium asset.

- Circuit identification labels:
  No labels are provided on receptacle or light switch faceplates to identify power source panel/circuit number. Recommend tracing circuits and adding labels to devices to better facilitate future maintenance work.

- Fiber terminations:
  Maintenance staff also highlighted a need to re-terminate all major fiber cable connections. It is recommended to replace existing armored cable splices with proper terminations at the following locations:
  1. PA/Scoreboard Room
  2. Truck Bay inside electrical room
  3. Above Women's Locker Room ceiling

For additional information on this item, refer to "IT/Video/Sound" sections of the report.

Food Service Equipment

For Phase 3 of this report, Code and Facility Upgrades, we have the following comments:

While the current concessions and club amenities seem to serve the customers in an adequate manner, the spaces are quite dated and could use a refresh. At a minimum we would recommend fresh paint, flooring and switching to digital menu boards.

The foodservice equipment appears to be in decent condition, put could stand a deep clean to remove years of grime and grease. Please refer to the capex matrix for details on existing foodservice equipment replacement schedule.

As the foodservice industry has grown and evolved over the past 20 years since the stadium was built, and with the worldwide post pandemic staff shortages there are several different styles of concession services that may benefit this stadium.

First is the "Order/Fulfill" model in which the order placement work is transferred to the customer. Instead of several employees standing at a “Belly Up” counter and taking orders and entering them into a Point of Sale (POS) terminal, the customers enter their own orders with one or two employees standing by to assist those who might need assistance. With 2 or 3 employees that assemble the orders and 2 at Back-of-House doing the cooking and/or preparation of the food items. This style of service significantly reduces the amount of concession staff needed to run the stand.

Order entry could be at the front counter, as noted above, or at kiosks out on the concourse or even through the customers own mobile device through a customizable app. The apps are a great way to connect to the customer, reminding them of all the great food options that are available, but also a way to showcase special items or special prices to draw the customer in.

The Order/Fulfill model usually includes Self-service soda stations throughout the concourse, where customers can make their own carbonated drinks, once again transferring the work to the customer, rather than having an employee doing the work. Note that when a customer’s order is filled it comes with empty soda cup(s) that the customer uses at the fountain machines. It is possible to use cups with microchips imbedded in them to prevent the customers from re-filling the cups multiple times.

A second style of service is the “Market” model, also known as Grab-n-Go. These Convenience Store styled spaces can be packaged only (bottles, snacks) or can be supported by a small cooking space to add burgers, fries, pizza, etc., to the menu. Customers walk through the space assembling their order and then check out through a self-serv POS and/or a manned POS depending on the needs of the facility.

There are several companies that offer security management of the market spaces, through cameras and weighted shelves, which are a convenience, but not required to operate a market style concession successfully.

A few of the companies that we have worked with, “Zippin” and Amazon’s “Just Walk Out” system have had a great deal of success in other stadiums and arenas.

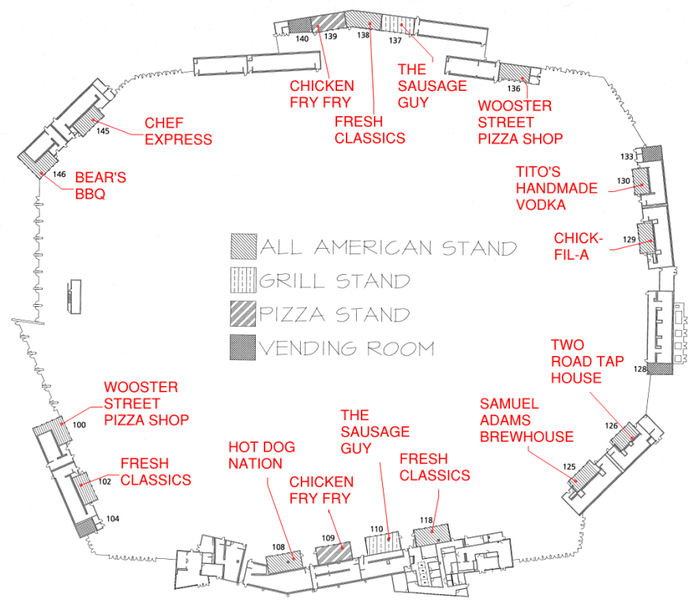
Looking at a plan of the main concourse and seeing all the food and beverage options offered throughout, it's hard to say which stands have had the greater success. Branded stands like Chick-fil-A and Wooster Street Pizza would definitely bring a legion of loyal fans. But local classis like Bear's BBQ would have a local following to suit.

Based on per-cap information from the operator, we would recommend identifying the 4 most under used concessions and consider re-configuring them into markets.

Also, based on those per-caps, we would recommend taking the 4 highest earning concessions and changing them to the order fulfill style of service to minimize the employees needed to run the concession.

This leaves the remaining 8 concessions that we recommend a refresh with new paint and flooring.

All concessions and markets would receive digital menu boards.



The foodservice spaces on the upper levels of the Press Box, while dated, are still in fair condition.

A refresh on the club concession would be good, and it already has a digital menu board. Additionally, something should be done to hide the beverage conduit as it comes down from overhead.

The club level bar seems to be run quite well, though the second side window doesn't seem to be used as bar service.

Someone has set up a nice screen partition with some plants to hide what appears to be a staging area for foodservice.

This particular area should really have a wall and door and permanent plumbing fixtures to keep issues with the Health Department at a minimum.

The rest of the foodservice spaces on the upper levels all appeared to be in good condition, although a refresh with new wall paint and flooring would be suitable for a facility of this age.

