NW Corridor Transit Planning

Union Station Existing Conditions Technical Memorandum

(Physical and Operational Assessments)

Capitol Region Council of Governments

October 24, 2007

Prepared in cooperation with the U.S. Department of Transportation (including its participating agencies) and the Connecticut Department of Transportation. The opinions, findings and conclusions expressed in this publication are those of the Capitol Region Council of Governments and do not necessarily reflect the official views or policies of the Connecticut Department of Transportation and/or the U.S. Department of Transportation.

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EXPERIENCE | Transportation

Executive Summary

As part of the initial evaluation efforts associated with Part 2: Union Station Planning portion of the Northwest Corridor: Transit Planning project, this report is the product associated with Task 2.1.1: Physical Assessment of Union Station and Task 2.1.2: Operational Assessment of Union Station. The goals of these tasks were to provide a background about the physical and operating conditions of Union Station for use in further analysis of utilization of Union Station for increased transit operations and as a hub for transit-oriented development.

The on-site assessment of the station was completed over a two day period from Wednesday, July 25th to Thursday, July 26th, 2007 by a team of four specialists from TranSystems:

- Jefferson Reeder, PE: structural components
- William Glassmyer, PE: mechanical components
- David Lin, PE: electrical components
- Bethany Long: operational review and architectural components

The on-site assessment involved a visual inspection only and did not include any non-destructive or destructive inspection techniques. No engineering analysis was performed to determine load carrying capacity of structures, operating efficiencies of equipment / components, or detailed building code analysis / review.

As part of the on-site inspection, informal interviews were conducted with the Greater Hartford Transit District as the building owners and several tenants during the walk-through. In addition, any extant building plans and reports were provided to the assessment team for their use.

The total structure was considered as three main parts: the original Union Station including Great Hall and tenant areas; the Ground Transportation Center; and the Amtrak loading platforms. Union Station and the Ground Transportation Center are owned by the Greater Hartford Transit District (GHTD) and Amtrak owns the loading platforms (trestles) via air rights. Following are the main findings of the analysis:

<u>Access and Circulation</u>

- Access to and through the structures is good and predominantly compliant. An accessible path is provided throughout all structures with the exception to an area on the 2nd floor north wing of Union Station, which is not currently leased. Minor upgrades to the visual and auditory devices should be made on the elevators whenever major improvements are planned. The accessible path between the Great Hall and the Ground Transportation Center could be enhanced with better signage.

- Accessible architectural features are generally compliant but could be improved with a renovation of the Ground Transportation Center waiting area to incorporate accessible counters, seating areas, and fully compliant public phones. One area of concern was with Amtrak's operations on the loading platform which had passengers loading and unloading along an area without the tactile warning strip.

- Stairwells from the Amtrak platform to grade show significant potential for structural deficiency and should be replaced immediately.

- Private bus services vehicles do not pull up to a curb, posing difficulties for access into those vehicles. Re-configuration of the bus bays to allow buses to pull up to the curb may be considered to improve accessibility.

- The existing concrete pavement on Spruce Street is showing significant failures which would be expected from its usage and lifespan. This area will need to be improved and replaced with new concrete. At that time, the drainage problems in the area should be addressed. It would be advisable to complete a hydraulic analysis of the water and redesign the current trench drain with the pavement replacement to better accommodate significant storm events.

Architectural Components

- Security was good throughout the structure. All access points are observed through CCTV security cameras. The entire structure is protected by sprinkler and fire alarm systems. The security fence to restrict access to the unused western trestle has a gate which should be closed and secured.

- Ticket counters and public phones are not fully ADA compliant, though a wheelchair user can receive service at the counters as well as use one of the public phones.

- An area of major safety concern that needs immediate attention are the emergency egress stairs from the 2nd level Amtrak platform to the ground and the platform itself. These stairs are an integral part of the emergency egress route from the 2nd and 3rd level tenants in Union Station. They demonstrate significant rusting and it is evident that the load carrying capacity has been compromised. On the platforms themselves, there are areas in which a person could step off and fall to the ground below or the roof of the Ground Transportation Center. Several areas have deteriorating wood and need replaced. These repairs are Amtrak's responsibility and the GHTD have made them aware numerous times of the concerns.

- Interior finishes within the Great Hall and tenant areas of Union Station are fair to good. The Ground Transportation Center is dated and a bit worn. Interior renovations would be recommended for improved appearance and increased passenger convenience / comfort. This includes up-dating restrooms.

- Exterior components were overall good. The EPDM roofing over the Great Hall should be inspected for some minor observed cracks and patch repaired as required. Future major improvements may consider the reglazing of the windows in the Great Hall with low-e glass and restoration to operating status to reduce heating and cooling costs. The windows could also be restored to allow them to be opened, reducing the need for cooling during spring and fall seasons.

- The skylights have leaking problems and closer inspection would be required to determine the exact nature of where the flashing was failing. If allowable by historic preservation regulations, replacement of the single slope skylight with a pitched skylight that matches the roof tile clad pitch might also avoid leaking problems.

- The exterior pavement at the bus loading area is showing significant fatigue and should be replaced. At that time, it is recommended to conduct a hydraulic analysis to redesign the drainage system to minimize flooding that currently occurs.

Structural Components

- With a few localized exceptions, Union Station is in good structural condition. The Brownstone walls show only minor deterioration and no major cracking. Steel roof framing appears to be in good condition where accessible for visual review. Staining of some of the concrete roof deck and interior masonry walls indicate some past or current water or moisture penetration. These should be investigated more thoroughly.

- Some deterioration of mortar joints was observed at ground level on the west side of the building, directly under the train platform. Those should be reviewed further and repaired as appropriate.

- The trestle structure supporting the Amtrak platforms and rail lines is in variable condition. Some of the exposed portions exhibit significant rusting to the point where there is the potential for the load carrying capacity to be compromised. Some bracing angles are rusted through or missing. Further inspection and analysis using destructing and non-destructive testing should be undertaken to determine the repairs. This would be an area of Amtrak responsibility, not GHTD. According to GHTD, the City of Hartford's Fire Marshall and Building Inspectors offices have also noted these deficiencies and have notified Amtrak.

- The Ground Transportation Center has significant rusting on the bases of the laced columns supporting the Amtrak trestle and platform above. This appears to be from the pitch pans and roof drains that collect the water from the platform above. Repair should be made to the pitch pans to stop the leaking and associated damage.

Electrical Components

- All major service and distribution equipment appear to be in sound, working condition. Some outdoor conduits are exposed and should be replaced. All temporary wires should be replaced. It is recommended to place a ventilation system within the main electrical room to diffuse the heat generated from the step-down transformer to prolong the life of the electrical equipment.

- The exterior and Great Hall lights are continuously on. It is recommended to install a sensor to have these fixtures only on when light levels require.

- In the future, it may be warranted to consider installation of occupancy sensors, scheduled shut-offs, and multi-level switching in areas to reduce energy costs during any renovation project.

Mechanical Components

- The major HVAC equipment is reaching the end of their natural life cycle and should be replaced. The boilers are currently within the capital grant improvements budget for replacement. The chillers should be considered for replacement within the next grant cycle.

- The installation of BTU meters at the individual terminal devices would allow for the individual metering of tenant spaces. With computer monitoring, a separate usage by tenant could be determined.

- Piping system (steam, hot water, chilled water system) including pipe and duct insulation needs replacement.

- While the water chillers have been operating satisfactorily with normal maintenance and repair, their useful service life has been seen. The units could possible operate for four to eight years. A replacement schedule should be created for this system.

- The water heater is reaching the end of its useful life and should be scheduled for replacement. Much of the piping for all systems is deteriorating and should be anticipated as an on-going maintenance issue. The septic system was reported to sometime clog and it is recommended that it be rodded (cleaned) before any replacement is considered.

Terminal Capacity

- Overall, Union Station offers excellent abilities and the capacity to incorporate increased transportation services.

- It is seen as feasible to incorporate local transit service (CTTransit) on either Union Place or Spruce Street. It may be possible to open up some of the intercity bus stalls; however reconfiguration to a curb style access would be recommended.

- Passenger waiting capacity may be increased through higher utilization of the Great Hall by connecting paging systems or by a reconstruction of the Ground Transportation Center lobby.

- Utilization of space is excellent with the exception of two areas. The un-leased area on the 2nd floor of the north wing could be made available for general lease by incorporating a hallway on the west side through the current area leased by Capital Workforce Partners. Additional space can be gained in the Ground Transportation Center through re-organization of the tenant spaces, especially Amtrak.

- No bicycle facilities currently exist at Union Station and they should be incorporated into any future planning.

Historical Designation Considerations

- Union Station is on the National Register of Historic Places. As such, significant modifications to the exterior appearance, Great Hall, and overall functionality should be avoided. The Ground Transportation Center and any storefront additions are not historic and can be modified as required.

- Any planned improvements should be discussed at the conceptual level with the Connecticut Trust for Historical Prevention to confirm compliance with national and state regulations.

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1.0 GENERAL BACKGROUND

1.1 Building History

The original Hartford Union Station building was constructed in 1889. There is a discrepancy between the information provided in the National Register and the Connecticut Trust as to the architect. The National Register lists the architect, builder, or engineer as George Keller, an influential architect from Hartford. The Bushnell Park website notes that George Keller was the impetus for the grade-separated design for the station, unique at its conception. The Connecticut Trust for Historic Preservation cites Shepley, Rutan, and Coolidge – the firm formed out of the practice of H.H. Richardson – as the architect. In design and style, the building harkens to both architects and in either manner is a significant building based on the architect and style.[1]

In 1914, a fire destroyed the interior structure of the building. From historical photographs, it appears that the building was rebuilt immediately after the fire, although the original front gables were eliminated. As much as practicable, it appears from photographs and visual inspections that the exterior Brownstone walls of the building were salvaged and used again in the rebuild.

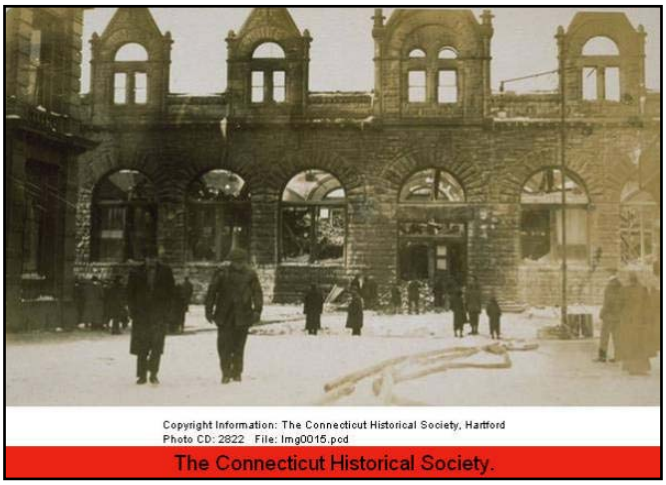

Photo 1 – Historic Photo of Union Station after 1914 Fire.

1.2 Existing Site Environment

The current 300 foot long station is owned by the Greater Hartford Transit District (GHTD) and oriented longitudinally in the north/south direction and is bounded by Union Place on the east, Spruce Street on the west, Church Street on the north and Asylum Street on the south. The primary façade for the original Union Station is facing Union Place at the intersection of Allyn Street. (See Figure 1 – Existing Site Map.)

The station features intercity bus service on the west side of the building, immediately adjacent to and west of the Amtrak platform trestle structure and the Ground Transportation Center, a 1985 addition to the western portion of the building to facilitate train and intercity bus service. There are currently 15 diagonal bus slots along the west side of the building. The intercity bus coaches enter and exit the bay area from Spruce Street. A canopy covering a passenger drop-off area separates the bus bays from Spruce Street. Located across Spruce Street to the west is a surface parking lot also leased (from the State of Connecticut) by the GHTD. Auto traffic patterns are bi-directional around the facility with the exception of Union Place, which has north-bound traffic only.

The original station was served by four railroad tracks located on the west side of the building. Currently, there is one active track (second line west of the station) which is used primarily by Amtrak and occasionally by Class 1 freight railroads. The rail lines are elevated approximately 25 feet above street level to avoid at-grade crossings at adjacent streets.

[1] National Register of Historic Places, Building #75001932; www.bushnellpark.org/content/george_keller.asp; Connecticut Trust for Historic Preservation, Union Station Project Detail.

Currently, CTTransit busses do not directly serve the facility through the Ground Transportation Center. Four routes pass along Asylum Street with bus stops at the intersection of Asylum and Union Place. The Star Shuttle currently turns north down Union Place from westbound Asylum Street, stops at the intersection of Union Place and Allyn Street, and continues back eastward on Allyn Street.

Photo 2 – Front Elevation Union Station (facing west)

Photo 3 – Intercity Bus Bays (facing south)

Photo 4 – Intercity Bus Bays & Passenger Drop-off Along Spruce Street (facing north)

Photo 5 – Spruce Street Parking Lot (facing west)

Photo 6 – Amtrak Train Entering Station (facing south)

Photo 7 – Amtrak Passenger Platform & View of Elevator Vestibule (facing south)

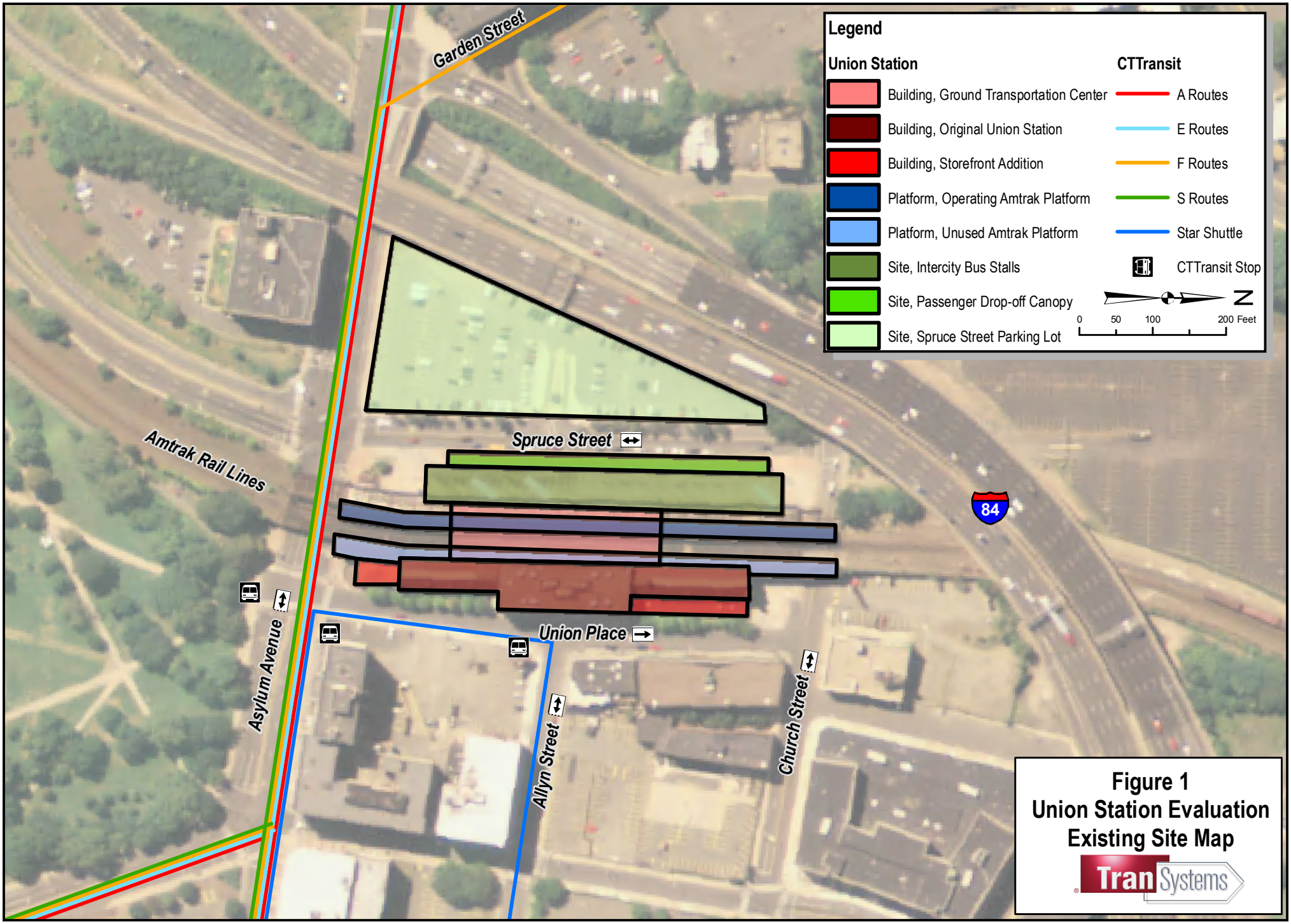

Figure 1
Union Station Evaluation
Existing Site Map

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1.3 General Building Composition

The original Union Station structure is comprised of three distinct elements: a central three-story, flat-roofed portion containing a two-story lobby area known as the Great Hall; and two narrower three-story wings on the north and south featuring steeply sloping roofs clad in roof tiles. An attic, containing numerous air handling units and other mechanical elements, is located in the Great Hall portion of the building. A mechanical room is located in a partial basement located below the northern wing and another small basement room is located on the extreme southern portion of the building. Trains and bus transit services are accessed through the Ground Transportation Center on the west side of the Station.

All rail lines were supported by a steel-framed platform or "trestle" structure. In addition to supporting the rails, the framing supports the wood-framed passenger platform adjacent to the station and a wood-framed/concrete central platform. The framing extends to the north and south for the length of the station and terminates at the stone piers of bridges crossing Asylum and Church streets. Amtrak owns and maintains the steel trestle structure and has air rights above this structure. The GHTD has ownership rights below the trestle structure.

There have been several additions and modifications made to the station since it was reconstructed in the early 1900's. Some of the major additions or modifications are listed below:

- Construction of a 16,000 square foot building addition, the Ground Transportation Center, under the rail line. This building was constructed on grade and is located approximately 5 feet below the elevation of the main level of the station. The steel columns of the rail trestle structure penetrate the roof of the addition. This addition was constructed and is maintained by the GHTD.

- Construction of a new steel-framed platform canopy structure on the central platform. This structure, which extends the entire length of the station, provides a cover for the access stairs to the Amtrak area below and the main station building. This canopy was constructed in 1985 and is owned and maintained by Amtrak.

- A general interior renovation in 1965 after the building changed ownership. The renovation included non-structural items such as cleaning and painting.

- Construction of a steel-framed storefront extension, located on the south end of the building.

- Construction of a steel-framed storefront expansion along the north wing on the east side of the building. Originally retail space, it is now occupied by the GHTD.

- Construction of new glass-walled office space on the north and south ends of the Great Hall. The new space is at both the first and second floor levels. The steel-framed space is free-standing with limited connections to the original station structure.

- Miscellaneous tenant improvements within the interior including walls, ceilings, floor finishes, lighting, and mechanical system alternations.

- Addition of steel framing in the attic, located over the central lobby, to support new air handling units.

- Installation of a steel-framed corrugated roof system north and south of the Ground Transportation Center to allow for protected parking, passenger access to buses, and certain service operations under the trestle.

Particular building components are discussed in further detail later in the report.

1.4 Existing Occupation / Leasing Arrangements

The following Figure 2 – Existing Usage Plan schematically diagrams the existing leaseholders within Union Station, including the Ground Transportation Center.

1.4.1. First Floor – Union Station

The first floor of Union Station has two main tenants and the Great Hall public space. Hot Tomato's, an established and popular local restaurant occupies the entire south wing, steel-framed south extension, and both first floor levels of the office space constructed within the Great Hall. In addition, they host large functions within the Great Hall. Hot Tomato's has been a long-time occupant and have made significant tenant improvements and renovations to their space.

GHTD, the building owner, occupies the entire north wing including the steel-framed storefront extension towards Union Place. The space is typical for most interior tenant improvements with drywall partitions and drop ceilings. There are some grade differentials within the tenant space which have accessible ramps within the corridors. A conference / board room is located in the storefront addition and is used for public events.

Between the two tenants is located the Great Hall, which was the original lobby and ticketing area for Union Station. As indicated previously, past renovations included the installation of a two-story glass-walled office structure at either end. Functionally, the space serves as general circulation for all tenants and the primary passage way between Union Place and the Ground Transportation Center. On occasion, the area is blocked off to general public access for special events or benefits.

1.4.2. First Floor – Ground Transportation Center

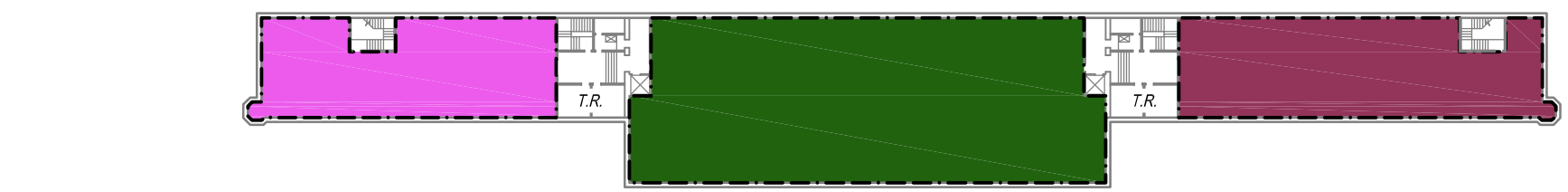
The first floor of the Ground Transportation Center is centered on the main waiting lobby for intercity bus and Amtrak passengers. This public area includes ticketing counters, food and newspaper vendors, security, an ATM machine, and access to the public toilet rooms and pay phones. The space includes benches for waiting and stairs / elevator to the train platform level.

On the south side of the public area, several tenants are incorporated. Both Peter Pan, which handles all intercity bus ticketing, and Dunkin Donuts have open counter access to the lobby. Additional space is provided within the area for Aquastone Graphics and Sign Wizard.

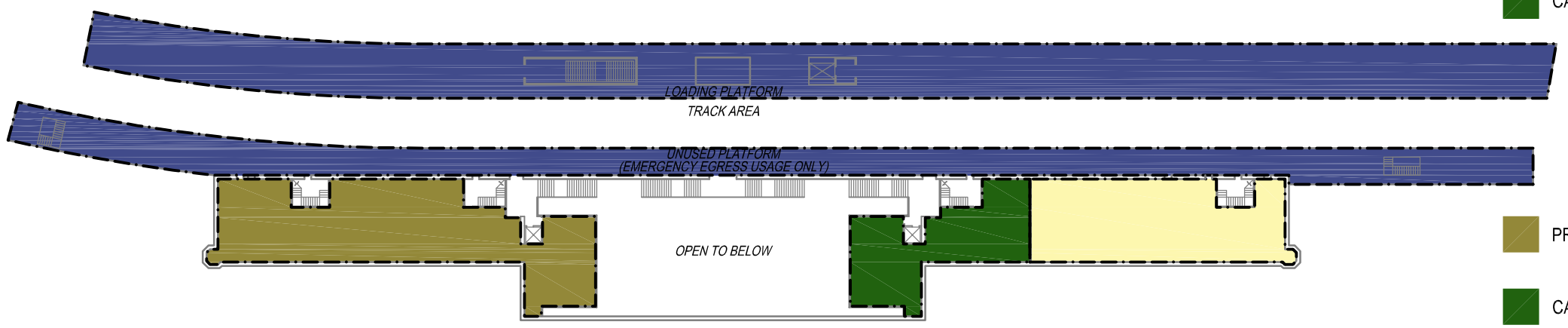
On the north side of the public area, the primary leaseholder is Amtrak. They have an open ticket window to the lobby. In addition, they have several storage and employee welfare areas located in non-public spaces. Recently the Amtrak area was divided to allow for the inclusion of Subway Restaurant. Subway also has a counter area to the public lobby.

1.4.3. Second Floor – Union Station

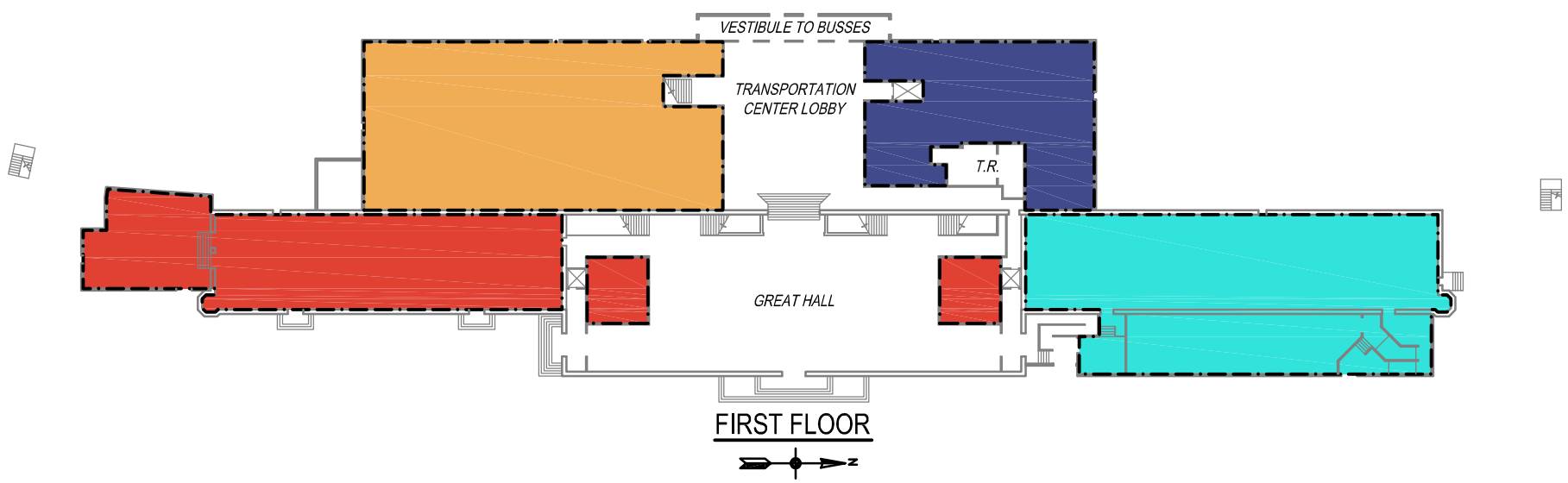
The second floor of Union Station is comprised of two wing areas as the Great Hall is open through this level. The entire south wing, including the mezzanine level storefronts in the Great Hall, is leased by Propark America, a provider of parking areas within Hartford. The tenant build-out is typical.