Note: The food service suggestions in this section have not been placed into the Capital Expense Matrix, as there are varying degrees of expenditure that could accompany any single recommendation (e.g. a simple Grab n Go market vs. an Amazon Walk Out Store). We recommend determining the vision for food service and then developing order of magnitude pricing.

Roofs

Summary

In the course of performing our visual observations of the existing roofs, and general observations while on-site, several other conditions were noted and photographed, that may not be directly related to the roof covering systems and are not included in our scope of work; however, it is our opinion that such items should be addressed or investigated. Some of these items were identified in the Structural section of this report (Phase 2), and we include them here for reference. The items are enumerated below, and presented in more detail, and with some very general recommendations, in the text and photographs of this section.

Potential Codes and Upgrades:

1. It was noted that some cables, associated with the lightning conductor/grounding system appear to be frayed, damaged, or loosely connected at junctions.

2. Safety/fall protection railings are in place near some pieces of rooftop mechanical equipment that are installed in close proximity to roof edges; however, there are a number of other similar situations where there is no safety/fall protection equipment in place. There are also areas where metal pipe stanchions are in place for such railings; however, no railings currently in place on the stanchions. It was also noted that there is no safety equipment whatsoever installed around any of the rooftop telecom equipment. Should any rooftop alterations occur, it will be important to identify requirements of the current building code.

3. A wood/plywood video camera platform, installed atop the main roof on the Tower Building, is deteriorated, and rotted nearly through in one area; the platform generally appears to be beyond its useful service life, and in need of replacement.

General Observations:

- The three exterior terraces (Tower Building, south elevation, Floors 3, 4, and 5) appear to utilize the same type of TPO single-ply membrane as the roofs on the building, and generally appear to be in fair condition. The terraces are not constructed above interior spaces.

- A long open/non-watertight vertical crack was noted in the EIFS exterior wall finish, above the Fifth Floor Level (Tower Building), potentially allowing moisture infiltration/ damage to the existing wall system and structural/interior components.

- Most areas of exterior wall construction on Buildings 1-9 utilize CMU masonry; some areas of the masonry walls are painted/coated; however, many areas of the masonry walls are bare/uncoated. It appears that, at least in some areas, moisture is infiltrating the porous masonry, causing damage to interior surfaces of the masonry, and deterioration to paint on interior faces of the walls. Moisture staining was also noted on exposed exterior faces of concrete and CMU masonry exterior walls on the Service Level.

- There are several areas of visible moisture damage on the underside of the cast-in-place concrete structural slab above the Service Level (structural slab for the Concourse Level deck). It generally appears that there are a number of breaches in the existing sheet membrane waterproofing system atop the structural slab. In our opinion, this condition will require additional investigation (including invasive testing), to more accurately assess the conditions, areas, quantities, and best possible remediation for this condition.

Based upon the existing conditions as summarized, it is recommended that the facility management staff procure the services of qualified expertise for thorough inspection/investigation/testing of the conditions as described above, and that appropriate remedial work (maintenance/repair/replacement) be recommended, designed, bid, contracted, and completed, to properly restore all such areas to watertight conditions and/or proper operation.

Description of Potential Upgrades

There are several items that were noted during a visual observation of the buildings/roofs, that may not directly affect the watertight integrity and/or the estimated service life of the roof covering systems; however, these items are more related to safety, watertight protection of the buildings and other construction, and/or general items that, in our opinion, require attention.

Lightning Conductor/Grounding System (Tower Building): The lightning conductor/grounding system is installed on/ above the roofs, and spreads extensively atop the building/ roof. It should be noted that, when the roof covering systems on the Tower Building are removed/replaced, the roofing construction project will have a major impact on the lightning conductor/grounding system. Much of the system that is installed on roof surfaces, perimeter parapets, and rooftop equipment, may need to be temporarily disconnected/ removed, to accommodate removal/replacement of the roof covering systems, and then be reinstalled.

It is recommended that the entire existing lightning conductor/ grounding system, facility-wide be inspected, as soon as possible, by a licensed lightning protection contractor, and any deficiencies be repaired until such time as the roof covering systems are removed/replaced. When the roof covering systems are replaced, reinspection of the lightning protection systems should be included.

Safety Railings/Fall Protection Equipment (Buildings 1-9 and Tower Building):

There are dozens of rooftop mechanical units, as well as telecom antennae/equipment mounted on the roofs, that require regular inspection/maintenance/repair. Many such pieces of equipment are located near roof perimeters. It was noted that there are fall protection railings between some rooftop units and the roof perimeters; however, there are many such units, as well as telecom equipment, that have no such fall protection provisions. It was noted that, generally, there is no fall protection equipment in place around the existing rooftop telecom equipment/antennae. Our understanding is that there are no violations regarding the building code under with Pratt & Whitney Stadium was constructed; however, any renovations or alterations in the future may trigger adherence to the then-current code.

Sections of safety railings are installed adjacent to some rooftop mechanical units, as fall protection (photos above/below); the railings are anchored to metal pipe stanchions that are flashed with EPDM membrane

There are also a number of areas where stanchions for fall protection railings are installed on the roofs; however, no railings are currently in place.

It was noted that some portable surface-mounted safety railings are installed on the main roof of the Tower Building. These railings utilize metal pipe rails that are inserted into heavy steel pedestals that are resting directly atop the roof membrane surface.