THIRD FLOOR



SECOND FLOOR



FIRST FLOOR

CURRENT TENANTS

- CROSSKEY ARCHITECTS
- HISPANIC PROFESSIONAL NETWORK
  GREATER HARTFORD LITERACY COUNCIL
- CAPITAL WORKFORCE PARTNERS
- PROPARK AMERICA
- CAPITAL WORKFORCE PARTNERS
- AMTRAK PLATFORMS (OWNED VIA AIR RIGHTS)
- NOT LEASED
- GREATER HARTFORD TRANSIT DISTRICT
- HOT TOMATO'S RESTAURANT
- AMTRAK TICKETS & OFFICES
  SUBWAY
- PETER PAN BUSLINES
  GREYHOUND BUSLINES
  CONNECTICUT LIMOUSINE
  DUNKIN DONUTS
  AQUASTONE GRAPHICS
  SIGN WIZARD

NOTES:

1. NON-SHADED SPACE IS EITHER PUBLIC ACCESS OR SHARED TENANT ACCESS.
2. TENANT DEMISING AND SIGNFICANT WALLS SHOWN ONLY. INTERIOR PARTITIONS IN TENANT SPACES NOT SHOWN.
3. THE AREA NOT LEASED ON THE SECOND FLOOR LACKS ACCESS TO THE MAIN STRUCTURE OF THE BUILDING. ACCESS IS ONLY PROVIDED FROM THE AMTRAK PLATFORM AREA.
4. T.R. SIGNIFIES PUBLIC OR SHARED TENANT TOILET FACILITIES.
5. TENANTS SHOWN CURRENT AS OF AUGUST, 2007.

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TRANSIT STUDY
UNION STATION EVALUATION
HARTFORD, CT

MARK	DATE	DESCRIPTION

PROJ NO: P701060067
SCALE: NTS
DATE: 08/20/07
DESIGNED BY: BJL
DRAWN BY: BJL
CHECKED BY: BJL

SHEET TITLE

EXISTING
USAGE PLAN

FIGURE 2

The north wing is divided into two spaces. Adjacent to the Great Hall and with access from the Great Hall is Capital Workforce Partners, a private, non-profit organization that coordinates programs to develop a skilled and vital workforce within the area. The second floor space is primarily executive offices with a small conference room. Tenant build-out is typical.

At the extreme northern portion of the second floor is an area that is not leased. Up until recently, portions of it were part of Amtrak's lease as storage. Access to this area is only from the exterior platform level, restricting its ability to be leased for general business or other commerce. Further discussion of this unleased area is provided within the capacity section of this report.

1.4.4. Platform Level – Ground Transportation Center

As discussed previously, the platform level of the Ground Transportation Center is owned by Amtrak via air rights. It is accessed either via a stairwell or elevator from the first floor lobby of the Ground Transportation Center. Loading is performed on the east side of the center platform. The platform adjacent to Union Station is unused except for emergency egress from Union Station. Significant safety concerns were identified on the platforms as part of the on-site evaluation and shall be discussed later in this report.

1.4.5. Third Floor – Union Station

The third floor of Union Station includes both wings and the center area over the Great Hall. All areas include fairly typical tenant improvements of drywall walls and suspended / drywall ceilings. Both third floor wing areas have exposed structure and skylights.

Capital Workforce Partners has their main area as the center of the third floor. On the south side are two complementary non-profit agencies, the Hispanic Professional Network and the Greater Hartford Literacy Council. All of these tenants use the south elevator as primary access.

On the north side of the third floor is a recent tenant, Crosskey Architects. They use the north elevator for access.

Photo 8 – Great Hall with Storefront Offices (facing north)

Photo 9 – Great Hall with Entrance Vestibule (facing east)

Photo 10 – Stairs between Great Hall & Ground Transportation Center Lobby (facing east)

Photo 11 – Ground Transportation Center Lobby (facing east)

Photo 12 – Peter Pan / Greyhound Ticket Counter, Ground Transportation Center Lobby (facing south)

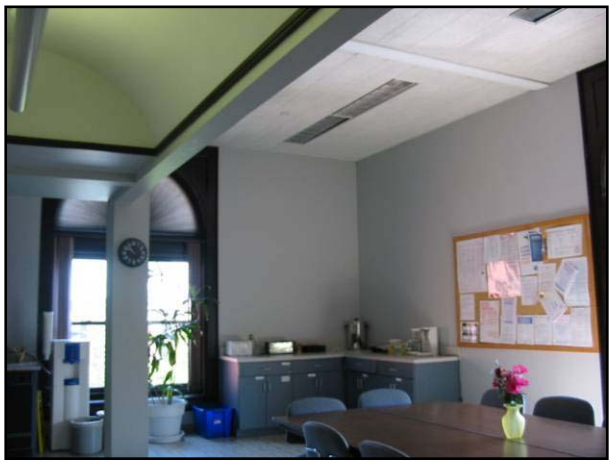


Photo 13 – Typical Office Tenant Space

Photo 14 – Typical Office Tenant Space

Photo 15 – Typical 3rd Floor Wings Tenant Space

2.0 BUILDING ACCESS AND CIRCULATION

Access to the existing structure is for three separate functions:

1. Accessible public access to transportation areas
2. Accessible public access to tenant spaces
3. Emergency egress and non-accessible routes

As established previously, Union Station was re-constructed in 1914 and the Ground Transportation Center built in 1985. Both areas were completed prior to the passage of the Americans with Disabilities Act in 1990. The Ground Transportation Center would have been required to be compliant with the 1968 Architectural Barriers Act and therefore had elements in the original construction that are mostly, if not completely, compliant with the more extensive ADA requirements.

In general, very good efforts have been made within Union Station to incorporate elements, such as push-to-open devices, to provide accessibility without any diminution of the historic nature of the structure. Further discussions will be provided for each area below. (See Figure 3 – Existing Access Plan.)

2.1 Accessible Public Access to Transportation Areas

One of transit's roles is to provide transportation solutions to those who are mobility impaired, whether it is visual, auditory, or ambulatory. As such, accessible access is one of the highest priorities in the design and function of transportation centers. The following sections focus on the primary accessible routes to and through the facility.

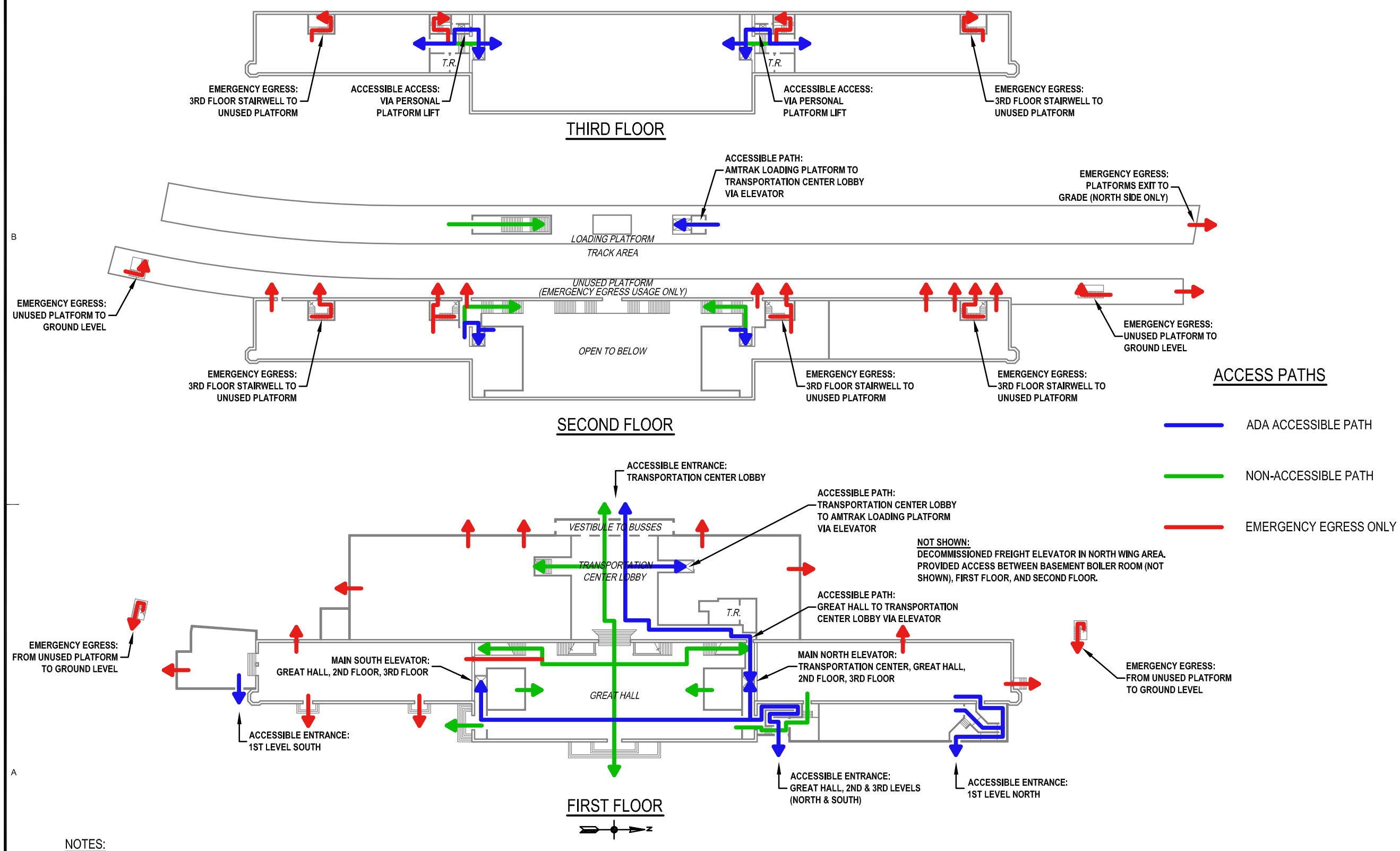
2.1.1. Ingress / Egress from Private Transportation (Taxi, Auto, Bike, Pedestrian)

Currently there are no bicycle racks or other facilities at the center. Pedestrian access would be similar to the taxi and auto access discussed below.

Access can be made from either via the Spruce Street side or the Union Place side. Predominantly taxi and auto access is from the Spruce Street side. Pedestrian access is variable between Spruce Street and Union Place. The pathway from the bus loading area to the transportation center is accessible.

Auto parking is available in the Spruce Street lot or other adjacent surface lots. A passenger drop-off area is located along the northern side of the Spruce Street canopy. There is an accessible path from the Spruce Street canopy to the main transportation center entrance.

Along Union Place, an accessible pathway is available from the street down to the Ground Transportation Center. It is required to enter through the only accessible entrance to the Great Hall area of the building, down an elevator, and into the Ground Transportation Center lobby. The accessible entrance is equipped with push to open buttons and a compliant ramp. The elevator should have minor retrofitting for Braille and audio annunciators during any improvement project.



NOTES:

1. ACCESS AND EGRESS SHOWN THROUGH A COMBINATION OF EXISTING RECORDS AND SITE VISIT. IT IS NOT A COMPREHENSIVE ANALYSIS OF EXITING LOCATIONS AND REQUIREMENTS; ONLY PRIMARY EXITS ARE SHOWN.

2. THE ADA ACCESSIBLE PATH HAS COMPLIANT GRADE TRANSITIONS (RAMPS / ELEVATORS) AND PUSH-TO-ENTER DOOR ASSISTS FOR THE PHYSICALLY DISABLED. SOME OF THE ELEVATOR COMPONENTS LACK MODERN MARKINGS AND ANNUNCIATORS FOR THE VISUAL OR HEARING IMPAIRED.

3. EMERGENCY EGRESS STAIRWELLS FOR THE THIRD FLOOR TENANTS DISCHARGE AT THE UNUSED PLATFORM LEVEL. STAIRS AT EITHER END OF THE PLATFORM PROVIDE EGRESS TO THE GROUND LEVEL.

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EXISTING ACCESS PLAN

FIGURE 3

2.1.2. Ingress / Egress from Public Transportation (City / Private Bus, Train)

City bus routes currently service the facility through a stop at the intersection of Union Place and Asylum Street for the A, E, F, and S Routes. Additionally, the Star Shuttle has a stop directly across from the main entrance to the Great Hall at the intersection of Union Place and Allyn Street. For all services, the primary access to the building would be from the east, or Union Place, side of the building. From that point, access would be the same as for pedestrians from Union Place as described previously. Both stop areas connect to the building via public sidewalks with curb ramps. The GHTD has recently completed a sidewalk improvement project on Union Place and a small portion of Church and Asylum Streets to enhance access and repair minor settlement.

Private bus services (Peter Pan / Bonanza, Greyhound, Connecticut Limousine) utilize the bus bays along the west side of the building between the Ground Transportation Center and Spruce Street. The pathway from the bus bays to the Ground Transportation Center is accessible. However, as the busses do not pull up to a curb it can pose difficulties for access into the vehicles.[2]

Train loading / unloading is performed at the second level platform area. An elevator is provided from the Transportation Center lobby to the platform level. It is adequate in size but lacks Braille or audio annunciators. A tactile warning strip is provided along a portion of the platform that was renovated and topped with concrete. As shown in the adjacent photo, passenger loading / unloading was observed to occur south of the limits of the tactile warning strip. A portable platform lift is located nearby to facilitate wheelchair access to the trains.

Overall, ADA compliant access is provided throughout the public transportation areas with the exception of some elevator components which are either constrained by the historical nature of the building or should be included with any interior improvements. However, more signage could be provided, especially in the Ground Transportation Center, to indicate the accessible path between the Ground Transportation Center level and Great Hall level.

2.2 Accessible Public Access to Tenant Spaces

With the exception of the first floor north and south tenants (GHTD and Hot Tomato's Restaurant), public accessible access is provided to all the tenant spaces either through the Great Hall or the Ground Transportation Center lobby. The not leased portion of the 2nd floor (north end) does not have accessible access.

Hot Tomato's Restaurant, the 1st floor south tenant, has accessible access to their facility via a street entrance into the southern storefront addition that is a portion of their restaurant. The Greater Hartford Transit District provides accessible access at the northernmost entrance to the storefront addition on the north wing of the building. Inside the building, an accessible ramp connects up to the main level of the building.

For the 2nd floor tenants, accessible access is provided through either the main south or north elevators off of the Great Hall. Once on the 2nd floor, the area is level between the wings and glass enclosed office additions within the Great Hall. Non-accessible access is provided by the main stairs on the west side of the Great Hall.

For the 3rd floor tenants, the only access is by the main south or north elevator. Upon reaching the 3rd floor, the portion above the Great Hall is at grade. The tenant areas in the north and south wing are located down a small flight of stairs. Accessible access has been accommodated by the installation of personal platform lifts in a former utility closet area.

[2] For ADA compliant busses, it is typically recommended to have a 6" to 12" curb to better facilitate the usage of integral wheelchair ramps without "kneeling" the busses.

The tenant spaces on either side of the Ground Transportation Center lobby are primarily at grade with the lobby and access is from the lobby. The extreme northern portion of the tenant area does have a grade differential with an internal ramp; however the public is not allowed access to this area.

Overall, the entire structure has been adequately retrofitted for ADA accessible access to all areas with the exception of the portion not leased on the 2nd floor. All main access points have push-to-open buttons. An issue should have further consideration with any major renovations would be retrofits to the elevator cabs and vestibules to ensure all visual and auditory annunciators are compliant to current codes.

2.3 Emergency Egress and Non-Accessible Routes

Figure 3 – Existing Access Plan also provides information relative to the non-accessible access into and thru the structure for both emergency and general purposes.

Overall, access is excellent to the first and second floors. Both can be reached either via the main stairs in the Great Hall along the western wall or the north / south main elevator. Emergency egress can be directly out to the Amtrak platform, if required.

For the third floor, public access is only provided by either the north or south elevator. Emergency egress from the third floor is through main stairwells on the east side of the building, which exit onto the Amtrak platform. At either end of the platform are a set of stairs down to ground level. As discussed later in the report, these final stairwells from the Amtrak platform to grade show significant potential for structural deficiency and should be replaced immediately.[3]

2.4 Access Summary

The following summarizes the access throughout the building:

- In general, it is very good. The only exception is the not-leased space on the northern wing of the second floor.

- Accessible access for the disabled is provided to all areas with the exception of the second floor vacant space. Increased signage should be provided for the accessible route from the Great Hall to the Ground Transportation Center lobby. During routine upgrades, visual and auditory announcers should be placed in all elevator cabs and vestibules. Coordination should be made with all appropriate officials to confirm the final requirements for access improvements within the historic nature of the structure.

[3] Amtrak did close the stairwells at one time because of the structural issues. However, total closure is not feasible because of their purpose as emergency egress from the second and third floors and the GHTD petitioned to have them reopened. Some repairs were made but total replacement is recommended for safety purposes.

Photo 16 – Main Accessible Entrance to the Great Hall from Union Place (facing northwest)

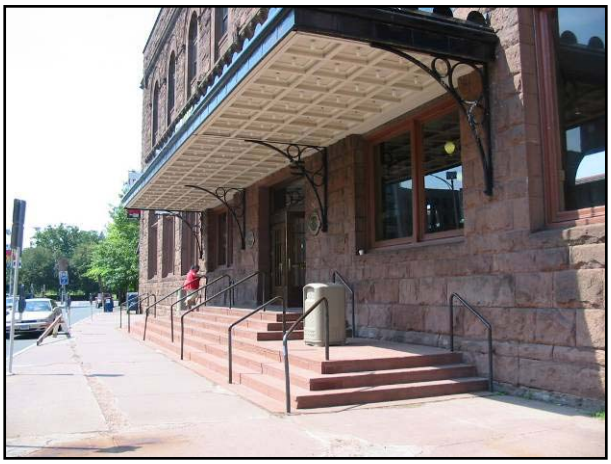

Photo 17 – Main Entrance to Union Station Great Hall from Union Place (facing southwest)

Photo 18 – Main Entrance to Ground Transportation Center Lobby from Spruce Street (facing east)

Photo 19 – Passengers Loading Bus (facing north)

Photo 20 – Passengers Disembarking from Amtrak Train (Note not along area of tactile warning strip)

Photo 21 – Amtrak Train Platform showing Tactile Warning Strip

Photo 22 – Personal Platform Lift on Amtrak Platform

Photo 23 – Historic Door Equipped with Power Assist Opener

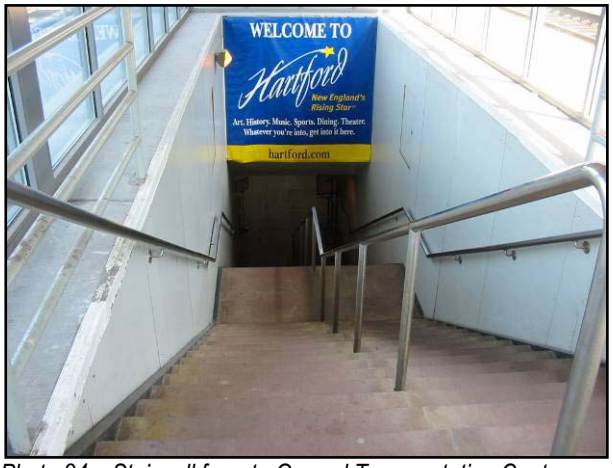

Photo 24 – Stairwell from to Ground Transportation Center Lobby from Amtrak Platform

Photo 25 – Accessible Ramp to Great Hall from Union Place

Photo 26 – Great Hall Main North Elevator Vestibule (provides access to Ground Transportation Center Lobby and north wing tenants)

Photo 27 – 3rd Floor Wing Tenant Access from Elevator (view is looking down stairs – accessible platform lift to left)

3.0 ARCHITECTURAL, STRUCTURAL, ELECTRICAL, AND MECHANICAL SYSTEMS AND COMPONENTS

This section deals with the four major divisions within the building and the results of the on-site inspection. The following components are considered within each section:

- Architectural: accessible features (toilet rooms, pay phones, counters); safety and security; interior finishes; exterior building systems (roofing, windows), exterior site elements
- Structural: bearing walls (Union Station); roof structure and deck (Union Station); trestle structure, rail and platform area (Ground Transportation Center)
- Electrical: power / distribution; exterior & interior lighting;
- Mechanical: heating, ventilation, and cooling systems; plumbing systems; fire protection system

3.1 Architectural Systems and Components

This section deals with four main areas: accessible features, safety and security, interior finishes, and the exterior roofing system. Some of these components cross-reference the other systems and will be identified as such. Also, exterior site elements: pavement, drainage, sidewalks; are addressed within this section.

3.1.1. Accessible Features

Any building is required to have all public amenities and areas accessible for the disabled. In general, most areas are compliant, if dated. All toilet rooms inspected are accessible. The ticketing counters are not compliant; however it is possible for a wheelchair customer to receive services. The waiting area does not provide specific handicapped seating. There are a bank of public phones, with one mounted at accessible height. It does lack the required accessible shelf and outlet for portable text telephone device.[4] Some of the required distances from door jamb to adjacent wall were insufficient, but this is common in all structures completed before the more comprehensive ADA act of 1990.

The only area of accessibility concern is on the loading platform for Amtrak. As discussed previously, while a tactile warning strip is present for a portion of the platform, loading and unloading operations were observed to occur in an area without the tactile strip.

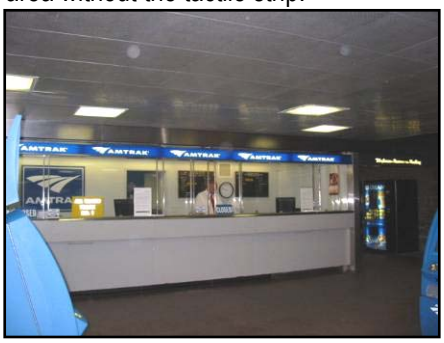

Photo 28 – Amtrak Ticketing Counter

Photo 29 – Public Phones

[4] Connecticut State Building Code, Section 1109.16

3.1.2. Safety and Security

Within Union Station and the Ground Transportation Center first level, safety and security were excellent. The GHTD has installed a modern security camera system that provides coverage throughout all public areas and their tenant space.[5] The entire space is protected by a sprinkler system and fire detection system.

Safety is a major concern in the Amtrak owned 2nd floor level platform area and should be addressed immediately. The following are the major concerns as outlined both architecturally and structurally:

- The steel-framed stairs on the north and south ends of the central platform that are used for emergency egress from the second and third floors of Union Station are significantly rusted (see Photos 30 and 31). Supplementary angle framing has been added to the underside of the steel riser/tread pans apparently in an effort to strengthen the steps. The load carrying capacity of the steps has obviously been compromised. We consider the condition of the stairs a safety concern and recommend that the stairs be closed and repairs initiated immediately. According to GHTD, the City of Hartford's Fire Marshall and Building Inspectors offices have also noted these deficiencies and Amtrak is aware that they may be receiving written notification or be cited for safety violations within their leasehold area.

- Several older, unused rail ties adjacent to the east platform are missing or highly deteriorated (see Photo 32). This creates gaps between the ties where a person could conceivably fall to the ground below or to the roof of the Ground Transportation Center. Amtrak has installed a temporary wood-framed and plastic mesh fence in an effort to create a protective barrier for pedestrian at the edge of the platform. It is our opinion that this fence system is not robust enough to serve as a safety barrier. Additionally, certain sections of the plastic mesh have become unattached from the supporting wood posts allowing access to the edge of the platform. We consider this condition along the edge of the platform a safety concern that should be addressed immediately.

- There are several significant gaps between ties and between the edge of platform and ties on the east edge of the central platform. It is conceivable that a person could step through one of these openings if they were to step off the platform. Steel wire mesh has been added in some locations between ties in an effort to mitigate this situation, but gaps still exist in several locations (see Photo 33).

- At several locations, the timber floor planks at on the central platform are deteriorated and should be replaced (see Photo 34). At one location, a piece of wood decking has been applied above a deteriorated section of deck (see Photo 35). This repair has created a trip hazard immediately adjacent to the active Amtrak line and should be corrected.

- The security fence to restrict access to the unused western trestle has a gate which was open. Furthermore, from discussions with the GHTD, it is quite common for youths to walk down the tracks from the north onto the platform areas. It would be our recommendation to better restrict this access through the installation of security fence with emergency egress only access on the platform areas. While the track area cannot be closed off due to operations, this would assist in discouraging youth to come onto the decrepit platform areas.

It is one of the major recommendations of this report that the safety of the platform areas be addressed immediately.[6]

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[5] GHTD also monitors cameras installed by Capital Workforce Partners as a specific side arrangement. No other monitoring of interior tenant spaces is provided.

[6] This would be the responsibility of Amtrak, not the GHTD, as the platforms are owned by Amtrak via air rights. It is our understanding that the GHTD has been actively trying to have some of these issues addressed at Amtrak without success.

Photo 30 – Underside of Steel Stairs Serving East Platform

Photo 31 – Underside of Steel Stairs Serving East Platform

Photo 32 – View of East Platform and Adjacent Rail Ties

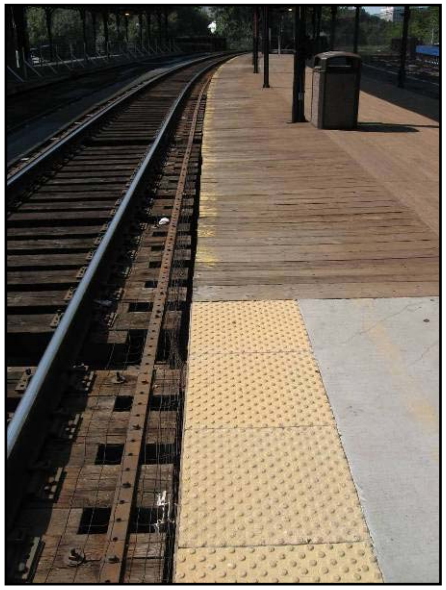

Photo 33 – View along Central Platform showing Rail Ties and Wire Mesh Enclosure

Photo 34 – Deteriorated Floor Plank, North End of Central Platform

Photo 35 – Repair Plank Applied to Top of Central Platform, Adjacent to Active Track

3.1.3. Interior Finishes

Overall, the interior finishes are a bit worn but generally serviceable within the public areas. Within the Great Hall, improvements could be made by cleaning the marble and general painting. Otherwise, it is in excellent condition for the age and usage. The Ground Transportation Center is decidedly dated in appearance. The toilet facilities are overdue for interior renovations. Some work is already scheduled, such as redoing the floor areas, but overall the area could be improved for passenger comfort and convenience by a significant interior renovation project.