There are numerous rows of metal pipe stanchions, for anchorage of rooftop safety railings on the roofs (Buildings 1-9), that have no safety railings attached (photos above/below)

It is likely that codes and requirements for safety and fall protection associated with rooftop equipment access have been updated/changed in the time period since original construction of the facility.

Portable, surface-mounted safety railings are utilized in one area on the main roof of the Tower Building (photo above); the metal pipe rails are attached to heavy steel bases that rest directly atop the surface of the roof membrane (photo below)

Based upon visual observations of the roofs, including Buildings 1-9 and the Tower Building, there are numerous additional rooftop mechanical units and pieces of telecom equipment on the roofs that are installed in close proximity to roof perimeters, yet they lack any type of fall protection equipment. It generally appears that installers/maintainers of the rooftop telecom equipment have made little or no efforts to place any type of fall protection around their equipment.

Numerous rooftop mechanical units, as well as pieces of rooftop telecom equipment are installed relatively close to roof edges; however, they lack any type of safety railings/fall protection equipment

It is recommended that facility management contract the services of a qualified safety/design consultant in the State of Connecticut to inspect the roofs, project-wide to note existing conditions and to recommend all needed alterations and/or additions to the existing rooftop safety/fall protection equipment, to ensure that the facility is in full compliance with all current OSHA/Connecticut/local building safety codes and requirements.

Video Camera Platform (Main Roof – Tower Building): A wood-framed platform, with plywood decking is constructed atop the main roof (Tower Building), to elevate and support video cameras above roof level. The plywood decking on the platform is somewhat rotted/deteriorated, and is rotted almost completely through in one corner, and the platform generally appears to have reached the end of its useful service life.

Summary List of Upgrades

1. Have all existing lightning conductor/grounding systems (facility-wide) thoroughly inspected by a qualified lightning protection contractor, and perform all necessary repairs to the system, to ensure proper operation of the system, and that the system is in full compliance with all applicable building codes, and state/local regulations.

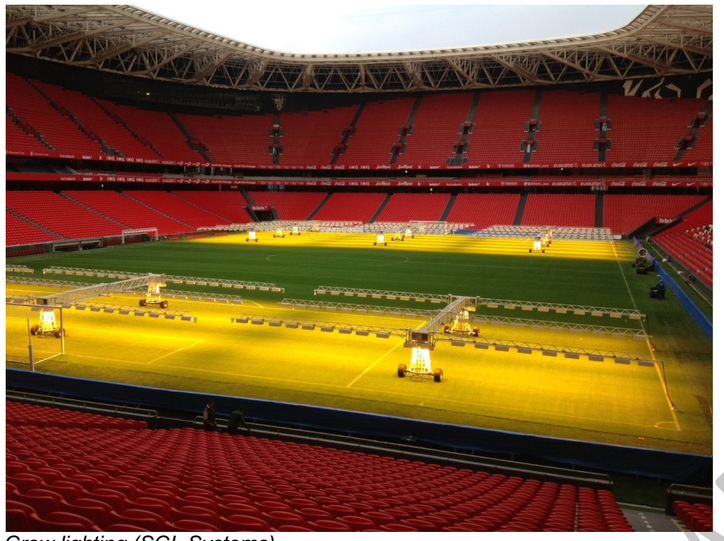
2. Consult with a qualified safety/fall protection design professional to inspect all buildings/roof areas; and if required, design/ install code-compliant fall protection systems surrounding all rooftop mechanical and telecom equipment, to fully comply with all OSHA/Connecticut/local codes and regulations.

Field and Site

Playing Field/Perimeter Track

Playing Field Grow Lighting

To promote healthy and stable turf growth in shaded areas that typically occur at the facility through most of the year, it is recommended that grow lighting be purchased and utilized. Grow Lighting provides both UV rays and heat to the playing surface, promoting root growth and plant health in areas that do not receive adequate sunlight. This is the case at Rentschler Field on the south and east sides of the current playing surface where the tower and south bleacher seating shade out much of the surface for much of the year.



Grow lighting (SGL Systems)

Playing Field Rootzone Warming System

To extend the growing season of the turf, it is recommended that a subsurface playing field rootzone warming system be installed. The implementation of this technology will allow for more events to be held in the colder months of the year on a stable surface and will provide some snow melting capability. There are two common types of rootzone warming systems utilized in major sporting leagues across the world today.

The first, and most common, is a hydronic system in which PEX tubing is placed within the rootzone at 6” center spacing. Heated glycol flows through the pipes from a dedicated boiler, thus heating the rootzone. The second, less common type, is an electric tape system in which electric tapes containing heating elements are placed at 6-inch center spacing. Both of these technologies will come with significant spatial requirements within the building for the associated equipment.

Hydronic rootzone warming system installation – Allianz Field – MNUFC

Subsurface Aeration

To compliment the Rootzone Warming System and promote healthy turf growth, it is recommended that a subsurface aeration system (SubAir) be accommodated with the design of the playing field subdrainage system. This requires subdrainage laterals spaced closer together, as well as enlarged collector piping to operate efficiently. The implementation of this technology will complement the rootzone warming system by forcing the heat through the rootzone, providing more efficient heating. This technology will also provide subsurface aeration in the event the playing surface is covered (i.e. during a concert). However, this will also require significant spatial requirements within the building for the associated equipment.

Grounds Facility

There is a lack of storage and office space for grounds staff within the existing facility. Existing offices are located within a break room of the main office space, and a lack of storage space has required the use of “offsite” shipping containers to store field equipment. Both could be resolved should a satellite grounds dedicated office/storage space be constructed where the shipping containers are currently located. This would also free up the existing grounds storage space for the implementation of rootzone warming and subsurface aeration equipment, should those options be desired.