Within the tenant spaces, the build-out varies based on the age of the improvements as is typical for leased arrangements. Nothing was noted as requiring immediate attention. Any minor issues involved paint touch-up or ceiling tile replacement. Otherwise, any tenants directly asked typically brought up common ongoing maintenance issues, such as loose door latches, that are to be expected in any situation.

Photo 36 – Replacement Marble in Great Hall (Replacement made with original piece of marble found on site. Notice difference in color)

Photo 37 – Toilet Facility in Ground Transportation Center

3.1.4. Exterior Building Systems (Roofing, Windows)

The roof over the Great Hall area is a ballasted EPDM system that goes up and over the parapet wall. It is a sloped system with roof drains collecting along the east and west sides of the building. Minor ponding was observed to have occurred at one point at the southeast corner of the roof based upon the mossy nature of the ballast and "path" that the water made as it flowed to the roof drain.[7] Other areas of the EPDM adjacent to the parapet have begun to show some fatigue cracking. Based on an estimated installation of approximately 1984, the roof would be near the end of a typical lifespan depending on the grade of the material installed. Overall, it does appear to be in generally good condition and our recommendation would be to have a qualified contractor come in and complete a detailed inspection, replacing any areas of cracking or fatigue, including the flashing at the parapet.

The roof over the wings of Union Station is steeply pitched with roof tiles with a center skylight on a very slight incline. Inspection was made from a distance on the Great Hall roof. The roof tiles appeared to be in fair condition. Concerns have been noted from both the GHTD and the 3rd floor wing tenants about the leaking of the skylights in those areas. It is very common for skylights to have leaking problems and closer inspection would be required to

[7] Although not confirmed by testing, it appears that this roof drain may be causing some damage to the interior plaster finish of the Great Hall on the southeast corner. Selective demolition of the damaged wall and ceiling area may be required to accurately determine the location of the water infiltration.

determine the exact nature of where the flashing was failing. It may be worthwhile in the future to consider, if allowable by historic preservation regulations, to replace the single slope skylight with a pitched skylight that matches the roof tile clad pitch. This would increase the ability to shed water, but may have a visual impact to the existing structure that would not be acceptable to historic preservationists.

The original exterior windows are single pane, non-insulated glass primarily throughout the building and more specifically within the Great Hall. Originally, the windows in the Great Hall did open to allow for natural ventilation but they have since been sealed shut. The exterior of the windows were just scraped and painted last year. Overall they are in fine condition. One recommendation for the future would be to consider the return-on-investment time to install low-e, insulated glazing to reduce the heat loss / transmission into the Great Hall, improving HVAC performance and lowering energy bills. Also, restoring the functionality of the windows may allow for additional HVAC operational savings in the spring and fall.

Photo 38 – Example of Minor Cracking of EPDM Roof System at Parapet Wall

Photo 39 – Water Path from Southeast Corner of Great Hall to Roof Drain at East Edge (extreme right of photo)

Photo 40 – Low Area at Beginning of Water Path Showing Sediment Collection and Moss, Evidence of Pooling Water

Photo 41 – View of South Wing Roof and Skylight

3.1.5. Exterior Site Elements

General observations were made about the sidewalks, stairs, pavement, and observable drainage conditions around the facility. Some of the non-used steps on the Union Place side have some chipping, but it is not a safety hazard. In addition, the GHTD has installed landscaping around the Union Place façade which has a nice visual impact on the site.

The major site concerns are at the Spruce Street side where the intercity bus stalls are located. First, the existing concrete pavement is showing significant failures which would be expected from its usage and lifespan. As some point within the next several years, this area will need to have a major pavement improvement and be replaced with new concrete. At that time, the drainage problems in the area should be addressed. The site was designed, according to record plans, and installed, according to visual observation, for the entire area from Spruce Street to sheet flow into a small trench drain located at the head of the bus stalls adjacent to the building. This area tends to flood in any major storm event. Without completing any hydraulic analysis, it appears that the trench drain is insufficient to handle the drainage. It would be advisable to complete a hydraulic analysis of the water and redesign the drainage system with the pavement replacement to better accommodate significant storm events.

Photo 42 – Repair to Original Union Station Stairs

Photo 43 – View of Bus Stall Pavement Showing Fatigue

Photo 44 – Trench Drain at Bus Stalls

3.2 Structural Systems

This section deals with three main areas: bearing walls (Union Station), roof structure and deck (Union Station), and the trestle Structure, rail and platform area (Ground Transportation Center).

3.2.1. Bearing Walls, Union Station

The structures of the Hartford Union Station building and Ground Transportation Center on the west side of the building are separate structures from the trestle structure supporting the Amtrak rail line and platform. Union Station is a load bearing Brownstone structure (see Photo 45). Brownstone, commonly used in New England as a building material, is dense sandstone which continues to be quarried in the region. Walls are approximately two to three feet thick at the base and bear directly on footings or piles. (Although foundations were not visible, copies of the original building drawings that were incorporated into the renovation plans dated 1985 indicate that the building is founded on stone spread footings supported by piles.) In general, the stone walls have been augmented with an interior brick facing. The brick was visible in the attic above the main lobby and in 3rd floor lease space at the north of the buildings (see Photos 46 & 47). Although construction details were not available for review, it appears that brick was also used as the base material for interior finishes, such as stucco or marble veneers, within the building. Window openings and door are framed with stone arches or stone lintels.

In general, the stone bearing walls of the building appear in good condition, especially for a building of this age. The majority of mortar joints appear in good condition. No diagonal cracks were observed propagating from window or door corners through the joints. Such cracks are usually an indication of localized wall settlement. Some deterioration of mortar joints was observed at ground level on the west side of the building, directly under the train platform (see Photo 48). In these cases, it appeared that water leaking down the face of the building may have caused the mortar to deteriorate over time. No associated deterioration of the stone masonry was observed around these areas.

One other area of considerable water staining on the wall was observed on the west face of the building immediately below the parapet wall at the roof (see Photo 49). The conditions of the mortar joints in this location were not observed. Upon an inspection of the roof, the cap flashing on the parapet wall appeared to be in good condition, but there could be small gaps or cracks in the flashing that is allowing water to infiltrate into the parapet and then seep through the wall. Evidence of water infiltration through the walls was observed in the third floor lease space at the north end of the building (see Photo 50). At this office location, the exposed brick wall was heavily stained with efflorescence (leaching of minerals in the brick and mortar). Personnel in the office space stated that this north wall can become damp during rainy weather. This should be investigated more thoroughly.

For the most part, stucco and marble finishes clad the walls in the large lobby. Some evidence of water leaking was observed on the east face of the lobby immediately below the ceiling. It appears that the water stains on the wall are in the general vicinity of a perimeter roof drain on the east side of the building. The age of the stains is not known.

From all vantage points, it appeared that the walls of the main building were plumb and in plane. There were no observable areas of crushing of individual stone pieces and no loose stones were observed on any walls.

Photo 45 – Brownstone Bearing Wall of Union Station

Photo 46 – Brick Facing, Interior of Brownstone Bearing Wall in Attic above Great Hall

Photo 47 – Interior of Brownstone Bearing Wall in 3rd Floor Lease Space

Photo 48 – Staining on Brownstone Bearing Wall; Mortar Joint Deterioration, West Face of Union Station

Photo 49 – West Face of Union Station (Note staining of Brownstone bearing wall below roof line, above windows)

Photo 50 – North Wall of 3rd Floor Space (Note efflorescence on wall from moisture infiltration)

3.2.2. Steel-Framed Roof Structure and Concrete Roof Deck, Union Station

The roof of the Great Hall is covered with a ballasted EPDM membrane roof system. The underlying roof structure of the Great Hall is comprised of a cast-in-place concrete slab spanning north-south between integral concrete ribs. These ribs span east-west and bear on secondary steel trusses at approximately 10 feet on center. The roof slab appears to slope from a ridge at the centerline of the building to a series of roof drains on the east and west sides of the building.

The secondary trusses supporting the roof ribs span approximately 20 feet between the primary building trusses. Primary trusses cross the width of the building and bear on the east and west exterior Brownstone walls (see Photo 51). The top chords of the primary trusses are embedded into the concrete roof deck (see Photo 52). The bottom chords of the primary and secondary trusses support a lattice of steel and timber members that support the plaster and lath ceiling of the third floor office level below. The primary trusses are approximately 7 feet deep. All trusses are composed of standard angle shapes and are assembled using rivets, which was common at the time of their construction.

In general, the main and secondary trusses appear to be in very good condition. Trusses do not appear to be deflecting excessively. Trusses are in plane and no damage to any truss web or chord members was noted. No missing rivets were observed. No areas of steel deterioration were noted, except for some areas of minor rusting near locations where water has leaked through the roof slab. Most of the staining resulting from these leaks seems to have occurred around the roof drains along the east and west edges of the building (see Photo 53). None of the stains appears to be new. The concrete in some of these localized areas is in fair to poor condition.

At some point in the past, a supplementary steel deck system was added in the attic space to support new air handling units and large ducts. This system of platforms is supported by steel wide-flange beams spanning the width of the building and bearing on the perimeter Brownstone walls (see Photos 54 & 55). It is our opinion that these 27 inch-deep beams were “inserted” into the attic space through holes created in the exterior Brownstone walls. It appears that individual Brownstone pieces were removed and re-laid after the beams were installed and secured. Beams bear on the Brownstone at pockets created at each side of the building. Steel channels span between the main beams and support a checker-plate steel deck. The mechanical platforms are self-supporting and are not connected to the building trusses. There are three such platforms in the attic and the structures of the platforms appear in excellent condition.

Based on existing building plans, the roof on the north and south office wings is made up of a concrete slab spanning between integral concrete stiffening ribs. These ribs bear on steeply sloped trusses which define the extreme pitch of the roof (see Photo 56). The opposing trusses are sloped toward each other and are connected at the top to form a flat plane. This flat roof area is covered with a translucent skylight in the office space on the north wing of the building and a ballasted EPDM roof in other areas. These trusses are comprised of steel plate and angle members and appear to be in very good condition. Trusses did not appear to deflect and all rivets appeared to be present. The condition of the concrete roof slab and integral ribs could not be observed because of drywall finishes.

Photo 51 – Secondary Roof Trusses (left) framing into Primary trusses (right), above Great Hall

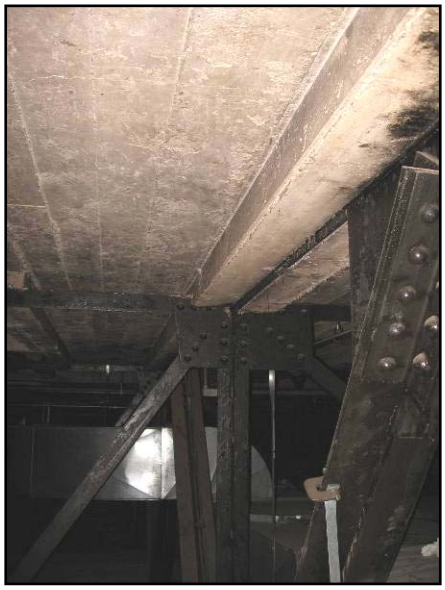

Photo 52 – Primary Roof Trusses at Great Hall (Note top chord of truss encased in concrete)

Photo 53 – Roof Drain at Great Hall. (Note evidence of leaking around drain at some time in past)

Photo 54 – Supplementary Steel Deck System (Note beam support extending to exterior wall)

Photo 55 – Supplementary Steel Deck System with Perimeter Beam Support, Adjacent to Primary Truss

Photo 56 – Roof Trusses at 3rd Floor Wing Office Space

3.2.3. Steel-Framed Trestle Structure, Rail and Platform Area, Ground Transportation Center

The steel trestle structure supporting the active rail line and associated platforms is owned and maintained by Amtrak. Because of the trestle's proximity to and operational relationship with Union Station and the Ground Transportation Center, a discussion of the condition of the trestle and platform structure is included in this report.

Description: Trestle Structure - The trestle structure is comprised of floor beams spanning north-south between primary girders on main grid lines at 25 feet on center. All floor beams and girders are built-up plate members composed of a steel plate web and angle flange members. A system of steel angles brace the top flanges of the floor beams in some locations. Rivets are used for all connections. (See Photo 57 for a general view of the exposed trestle framing, including top flange bracing elements.)

The girders are supported by laced columns at 22 and 24 feet on center. The columns are exposed except at the Transportation Center where they are concealed by a variety of walls and architectural treatments (see Photo 58). The columns generally coincide with roof drain locations in the Ground Transportation Center and can be accessed by service doors in various locations.

Currently, the trestle structure supports the central passenger platform, the adjacent Amtrak rail, and the passenger east platform adjacent to Union Station. The passenger platforms are wood deck structures supported by timber framing below. The exception to this is the center section of the central platform where a concrete deck has been used (see Photo 59). Steel-framed stairs are located at the ends of the east platform to allow passenger access to the street below. Timber rail ties bear directly on the trestle beams. The top of the rail ties are located approximately one foot below the platform elevation.

The Ground Transportation Center is a steel-framed structure housing Amtrak and bus services as well as limited retail. This structure is located immediately below the trestle structure. From the passenger platforms, the roof of this area can be observed between rail ties. A supplementary steel-framed corrugated roof system is present in some areas north and south of the Ground Transportation Center. This roof was apparently installed to protect parking and certain service operations from rain and snow.

Trestle Structure: Observations – Because of long-term exposure to the elements, and apparent lack of regular maintenance, the trestle structure and associated platform framing display variable levels of deterioration. Some of the more prominent examples of deterioration include the following:

- The bracing angles for the trestle beams are significantly rusted or are completely missing in some locations (see Photo 60). Although the bracing that was observed was primarily on the unoccupied west side of the trestle, bracing members under the active Amtrak line could also be deteriorated.

- The bottom flange of one trestle beam on the side of the east platform is significantly rusted (see Photo 61). The load carrying capacity of this beam has been compromised and should be inspected and analyzed more thoroughly.

- The top flange of several beams and girders are significantly rusted (see Photos 57 & 60). The load carrying capacity of these members could be compromised. It is recommended that a more comprehensive inspection and analysis of the trestle structure be performed.

- Some hangar supports for the supplementary corrugated steel roof system are significantly rusted or have failed (see Photo 62). Station personnel stated that a section roof panels, located south of the Transportation Center, collapsed at some time in the past, and caused damage to vehicles below.

- Significant rusting was observed on the columns and column bases at the pitch pan drain locations in the Ground Transportation Center (see Photos 63 & 64). It appears that there is chronic leaking in and around the pitch pan locations on the roof of the Transportation Center and water continues to drain down the columns. Flashing that has been installed around the columns at the roof appears to be ineffective in directing water away from the column (see Photo 65).

- Observations relating to the safety issues of the platform and egress stairs as documented in the architectural safety and security section.

Photo 57 – Exposed Trestle Framing, West of Central Platform

Photo 58 – Architectural Finishes Concealing Trestle Columns ("Reading" sign & associated finishes)

Photo 59 – Concrete Deck at Platform with Amtrak Rail Line to Left

Photo 60 – Severe Rusting of Top Flange Beam Bracing. (Note missing symmetrical brace)

Photo 61 – Rusted Bottom Flange of Trestle Beam, East Platform, North of Ground Transportation Center

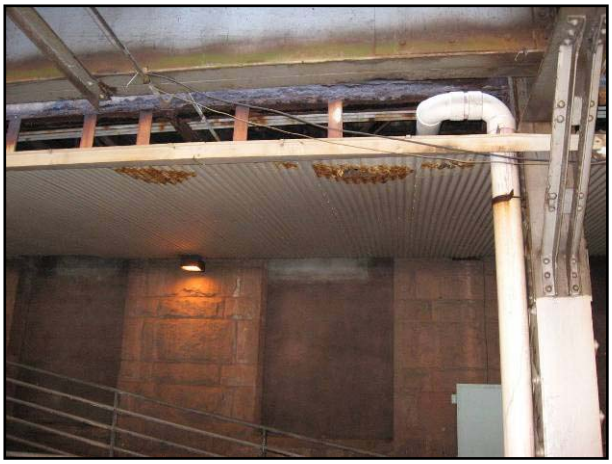

Photo 62 – Corrugated Steel Roof with Rusting Hanger Supports

Photo 63 – Significant Rusting at Laced Column Base of Trestle, Ground Transportation Center

Photo 64 – Typical Rusting around Pitch Pan, near Laced Column, Roof of Ground Transportation Center

Photo 65 – View from Above of Flashing around Laced Column, Ground Transportation Center

3.2.4. Structural Summary

With a few localized exceptions, the Hartford Union Station building appears in good structural condition. The Brownstone bearing walls display only minor joint deterioration at some locations on the west face of the building or under the roof parapet. No areas of wall settlement or cracking of individual stone pieces was observed.

The steel roof framing appeared in good condition, with only minor areas of rusting noted in the attic area above the Great Hall. The concrete roof deck above the Great Hall had localized areas of water damage, especially in the vicinity of the roof drains. All primary and secondary roof trusses appeared in good condition.

The steel roof framing in the in the third floor office area on the north end of Union Station appears in good condition. The concrete roof deck in this area could not be observed because of architectural finishes. Staining on the north masonry wall of this office space indicates that moisture is penetrating the wall during wet weather. This should be investigated more thoroughly.

The trestle structure supporting the Amtrak rail line and the passenger platforms is in variable condition. The trestle is exposed to weather and several of the trestle beams and girders have rusted significantly. In some cases, beam flanges have deteriorated to the point that the load carrying capacity of the members may have been compromised. At other locations, bracing angles have rusted through or are missing. It is recommended that a more thorough inspection and analysis of the existing trestle framing be undertaken to determine what repairs are required. Additionally, steel-framed stairs serving the east platform are heavily deteriorated and should be repaired immediately. According to GHTD, the City of Hartford's Fire Marshall and Building Inspectors offices have also noted these deficiencies and have notified Amtrak.

Upon inspection of the trestle columns in the Ground Transportation Center, it appears that the pitch pans around the roof drains are leaking. This leaking has caused significant rusting on the laced columns and their bases. It is recommended that repairs be made to the pitch pans and drains of the roof to stop the leaking and associated water damage to the columns.

3.3 Electrical Systems

3.3.1. Description of Electrical System

Electrical Service	● 480/277V 2000A switchboard served by two 750KVA service transformers located in transformer vault. One utility meter connected to the switchboard is for measuring electricity consumption for public areas and public facilities. Two electric meter banks are for measuring electricity consumption for each tenant space.
Exterior Lighting	● HID fixtures under canopy, pole mounted HID in parking lot controlled by time clock
Platform Lighting	● HID fixtures under canopy controlled by time clock
Emergency Lights	● LED exit signs and emergency lights powered by emergency battery systems.
Interior Lighting	● Fluorescent fixtures controlled by manual switches.
Receptacles	● Convenience receptacles throughout.
PA System	● Public address system present; no visual message system present.

3.3.2. Electrical System Observations

- Major electrical service and distribution system equipment is in working condition.
- Some outdoor exposed conduits are corroded and should be replaced.
- The main electrical room, due to heat generation from the step-down transformer located within it, should be fitted with a ventilation system in order to lower the ambient room temperature and prolong the life of electrical equipment located therein.
- 30 exterior lights are on 24/7 for security purposes. Our opinion is that a majority of them can be turned off during day time for energy savings.
- 20 ceiling recessed down lights in the transportation center entrance area are on 24/7. Our opinion is that a majority of them can be turned off during day time for energy savings.
- Many temporary wires are used on site. They should be replaced or removed.
- Some exterior lights are damaged and/or severely worn. They should be replaced.

3.3.3. Lighting Control Recommendations for Energy Savings

In order to realize energy savings, there are several lighting control methods that could be installed for the existing lighting system:

- Occupancy sensors: occupancy sensors can be used in restrooms, conference rooms, private offices, break rooms, etc. Our opinion is that with proper configuration, approximately 35% potential energy savings can be achieved in these areas.

- Scheduled automatic shut-off at end of workday via switching panels, time clocks or a building automation system: The strategy can be used when space is predictably unoccupied; usually features local override control. Our opinion is that with proper configuration, approximately 10% potential energy savings can be achieved in corresponding areas.

- Multi-level switching using daylighting sensors: Such a system would dim or turn the lights off automatically based on available ambient daylight. This strategy can be used in spaces that have windows or skylights. Our opinion is that with proper configuration, approximately 10% potential energy savings can be achieved in the corresponding areas.

Photo 66 – Typical Panel Board

Photo 67 – Corroded Exterior Conduit

Photo 68 – Exterior Light (Damaged)

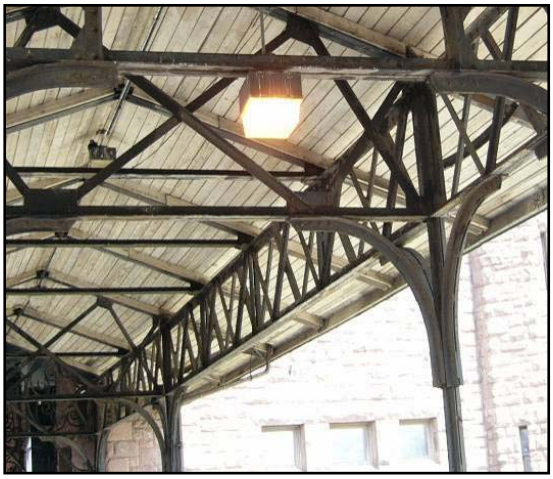

Photo 69 – Exterior Light (On during the day)

3.4 Mechanical Systems

3.4.1. Heating and Air Conditioning Systems

Description of Heating and Cooling Systems

Heating System: The primary heating equipment consists of 2 combination gas/oil fired cast iron Weil-McLain steam boilers (Model Number BGL 1894 WS) which generate up to 15 psi steam. These boilers are located in the basement mechanical room.

The burners are dual fuel capable of burning either natural gas or fuel oil.

Steam supplied from the boiler system is used as the heating source transfer medium in some of the terminal devices.

The remainder of the terminal devices use hot water as the transfer medium. Hot water is generated from the facility steam system through the steam to water shell and tube heat exchanger, which is located in the basement Mechanical Room. The hot water is then pumped throughout the building to the terminal devices which supply heat to the facility through a conventional hydronic heating system.

Cooling System: The primary cooling equipment consists of 6 air-cooled Trane air and water chillers (Model Number CGAA 0754E; Serial Number L86B36091). These water chillers generate chilled water, which is pumped to the terminal cooling devices by means of a conventional hydronic piping system. These chillers operate on 460 volts/3 phase power supply and utilize Refrigerant R-22.

Natural Gas Service: Natural gas is utilized to fire the boilers. Gas service enters the west side of the Boiler Room (service from Spruce Street). Due to low gas pressure in the city mains, a Spencer gas booster pump is utilized to augment street pressure to supply the gas demands of the building.

Fuel Oil Storage: The #2 fuel oil storage tanks are located beneath the parking lot. They were installed in 1980 and there is currently no tank monitoring.

Heating & Cooling System Observations and Recommendations

Boilers: The major concern of the heating system is the age and condition of the two existing boilers. These boilers are circa 1975, approximately 32 years old. These boilers are in a deteriorated condition. Boiler #1 was down due to leakage last year. These leaks were repaired and additional leaks surfaced again this year. These boilers would have an estimated service life of approximately 30 years under normal conditions, based on the Estimated Service Life Table (Table 3 from ASHRAE 2003 Applications Handbook, page 36.2 and 36.3) and the recommendations of the boiler manufacturer. However, their urban location with higher levels of automotive emissions and combustion by-products consisting of elevated levels of sulfur oxide and nitrogen oxides, a reduced service life is anticipated. Also, there has been no maintenance in the form of chemical treatment to these boilers.

Regardless of age, these boilers have seen their useful life expectancy. Our recommendation is that these boilers be replaced as an equipment failure could occur at any time. The option would be to continue to repair the boilers as problems evolve.[8]

Piping System: (steam, hot water, Chilled water system)

Many portions of the piping system are in a severely corroded condition. Sections are failing and are requiring replacement. Additional piping failures and maintenance can be expected.

Air Cooled Water Chillers:

The six air cooled water chillers are in fair condition. These units were manufactured and installed in 1986, so they have 21 years of service life. For this type of equipment, a service life of 20 years can be anticipated. (See Figures 4 & 5 following which are Table 3 from ASHRAE 2003 Applications Handbook.) Therefore, although these water chillers have been operating satisfactorily with normal maintenance and repair, their useful service life has been seen. The units could operate for four to eight years without major issues or could have major repair issues next month.

Our recommendations would be to develop a plan for replacement of these chillers.

Insulation:

The pipe and duct insulation has been physically damaged in may locations and is in need of repairs.

Controls:

The building control system is a Barber-Coleman system of pneumatic (air) controls. Over the years many of the system components have failed and have been replaced with Johnson Controls components.

Energy Metering:

Currently, energy is not metered to each individual tenant. The current boiler and piping systems would make individual tenant metering difficult from an energy source standpoint. However, consumption could be metered via BTU meters located at the individual terminal devices, (air handling units, fan coil units, etc.). The energy consumption, as metered by the BTU meters, could be totalized via a computer system and the use by each tenant separated from the total facility consumption.

Photo 70 – Boiler #1 Down for Maintenance

Photo 71 – Boiler #1 – Enclosure Panels Removed Exposing Cast Iron Sections

[8] It is within the current GHTD grant budget to replace the boilers.