Subsurface Water Collection

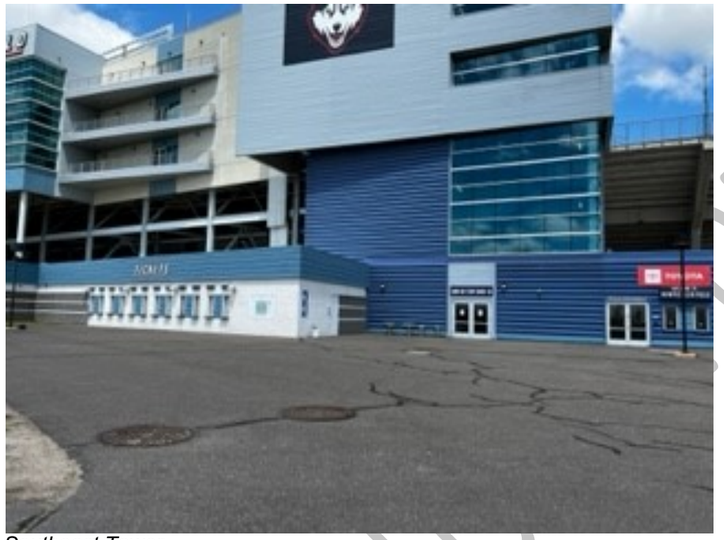
There is potential for a subsurface water collection and storage system that could be utilized for irrigation purposes for site landscaping. This system would capture stormwater runoff from the playing field surface only and utilize it as the main source of irrigation water for landscaping on the exterior of the building.

Site Landscape/Hardscape

Site Landscaping is non-existent. The entire site, particularly those areas directly adjacent to the stadium, are turfgrass areas that have become overrun with weeds and trampled from pedestrian and vehicular traffic. There are no trees adjacent to the stadium, nor in the parking areas, giving the site the appearance of a barren landscape of weedy turfgrass and pavement.

The site pavement is all asphalt pavement that is significantly deteriorated. Much of the pavement is cracked and needing replacement.

Southeast Entry



Southeast Tower

View of west stadium from parking

Southeast ticket windows from road

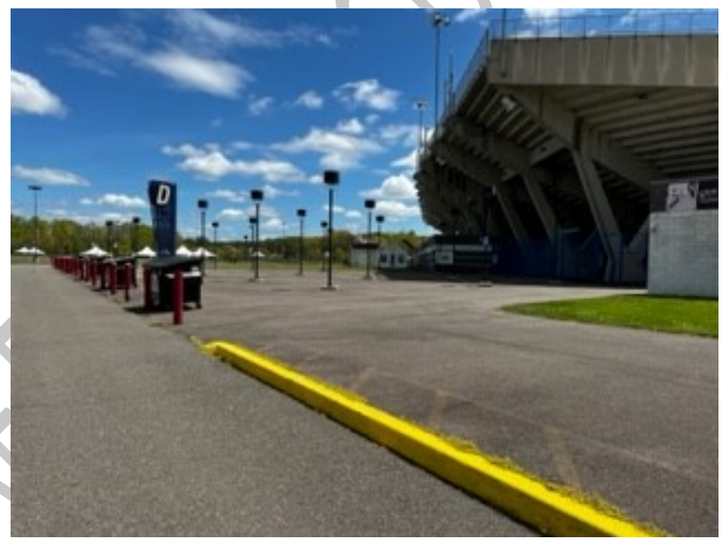
VIP Entry

West side of stadium from parking

Southwest Entry

Northwest Entry

West side of stadium



Northwest Entry

North side of stadium

North side of stadium

Typical parking lot landscape

Typical parking lot landscape

Northeast Entry

Typical parking lot landscape

Typical parking lot landscape

Typical parking lot landscape

Typical parking lot landscape

Recommendations:

It is recommended that ornamental plantings be added to the perimeter of the stadium to provide a more aesthetic experience upon approach, and while walking around the perimeter of the building. See Appendix B. Ornamental plantings should especially be incorporated at premium entries. As to not overwhelm the site and to provide space for outside vendors, some turf areas should remain. Turf areas should be reestablished with new sod.

Alumni Center Entry - Canvas Stadium – Colorado State University

It is recommended that all ornamental planting areas and turf areas directly surrounding the building be irrigated with a high-efficiency automatic irrigation system.

We also recommend that shade trees be added within the parking areas and along access drives as to break up the current wide-open space and to highlight the main vehicular paths.

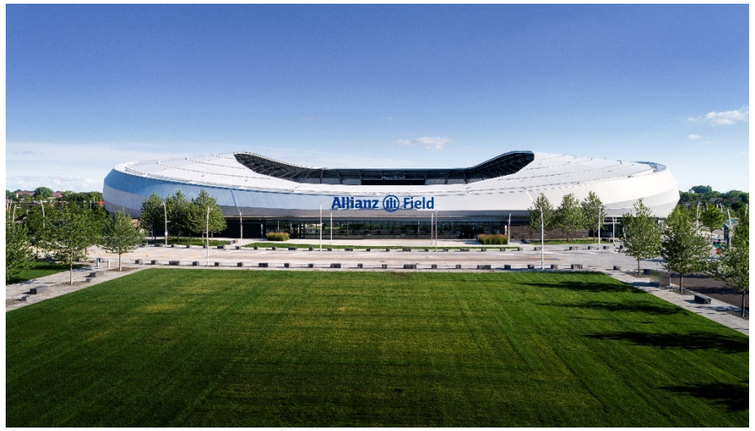
Stadium Perimeter Hardscape

We recommend that pavements around the perimeter of the stadium be replaced with decorative concrete to differentiate vehicular from pedestrian traffic and provide a more appealing entry into the stadium.