Photo 72 – Air Cooled Water Chillers Located below Rail Platform

Photo 73 – Air Cooled Water Chiller Located on Roof

Photo 74 – Natural Gas Service in Basement Mechanical Room

Photo 75 – Spencer Gas Booster Pump in Basement Mechanical Room

Photo 76 – Steam to Water Shell and Tube Heat Exchanger In Basement Mechanical Room

Photo 77 – Sample of Corroded Piping in Basement Mechanical Room

Photo 78 – Sample of Corroded Piping in Basement Mechanical Room

Photo 79 – Sample of Corroded Piping in Basement Mechanical Room (Note replacement piping)

Photo 80 – Sample of Deteriorated Insulation in Basement Mechanical Room

Photo 81 – Sample of Deteriorated Insulation at Air Cooled Water Chiller on Roof

Photo 82 – Sample of Deteriorated Insulation in Attic above Great Hall

Figure 4 – ASHRAE Table 3
Estimated Service Life

Table 2 Initial Cost Checklist

Energy and Fuel Service Costs
Fuel service, storage, handling, piping, and distribution costs
Electrical service entrance and distribution equipment costs
Total energy plant
Heat-Producing Equipment
Boilers and furnaces
Steam-water converters
Heat pumps or resistance heaters
Makeup air heaters
Heat-producing equipment auxiliaries
Refrigeration Equipment
Compressors, chillers, or absorption units
Cooling towers, condensers, well water supplies
Refrigeration equipment auxiliaries
Heat Distribution Equipment
Pumps, reducing valves, piping, piping insulation, etc.
Terminal units or devices
Cooling Distribution Equipment
Pumps, piping, piping insulation, condensate drains, etc.
Terminal units, mixing boxes, diffusers, grilles, etc.
Air Treatment and Distribution Equipment
Air heaters, humidifiers, dehumidifiers, filters, etc.
Fans, ducts, duct insulation, dampers, etc.
Exhaust and return systems
Heat recovery systems
System and Controls Automation
Terminal or zone controls
System program control
Alarms and indicator system
Energy management system
Building Construction and Alteration
Mechanical and electric space
Chimneys and flues
Building insulation
Solar radiation controls
Acoustical and vibration treatment
Distribution shafts, machinery foundations, furring

contractors or by consulting commercially available cost-estimating guides and software. Table 2 shows a representative checklist for initial costs.

Analysis Period

The time frame over which an economic analysis is performed greatly affects the results of the analysis. The analysis period is usually determined by specific analysis objectives, such as length of planned ownership or loan repayment period. However, as the length of time in the analysis period increases, there is a diminishing impact on net present value calculations. The chosen analysis period is often unrelated to the equipment depreciation period or service life, although these factors may be important in the analysis.

Service Life

Table 3 lists representative estimates of the service life of various system components. Service life as used here is the time during which a particular system or component remains in its original service application. Hiller (2000) discusses service life in more detail.

Estimated service life of new equipment or components of systems not listed in Table 3 may be obtained from manufacturers, associations, consortia, or governmental agencies. Because of this information's proprietary nature, the variety of criteria used in compilation, and the objectives in disseminating data, extreme care must be exercised in comparing service life from different sources. New designs, materials, and components of equipment listed in Table 3 have changed over time and may have altered those estimated service lives. Establishing equivalent comparisons of service life is important.

Replacement may be for any reason, including, but not limited to, failure, general obsolescence, reduced reliability, excessive maintenance cost, and changed system requirements due to such influences as building characteristics, energy prices, or environmental considerations. Locations in potentially corrosive environments and unique maintenance variables will affect the service life of HVAC equipment. Examples include the following:

- **Coastal and marine environments**, especially in tropical locations, are characterized by abundant sodium chloride (salt) that is carried by sea spray, mist, or fog.

  Many owners with locations throughout the United States require equipment specifications stating that HVAC equipment located along coastal waters will have corrosion-resistant materials or coatings. The design criteria for systems installed under these conditions should be carefully considered.
- **Industrial** applications provide many challenges to the HVAC designer. It is very important to know if the emissions from the industrial plant contain products of combustion from coal, fuel oils, or releases of sulfur oxides (SO_2, SO_3) and nitrogen oxides (NO_x) into the atmosphere. These gases typically accumulate and return to the ground in the form of acid rain or dew.

  Not only is it important to know the products being emitted from the industrial plant you are designing, but also the adjacent upwind or downwind facilities. HVAC system design for a plant located downwind from a paper mill will require extraordinary corrosion protection or recognition of a reduced service life of the HVAC equipment.
- **Urban** areas generally have high levels of automotive emissions as well as an abundance of combustion by-products. Both of these contain elevated sulfur oxide and nitrogen oxide concentrations.
- **Maintenance** factors also affect cooling coil life expectancy. The coils specified in Table 3 include DX, water, or steam (20 years) and electric (15 years). The HVAC designer should temper the service life expectancy of coils with a **maintenance factor**. Chilled-water coils with more than four rows and close fin spacing are virtually impossible to clean even using extraordinary cleaning methods. In order to realize the estimated service life values in Table 3, HVAC cooling coils must be maintained properly, including good filter-changing practices and good maintenance procedures. Many times coils with more than four rows are replaced with multiple coils in series with a maximum of four rows and lighter fin spacing.

Depreciation periods are usually set by federal, state, or local tax laws, which change periodically. Applicable tax laws should be consulted for more information on depreciation.

Interest or Discount Rate

Most major economic analyses consider the opportunity cost of borrowing money, inflation, and the time value of money. **Opportunity cost** of money reflects the earnings that investing (or lending) the money can produce. **Inflation** (price escalation) decreases the purchasing or investing power (value) of future money because it can buy less in the future. **Time value** of money reflects the fact that money received today is more useful than the same amount received a year from now, even with zero inflation, because the money is available earlier for reinvestment.

The cost or value of money must also be considered. When borrowing money, a percentage fee or interest rate must normally be paid. However, the interest rate may not necessarily be the correct

Figure 5 – ASHRAE Table 3
Estimated Service Life

cost of money to use in an economic analysis. Another factor, called the **discount rate**, is more commonly used to reflect the true cost of money (Refer to NIST *Handbook* 135 for detailed discussions). Discount rates used for analyses vary depending on individual investment, profit, and other opportunities. Interest rates, in contrast, tend to be more centrally fixed by lending institutions.

To minimize the confusion caused by the vague definition and variable nature of discount rates, the U.S. government has specified particular discount rates that can be used in economic analyses relating to federal expenditures. These discount rates are updated annually (Fuller and Boyles 2001; OMB 1992) but may not be appropriate for private-sector economic analyses.

Periodic Costs

Regularly or periodically recurring costs include insurance, property taxes, income taxes, rent, refurbishment expenses, disposal fees (e.g., refrigerant recycling costs), occasional major repair costs, and decommissioning expenses.

Insurance. Insurance reimburses a property owner for a financial loss so that equipment can be repaired or replaced. Insurance often indemnifies the owner from liability as well. Financial recovery may include replacing income, rents, or profits lost due to property damage.

Some of the principal factors that influence the total annual insurance premium are building size, construction materials, amount and size of mechanical equipment, geographic location, and policy deductibles. Some regulations set minimum required insurance coverages and premiums that may be charged for various forms of insurable property.

Property Taxes. Property taxes differ widely and may be collected by one or more agencies, such as state, county, or local governments or special assessment districts. Furthermore, property taxes may apply to both real (land, buildings) and personal (everything else) property. Property taxes are most often calculated as a percentage of assessed value but are also determined in other ways, such as fixed fees, license fees, registration fees, etc. Moreover, definitions of assessed value vary widely in different geographic areas. Tax experts should be consulted for applicable practices in a given area.

Income Taxes. Taxes are generally imposed in proportion to net income, after allowance for expenses, depreciation, and numerous other factors. Special tax treatment is often granted to encourage certain investments. Income tax professionals can provide up-to-date information on income tax treatments.

Other Periodic Costs. Examples of other costs include changes in regulations that require unscheduled equipment refurbishment to eliminate use of hazardous substances, and disposal costs for such substances.

Replacement Costs and Salvage Value

Replacement costs and salvage value should be evaluated when calculating the owning cost. At the end of the equipment's useful life there may be negative salvage value (i.e., removal, disposal, or decommissioning costs).

OPERATING COSTS

Operating costs are those incurred by the actual operation of the system. They include costs of fuel and electricity, wages, supplies, water, material, and maintenance parts and services. Chapter 31 of the 2001 *ASHRAE Handbook—Fundamentals* outlines how fuel and electrical requirements are estimated. Note that total energy consumption cannot generally be multiplied by a per unit energy cost to arrive at annual utility cost.

Table 3 Estimates of Service Lives of Various System Components[a]

Equipment Item	Median Years	Equipment Item	Median Years	Equipment Item	Median Years
Air conditioners		Air terminals		Air-cooled condensers	20
Window unit	10	Diffusers, grilles, and registers	27	Evaporative condensers	20
Residential single or split package	15	Induction and fan-coil units	20	Insulation	
Commercial through-the-wall	15	VAV and double-duct boxes	20	Molded	20
Water-cooled package	15	Air washers	17	Blanket	24
Heat pumps		Ductwork	30	Pumps	
Residential air-to-air	15[b]	Dampers	20	Base-mounted	20
Commercial air-to-air	15	Fans		Pipe-mounted	10
Commercial water-to-air	19	Centrifugal	25	Sump and well	10
Roof-top air conditioners		Axial	20	Condensate	15
Single-zone	15	Propeller	15	Reciprocating engines	20
Multizone	15	Ventilating roof-mounted	20	Steam turbines	30
Boilers, hot water (steam)		Coils		Electric motors	18
Steel water-tube	24 (30)	DX, water, or steam	20	Motor starters	17
Steel fire-tube	25 (25)	Electric	15	Electric transformers	30
Cast iron	35 (30)	Heat exchangers		Controls	
Electric	15	Shell-and-tube	24	Pneumatic	20
Burners	21	Reciprocating compressors	20	Electric	16
Furnaces		Package chillers		Electronic	15
Gas- or oil-fired	18	Reciprocating	20	Valve actuators	
Unit heaters		Centrifugal	23	Hydraulic	15
Gas or electric	13	Absorption	23	Pneumatic	20
Hot water or steam	20	Cooling towers		Self-contained	10
Radiant heaters		Galvanized metal	20		
Electric	10	Wood	20		
Hot water or steam	25	Ceramic	34		

Notes: 1. ASHRAE makes no claims as to the *statistical* validity of any of the data presented in this table.
2. Table lists base values that should be adjusted for local conditions (see the section on Service Life).

Source: Data obtained from a survey of the United States by ASHRAE Technical Committee TC 1.8 (Akalin 1978).

[a] See Lovvorn and Hiller (1985) and Easton Consultants (1986) for further information.
[b] Data updated by TC 1.8 in 1986.

3.4.2. Plumbing Systems

Description of Plumbing Systems

Water Service: Domestic water service enters the boiler room on the east wall; Union Street side. Domestic water service first passes through a 3" diameter water meter then through two (dual) 4" diameter Watts back-flow preventers piped in parallel.

Water Heater: Domestic hot water for the facility is generated by means of an instantaneous gas fired water heater. The unit is manufactured by A.O. Smith, Model BC 420. The heater is augmented by means of an uninsulated 200 gallon water storage tank.

Sanitary System: Sanitary service exists both in the north and west sides of the Mechanical Room (facility). It was reported that the system operated sluggishly at times and two flushes are required for the water closets. Rodding (roto-routing) the piping system would be the first repair for this issue. The alternative would be pipe replacement. Replacement of the piping should only be considered if the severity is a large enough concern as pipe replacement would be a very costly and time consuming remediation, which would render the sanitary service inoperative for an extended period of time while construction work is completed.

Plumbing System Observations and Recommendations:

Water Heater: The water heater has been in service for 20+ years and has seen its useful life. Replacement of the water heater should be anticipated in the near future.

3.4.3. Fire Protection System

Six inch water service for the fire protection system enters the basement Mechanical Room from the east wall (Union Street) side. A Watts back-flow preventer is installed on the fins service main. A wet pipe system provided with a Viking Model H-1 alarm check valve feeds the sprinkler system. No hydraulic nameplate date identifies the system capacity.

Photo 83 – Domestic Water Service (left) and Fire Service (right) in Basement Mechanical Room

Photo 84 – Domestic Water Service Backflow Preventers in Basement Mechanical Room

Photo 85 – Water Meter in Basement Mechanical Room

Photo 86 – Domestic Water Heater in Basement Mechanical Room

Photo 87 – Sprinkler Riser Assembly in Basement Mechanical Room

4.0 TERMINAL CAPACITY

The structure was evaluated for its existing capacity to handle:

1. Bus traffic
2. Taxi and private auto traffic
3. Pedestrian and bicycle traffic
4. Overall building

No specific capacity modeling techniques were employed at this time. The following analysis is based on observations of the area and previously documented capacity.[9]

4.1 Bus Traffic

Currently 15 bus stalls are provided on the west side of the building for the private carriers that lease space in the facility. All 15 stalls are leased out. Typically, the stalls are assigned to particular routes for each bus line. Utilization rates of the stalls are high during the peak time from Thursday evening to Monday morning according to GHTD staff. In review, it does appear that there is the potential for some "over-leasing" of the stalls to prevent access to competing bus lines; however direct discussions and negotiations with the bus lines would be required to understand their future plans before it should be assumed that stalls could be re-assigned to other uses. Furthermore, it may be that re-allocation of the area would be preferable as the stalls were designed for smaller than the standard 45 foot over-the-road coaches used today. A solution to this situation is to increase the angle of the stall to provide for more access way. This would reduce the overall stall capacity within the area.