Allianz Field – St. Paul, MN

Exterior Pregame Area

The wide open, flat nature of the site provides great possibility for the creation of a pregame lawn space. These spaces provide for an area for pregame fan amenities, as well as activation of the site on non-event days with activities such as movie nights and festivals.



Great Lawn – Allianz Field – St. Paul, MN

Decorative Bollards

The current concrete filled pipe bollards could be replaced with more decorative bollards or natural stone blocks, yet achieve the desired level of security. This would provide a more aesthetic experience when entering the stadium.

Decorative Bollards – Arrowhead Stadium – Kansas City, Missouri

Stone Block Barricades – Kaufmann Stadium – Kansas City, Missouri

Seating

Bench style seating and landscaping could be incorporated into the larger plaza spaces to provide a more pedestrian scale to the spaces. There is a wide array of seating options available ranging from pre-manufactured metal benches to natural stone or precast concrete materials.

Seating at building entry – Canvas Stadium – Colorado State University

Streetside Monument Signage

Currently, there is no signage identifying the entry points to the stadium site. While most facilities provide their own visibility with just the building, Pratt & Whitney Stadium cannot, due to its location being set back from major roads and the surrounding landscape screening the view. Monument Signage could be added at each point of site entry to enhance the visibility of the facility from the exterior, and digital signage could be incorporated to share information regarding upcoming events.

Example Monument Signage – Scheels Overland Park Soccer Complex – Overland Park, KS

Example Monument Signage – Garmin Olathe Soccer Complex – Olathe, KS

Stadium Perimeter Wayfinding Signage

There is also a lack of wayfinding signage on the perimeter of the stadium. The incorporation of wayfinding signage could make the site more navigable.

Example Wayfinding – Allianz Field – St. Paul, MN

Example Wayfinding – Toyota Field – Madison, AL

Site Potential

The nature of the overall site is spacious and relatively flat with many open areas that are currently used for gameday/event parking. The open, sprawling nature of the site yields itself as prime development for a multi field multipurpose youth sports complex. Natural grass playing fields could still serve as gameday/event parking, while providing an additional revenue source throughout the year. With the close proximity to major New England cities, and a lack of larger regional sports complexes in the area, it is our opinion that this option may be worth exploring.

Because this concept could take into account many variables, it is not included in the Capital Expense Matrix.

The following images are for informational and reference purposes.

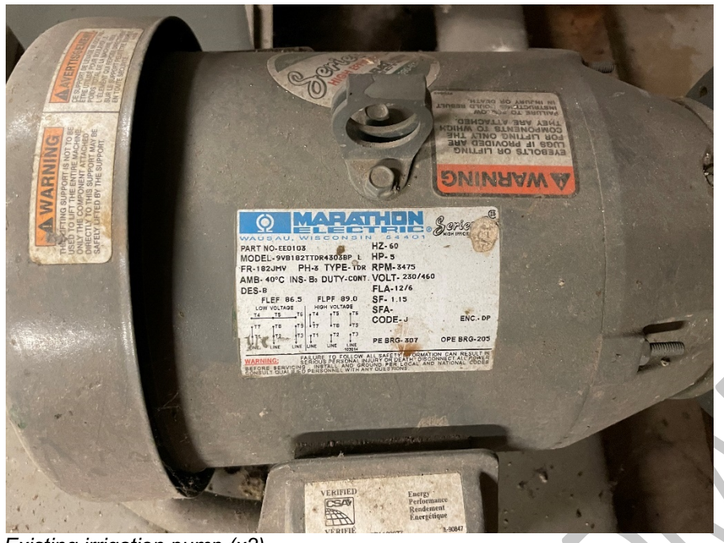

Existing goal post sleeve


Existing goal post sleeve enclosure


Existing subdrainage outfall to vault (south end)


Existing subdrainage ejector pump vault

Existing drainage outfall/ejection piping

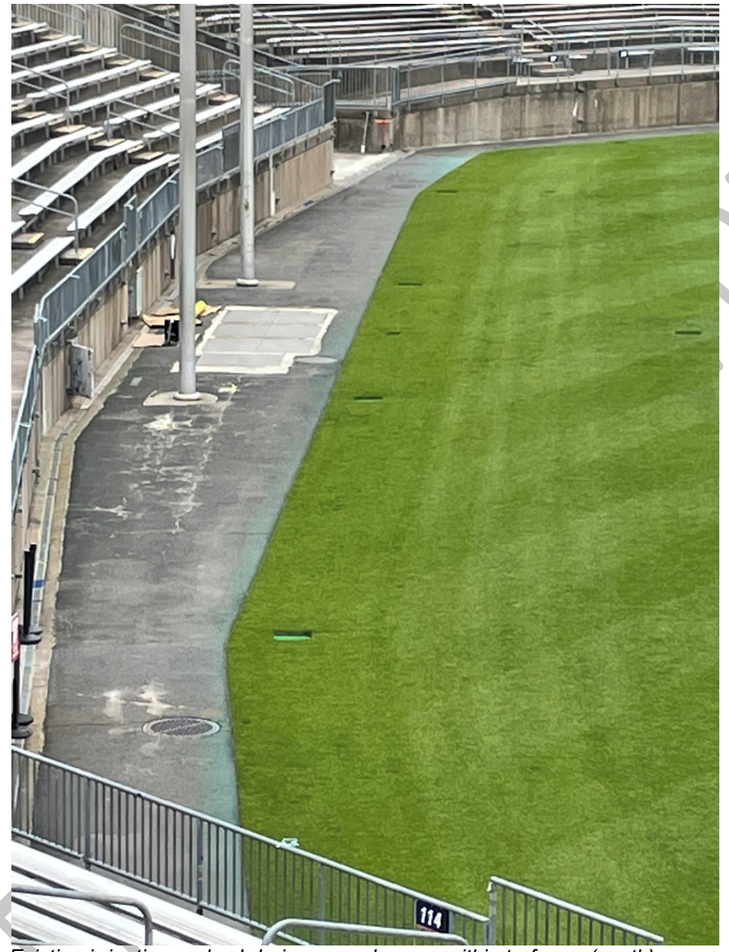


Existing irrigation pump (x2)

Existing irrigation pump

Existing irrigation and subdrainage enclosures within turf area (north)

Existing irrigation and subdrainage enclosures within turf area



Existing irrigation and subdrainage enclosures within turf area (south)

Existing irrigation and subdrainage enclosures within turf area

Existing subdrainage cleanout within turf area

Existing satellite grounds storage area

Existing netting post footing

Vertical Transportation

There are no code or upgrades required

Structure

There are no code or upgrades required

Other Information

Computerized Maintenance Management System (CMMS)

Public assembly facilities that are well maintained and upgraded when appropriate remain contemporary and competitive with their local and regional rivals. On the other hand, poorly maintained facilities have a negative impact on the operator and owner's ability to attract regional and national events that have large economic impacts.

Well-maintained facilities do not happen by accident and require an actionable plan, resources to implement the plan, and staff with proper skill sets to execute the work, which includes tracking and capturing data, transferring knowledge, and implementing training and professional development.

The plan should have a set of objectives on how the operator wants to execute preventive maintenance for the facilities, and the following items should be part of the overall plan:

1. Develop policies for preventive maintenance (which would start with a list of equipment by facility)
2. Utilization of a computerized maintenance management software (CMMS)
3. Develop a set of checklists for equipment maintenance
4. Establish who does the work
5. Establish process for employee feedback
6. Establish quality assurance process to ensure work is actually being done
7. Establish performance metrics for department employees and contractors

Preventive maintenance (PM) is not an attractive or high-profile function, and decisions to defer preventive maintenance are made every day by well-intentioned people when prioritizing resources. More resources are typically allocated toward revenue generation. Poorly maintained systems and equipment typically results in more rapid, untimely breakdowns, expensive emergency service calls, and higher utility costs. Proper preventive maintenance procedures require investments in staff and materials; however, an effective program will save the operator money over the life of the facility by limiting repairs and replacements, therefore avoiding costly breakdowns and accelerated equipment replacement, and facilitating lower utility costs.

Employees tasked with executing preventive maintenance require training and updating on the systems they are to maintain. Mechanical, electrical, plumbing, roofing, telecommunication, and other facility systems require specific training that is ongoing, and this takes a commitment from the employer and employee in the investment of time and financial resources. Well-trained employees and a continued commitment to maintaining certification in their respective disciplines will lay the foundation for adherence to the preventive maintenance program. As technology advances, the commitment to training will ensure that employee skills do not become dated and obsolete.

One of the most critical aspects for effective asset preservation is the utilization of a computerized maintenance management system (CMMS) that allows for the implementation of preventive maintenance along with the necessary tracking and budgeting for preventive maintenance. Daily work orders can be produced through the system, employee hours tracked, and materials required to perform preventive maintenance can be identified and managed. The system can assist the operator administratively as it can also be used for contract and insurance tracking, purchase orders, inventory ordering and scheduling.

Currently, there is no CMMS at Rentschler Field and all work is either manually documented or stadium management relies on the work tickets from service providers.

VSG recommends that the CRDA and Spectra assess the viability of a CMMS for utilization at the stadium or incorporating whatever might be used at XL Center.

The following CMMS programs are currently in use at other similar public assembly venues and are reasonably priced.