With some minor reconfigurations of traffic and parking patterns, curb-style[10] bus stalls could be incorporated onto either Spruce Street or Union Place for increased access for CTTransit busses. Not only is this a preferential configuration to the pull-in arrangement of the private stalls, it would allow for access adjacent to a curb to minimize the travel distance of the incorporated wheelchair ramps, a long-term maintenance concern.

Overall, it is seen that with some street improvements that there is capacity for incorporation of CTTransit busses within the facility area without reduction or elimination of any private bus stall capacity.

4.2 Taxi and Private Auto Traffic

At the time of the observational field visit, taxi service was provided along the Spruce Street canopy. While no capacity problems were observed with the taxis, peak period situations were not observed and may be more congested. With increased traffic at Union Station alternative methods of allocating space to taxis may be warranted.

Private auto traffic is limited within this memo to "kiss-and-ride" or drop-off traffic. Subsequent technical memos shall deal with parking capacity within the vicinity of Union Station. For drop-off private autos, a short-term waiting zone is provided along the north end of the Spruce Street canopy. During the site visit, it was observed to be at capacity

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[9] Occupancy levels were based on the Building Code information shown on Sheet A-1 of the Phase Three Union Station Transportation Center plans dated 10/25/1985. General areas and occupancy assumptions were confirmed by visual inspection and review of the current Connecticut Building Code.

[10] The bus stalls for the private carriers adjacent to the Transportation Center are pull-in / back-out style. While adequate for intercity style bus routes with longer layovers, the required backing motion is not recommended for the shorter layovers of innercity bus service. For these services, a curb-side or saw tooth bus stall adjacent to a curb is preferred.

during some times; however at other instances parking was available. For immediate drop-off, the observed current traffic on Union Place is not heavy enough to prohibit stopping to let passengers out of a vehicle. Within the overall analysis of parking in the area, it may be worthwhile to consider some increased short term waiting parking, perhaps as a separate rate portion of an enhanced Spruce Street lot. This would be more important for any increased passenger usage from the proposed commuter rail line than for increased usage for CTTransit service.

4.3 Pedestrian and Bicycle Traffic

Pedestrian capacity primarily evaluates the waiting areas ability to handle the passenger loads. The existing Ground Transportation Center lobby has a permitted capacity of 400 persons assuming a standing arrangement. Practical capacity is approximately one-half of that number to not have a "crowded" situation within the area. While no direct observations were made during the peak times, it would be anticipated that area does have some minor congestion during the heaviest times of usage but not outside of the total capacity.

The Great Hall does offer an excellent area of under-utilized waiting capacity for transportation movements. With a total maximum occupancy of approximately 950 persons in a standing arrangement, it could easily accommodate another 400 – 500 waiting passengers without congestion. To utilize this space better for passenger waiting, it would be necessary to connect the announcement and other notification systems. Furthermore, it may be preferential to incorporate either better signage for the existing accessible path or to construct a new accessible path between the Great Hall and Ground Transportation Center lobby by reconfiguring the Ground Transportation Center lobby.[11]

Currently there are no bicycle facilities at Union Station. Any future improvements that incorporate increased CTTransit service should include the installation of bicycle racks and / or lockers. This would be consistent with CTTransit's installation of bicycle racks on all busses in the Hartford area. The location for the racks and / or lockers should be adjacent to any CTTransit main stop areas, if feasible.

4.4 Overall Building Capacity

Overall building utilization is very good with a few exceptions. The only tenant space not currently leased out is the inaccessible portion of the 2nd floor. With some reorganization of the Capital Workforce Partners lease, a corridor could be provided from the Great Hall / elevator area to allow for this space to be leased.

In addition, the original build-out for the Ground Transportation Center is obsolete based on the current functions. On the south side, a majority of the area is utilized; however operational efficiencies and some additional capacity could be found through restructuring the area. For example, the office for Dunkin Donuts is located distant from their vending and operational area. On the north side, which is primarily Amtrak with the exception of the recent lease to Subway, even more space can be potentially gained for another tenant or increased passenger area and amenities. Amtrak's area includes a significant amount of underutilized area; however it would require a restructuring of their lease and construction improvements to access the area.

4.5 Capacity Summary

Depending on any final operation scenarios, it appears that Union Station offers excellent abilities and capacity to handle more services.

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[11] It may be feasible to install an ADA compliant ramp system in the area of the main stairs between the two areas with a complete reconfiguration of the Ground Transportation Center lobby. Further analysis of this option will be performed as a later task associated with Union Station development if the operating scenarios suggest it is a logical improvement.

- Increased passenger services would more fully utilize the Great Hall space, generating more pedestrian traffic and thusly higher potential for tenant lease revenues.

- There is the potential for greater passenger space and / or increased tenant space within the Ground Transportation Center with the reorganization of the tenant areas, in particular Amtrak.

- While part of a further analysis, it is seen as feasible to incorporate local transit service (CTTransit) on either Union Place or Spruce Street. It may be possible to open up some of the intercity bus stalls; however reconfiguration to a curb style access would be recommended.

- With increased traffic at Union Station alternative methods of allocating space to taxis may be warranted.

- Within the analysis of parking around Union Station, consideration for increased passenger drop-off service may be warranted, especially with any incorporation of commuter rail.

- Bicycle amenities should be included in any future planning.

5.0 HISTORICAL DESIGNATION

Union Station was placed on the National Register of Historic Places in 1975 as Building #75001932. Contact was made with the Connecticut Trust for Historic Preservation (CT Trust), who is the state historic preservation office (SHPO), to request the nomination file for the building to have a clear understanding of its significance. According to CT Trust, no nomination file is available for this structure.[12] While not definitively documented, it would be safe to assume that the exterior architectural façade of the original Union Station, principal public interior space of the Great Hall, and functionality of the elevated train platforms all contribute to the historical significance of the structure. This is confirmed in general by the National Register noting that the two areas of significance are architecture and transportation.

5.1 General National Standards

All rehabilitation, restoration, preservation, or reconstruction activities are governed by the local SHPO agency in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties. The GHTD are aware of these guidelines as they have been interacting with CT Trust for general building improvements, such as the planned boiler replacement. In general, most activities that would be required for enhancement of the transportation functions within Union Station would be considered "rehabilitation" which is defined as the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features which convey its historical, cultural, or architectural values.[13] The following bullets summarize the basic precepts with commentary on how it may apply to Union Station:

- *A property will be used as it was historically or be given a new use that requires minimal change to its distinctive materials, features, spaces, and spatial relationships.*
    - Further utilization of the space as a transportation terminal is the historic use.

- *The historic character of the property will be retained and preserved. The removal of distinctive materials or alternation of features, spaces, and spatial relationships that characterize the property will be avoided.*
    - This requires the maintenance of the overall exterior façades and the form and function of the Great Hall.

- *Each property will be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or elements from other historic properties, will not be undertaken.*
    - This is not foreseen as an issue.

- *Changes to a property that have acquired historic significance in their own right will be retained and preserved.*
    - It is not perceived that either the Union Place storefront additions or the Ground Transportation Center would be considered to have acquired any historic significance. Therefore, while it is not anticipated, the storefront additions could be removed. The Ground Transportation Center may be reconstructed in any manner befitting the needs of the terminal as long as the platforms above are maintained within their function and historic context.

- *Distinctive materials, features, finishes and construction techniques or examples of craftsmanship that characterize a property will be preserved.*

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[12] Primary contact for Union Station at CT Trust is David Poirier: d.poirier@ct.gov or 860-566-3005
[13] From the Secretary of the Interior's Standards for the Treatment of Historic Properties

- This would primarily relate to any efforts to clean or repair the exterior brownstone masonry, which is currently in good condition. Any future repairs must not alter the material appearance nor affect the hand-carved cornice and other detailed moldings. This would apply to a lesser degree for the Great Hall.

- *Deteriorated historic features will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature will match the old in design, color, texture, and, where possible, materials. Replacement of missing features will be substantiated by documentary and physical evidence.*
    - No major historic features were found to be deteriorated to the need of repair or replacement with the exception of the train trestles and Amtrak platforms. The most major repair that should be completed immediately is the replacement of the stairs from the platform to the ground level at the north and south ends. Through reviewing old photos, the original stairs had been removed an unknown number of years ago and the current stairs are newer. As it is a major safety concern and the installation of the original stair configuration would impact the south storefront addition, it is suggested that these stairs be replaced in kind to their current configuration to correct the situation in the most expedient manner.

- *Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.*
    - Care would need to be exercised in the cleaning of the exterior masonry or interior granite.

- *Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.*
    - Not applicable.

- *New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work shall be differentiated from the old and will be compatible with the historic materials, features, size, scale and proportion, and massing to protect the integrity of the property and its environment.*
    - An illustrative example would be if it was determined to be necessary to add another handicap accessible egress point to the Great Hall at the southern entrance. Rather than something similar to the storefront addition on the north end, which would not be allowable under current regulations and designations, the installation of an exterior ramp with a brownstone screening wall may be acceptable.

- *New additions and adjacent or related new construction will be undertaken in such a manner that, if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.*
    - Following the example of a new southern Great Hall ADA entrance, the ramp and wall must be installed to not impact the existing construction. Preference would be to isolate the new construction from the existing structure and leave the steps remaining under the ramp structure.

5.2 National Accessibility Guidelines

The Department of the Interior recognizes one of the most difficult situations with historic properties is to make them fully accessible for people with disabilities. The National Park Service's *Technical Preservation Brief 32: Making Historic Properties Accessible* provides an excellent overview of the general requirements for accessibility. In summary:

- Modifications can usually be made to non-significant spaces, secondary pathways, later additions, previously altered areas, utilitarian spaces, and service areas.

- If possible, access should be through a primary public entrance. If that cannot be achieved, at least one entrance shall be accessible.

- Historic steps should be buried, and not removed, when making a path accessible.

- Wheelchair platform lifts, if acceptable by state building code, may be used; however they do have limited capacity and require frequent maintenance.

- Historic doors should not be replaced nor should door frames be widened.

In reviewing the access modifications to date, it is seen that they have been compliant with the above recommendations. The ramp was placed in a later addition and the accessible path was developed using secondary pathways. While not at the main central entrance to the Great Hall, the accessible entrance is at the northern end and along the front main Union Place façade. Wheelchair platform lifts were only utilized on the third floor where no other solution would have been feasible and in an area of more limited public usage. The historic doors on the accessible path were modified using push-to-open and other unobtrusive mechanical devices, rather than replacement.

5.3 State Building Code

Section 3407 and 3409 of the Connecticut State Building Code refers to historic buildings.

Section 3407.1: *Historic Buildings. The provisions of this code relating to the construction, repair, alteration, addition, restoration and movement of structures, and change of occupancy shall not be mandatory for historic buildings where such buildings are judged by the building official to not constitute a distinct life safety hazard.*

Section 3409.8: *Historic Buildings. These provisions shall apply to buildings and facilities designated as historic structures that undergo alterations or a change of occupancy, unless technically infeasible. Where compliance with the requirements for accessible routes, ramps, entrances, or toilet facilities would threaten or destroy the historic significance of the building or facility, as determined by the authority having jurisdiction, the alternative requirements of Sections 3409.8.1 through 3409.8.5 for that element shall be permitted.*

Section 3409.8.1: *Site arrival points. At least one accessible route from a site arrival point to an accessible entrance shall be provided.*

Section 3409.8.2: *Multilevel buildings and facilities. An accessible route from an accessible entrance to public spaces on the level of the accessible entrance shall be provided.*

Section 3409.8.3: *Entrances. At least one main entrance shall be accessible.*

Section 3409.8.4: *Toilet and bathing facilities. Where toilet rooms are provided, at least one accessible toilet room… shall be provided.*

Section 3409.8.5: *Ramps. The slope of a ramp run of 24 inches maximum shall not be steeper than one unit vertical in eight units horizontal.*

As discussed previously, the current building is compliant based on the historic regulations above by providing an accessible route to each accessible entrance both on the exterior and interior. Each main area has one accessible entrance.

The above regulations, in particular Section 3407.1, are reinforced in Chapter 541, Section 29-259 of the General Statutes of Connecticut.

5.4 Historical Summary

While the exact nature of any improvements is undefined at the time of this report, some general thoughts and considerations are given below for further development.

- Significant modifications should be avoided to the main Union Station, in particular the exterior appearance and the Great Hall.

- Existing accessibility is excellent within the structure. It may be desirable to increase accessible access between the Great Hall and Ground Transportation Center lobby depending on the final estimate of passenger throughput and location of CTTransit services. This may be accomplished within the Ground Transportation Center footprint to minimize impacts to the Union Station and Great Hall.

- Any planned improvements should be discussed at the conceptual level with the CT Trust to confirm that they would be acceptable.

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