1. HippoCMMS by IOffice+SpaceIQ - https://hippocmms.iofficecorp.com
2. Dude Solutions - https://www.dudesolutions.com

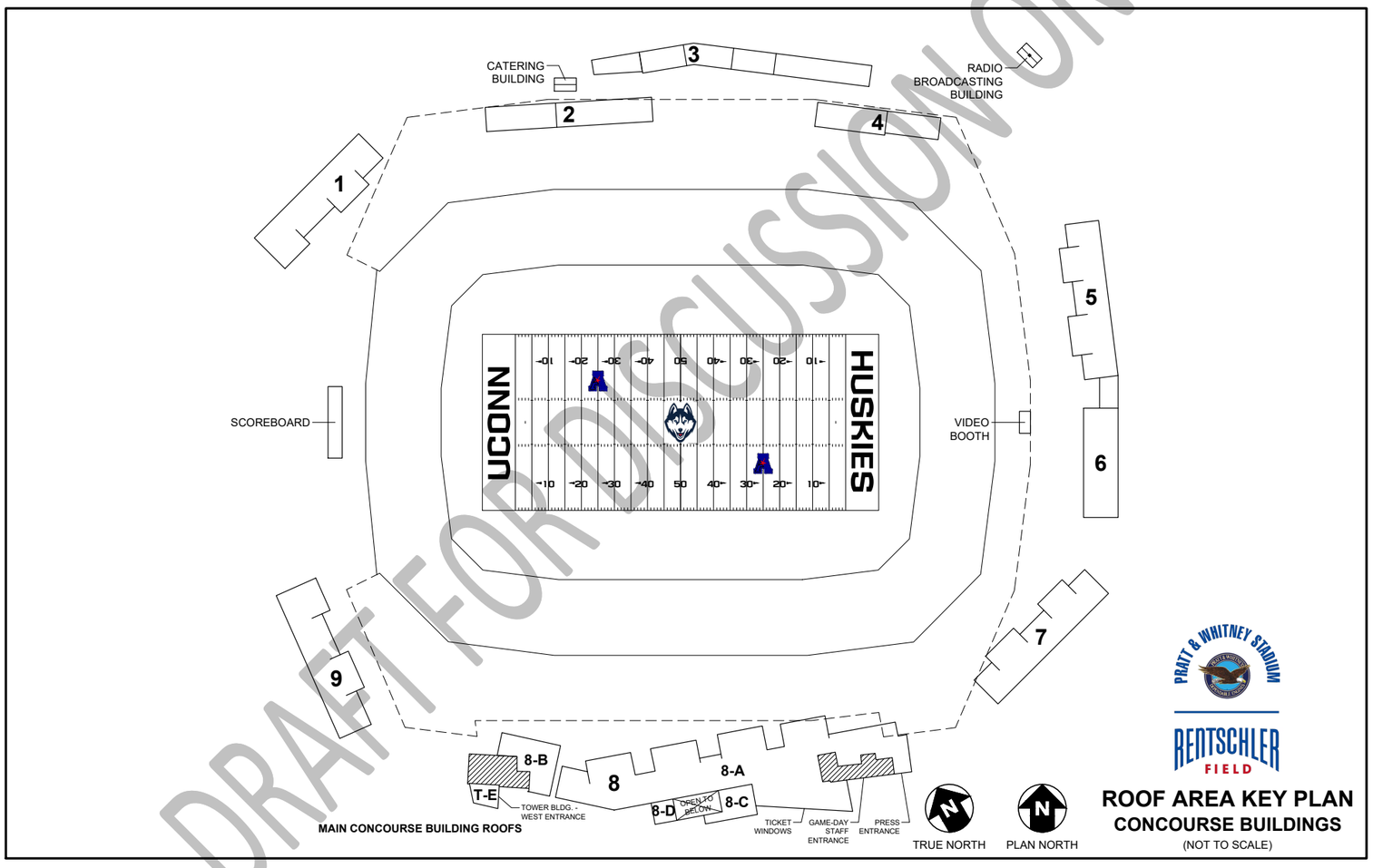
Both firms will provide an on-line demonstration of their product and allow you to ask questions about its functionality.

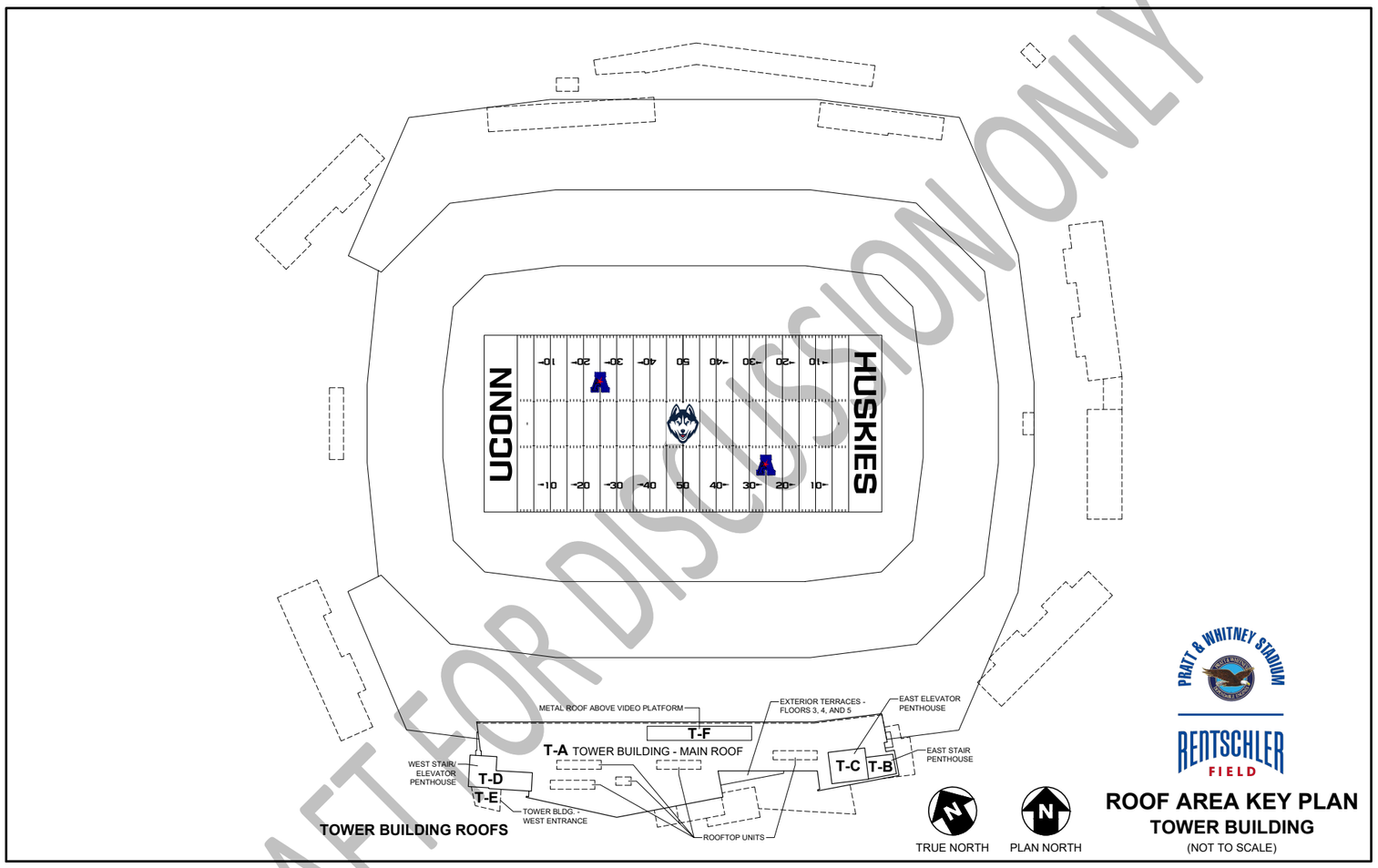
Higher end products with multiple modules include:

1. AwareManager https://www.buildingengines.com/facility-and-venue-management/
2. 24/7 Software https://www.247software.com

Utilization of the CMMS may require administrative support to ensure equipment data base is kept up to date and that the flow and assignment of work orders is managed efficiently. Ideally, the personnel assigned to executing the work generated from the CMMS would not be tasked with the administration of the CMMS program.

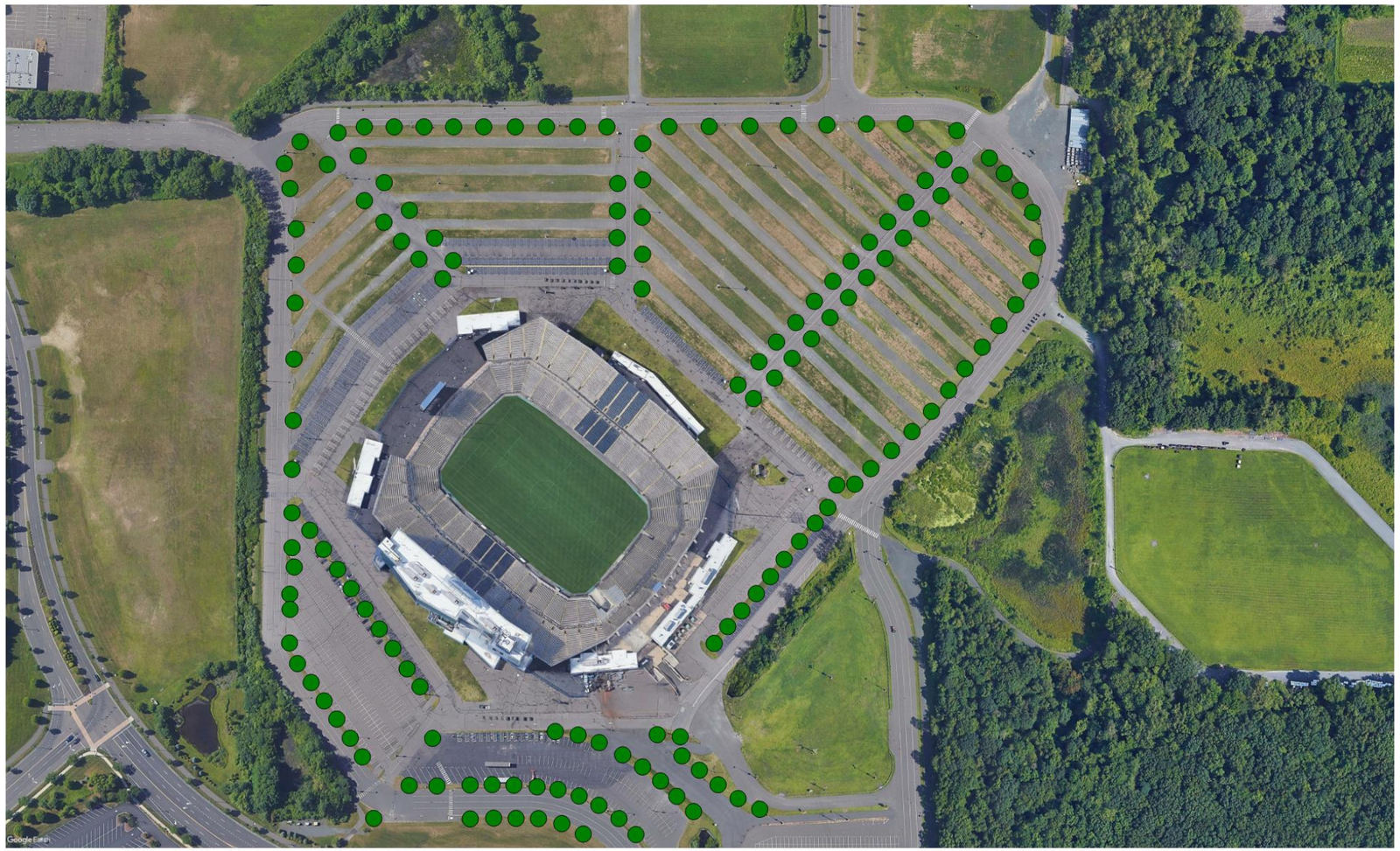
APPENDIX A





APPENDIX B

Stadium Adjacent Landscaping



Parking Lot Trees