

**CONDITION APPRAISAL
(FY 2020)**

**AIR RIGHTS PARKING GARAGE
NEW HAVEN, CONNECTICUT**



**NEW HAVEN
PARKING
AUTHORITY**

PREPARED FOR:
NEW HAVEN PARKING AUTHORITY
232 GEORGE STREET
NEW HAVEN CONNECTICUT 06510

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NHPA PROJECT NO. 20-001
DESMAN PROJECT NO. 20-19171.00-2

APRIL 2020



CONDITION APPRAISAL AIR RIGHTS PARKING GARAGE

NEW HAVEN PARKING AUTHORITY FACILITIES
NEW HAVEN, CONNECTICUT

APRIL 2020

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1. INTRODUCTION

The Condition Appraisal of the Air Rights Parking Garage was performed by DESMAN in accordance with the executed agreement by and between the New Haven Parking Authority (NHPA Project No. 20-001).

The primary objectives of this appraisal are as follows:

- A. Perform a detailed, on-site inspection and observation of the Air Rights Parking Garage in concert with DESMAN's applicable sub-consultants.
- B. Compare the results of the inspection with those addressed in the 2019 Condition Appraisal Report prepared previously by DESMAN.
- C. Prepare a report detailing the findings of the survey including, but not limited to, an update of the estimated construction costs, along with priorities for the various repairs, and recommended capital reserves (future repair and maintenance), to allow the New Haven Parking Authority flexibility in the implementation of structural repairs, mechanical and electrical modifications, and architectural improvements.



2. EXECUTIVE SUMMARY

The Air Rights Garage is PNH's largest structure, containing 2,600 spaces. Opened on December 16, 1982, this garage consists of six (6) levels of cast-in-place concrete beams and columns with cast-in-place, post-tensioned concrete decks in excess of 825,000 gross square footage of parking area. Below the Air Rights Garage is a surface parking lot, comprised of bituminous concrete (asphalt) pavement, known as Under Air Rights Garage.

This 38 year old garage is generally in good condition. The structural integrity of the Air Rights Parking Garage, along with restoration work that was performed over the years, was reviewed and shows the structure to be well maintained. Priority concrete repair and waterproofing work was completed as part of the repair program of 2011/2012 and a subsequent repair program, started Fall 2015 and continued through 2019, as well as a painting and miscellaneous improvement project starting construction in Spring 2018, both continuing into 2020. The installation of a new lighting system is planned for 2020, funding permitting, to replace the existing metal halide fixtures with new and more efficient LED light fixtures.

Currently there are six (6) projects in design or construction which represent a combined project cost of approximately \$11,890,000 (including contingencies and design/management fees). Between 2021 and 2025, an additional expenditure of approximately **\$19,341,550.00** can be expected to properly repair and maintain the Air Rights Garage over the next five years.

DESMAN makes special note that certain repairs deemed necessary over the next five years are now coming due. Certain significant increases are associated with a full replacement of the signage program (**Photos #1 & #2**) as well as various streetscape improvements along South Frontage Road and Rev. Dr. Martin Luther King Jr. Boulevard to improve the pedestrian experience around the garage. There have also been modifications made to account for changes in the condition of the garage, adjustments in the work envisioned (as requested by NHPA staff), changes in economic climate, and changes in the scope of repairs being recommended by DESMAN which are based on currently observed conditions.



Photo #1



Photo #2

**Photo #3****Photo #4**

While partial depth concrete deck repairs have been performed historically (**Photos #3 & #4**), a designated amount of deck repair was addressed as part of the comprehensive repair program of 2011/2012, with additional work in 2015/2016 and continued again in 2016/2017 as well as season (2017/2018) and (2018/2019), a process which should continue to be expected in the future to keep this structure in good condition. As we have indicated previously, this facility's lack of concrete cover and the extent of chloride contamination will continue to result in ongoing corrosion and concrete deck deterioration, so a program to keep it in check is necessary. NHPA should continue to plan to perform repairs at approximate two year intervals, and monitor the performance of the corrosion inhibitor. The projected five year repair costs have been adjusted accordingly.

In addition to the periodic concrete repairs which can be expected in the future, concrete surface scaling/shallow-depth repairs will also be required at roughly two year intervals. Scaling/shallow repairs have become necessary to replace the thin cementitious concrete overlay installed to address this facility's insufficient concrete cover, inadequate drainage slopes, and which have been required to address areas of new surface scaling (loss of surface and exposure of concrete aggregate due to cyclical freeze-thaw) (*Photo #3*). Recent scaling repairs have been performed utilizing a polymer/epoxy/aggregate material in lieu of cementitious material, which is outperforming the cementitious concrete overlay materials used historically. However, while the shallow-depth repairs are an option in select areas, where the depth of the repair is appropriate, DESMAN may recommend the consideration of a deeper repair (partial-depth) to achieve a more durable and long-term repair.

Comprehensively, DESMAN has recently begun to observe that the concrete deterioration appears to be increasing at a faster rate (i.e. shallow-depth and partial-depth). Due to inadequate coverage of the reinforcing steel and insufficient drainage slopes related to original construction, common deterioration mechanisms (ponding of water, subsequent freeze-thaw damage, followed by corrosion of the reinforcing steel) need attention. DESMAN has therefore recommended that a structural analysis of the garage be performed to determine if a more aggressive repair program can be developed, one that could improve the coverage of the steel and the drainage slopes. This analysis is currently in progress as part of NHPA Project #15-005.

The Capital Projects currently in progress consist of the following:

| PROJECT NUMBER | PROJECT TITLE | OPINION OF COST* | STATUS |
|---------------------------------|--|-------------------------|--|
| 12-002/17-003/ 18-010/20-003 | Miscellaneous Repairs & Improvements | \$2,700,000 | In Construction |
| 13-002 | Repairs, NHPA Project No. 13-002 | \$4,900,000 | In closeout |
| 17-002 | Sidewalk Improvements | \$500,000 (approximate) | Design complete; City to bid and administer the construction |
| 18-003 | Lighting & Electrical Repairs and Improvements | \$1,500,000 | In Design |
| 18-011A | Drainage & Pavement Repairs | \$90,000 | In Construction |
| 20-002 | Concrete Repairs & Waterproofing | \$2,200,000 | In Bid Phase (delayed due to Coronavirus Disruption) |

* Rounded, Inclusive of Contingencies, Engineering and Program Management costs.

The costs associated with the implementation of future repairs and preventative maintenance for this garage is presented in more detail later in this report.

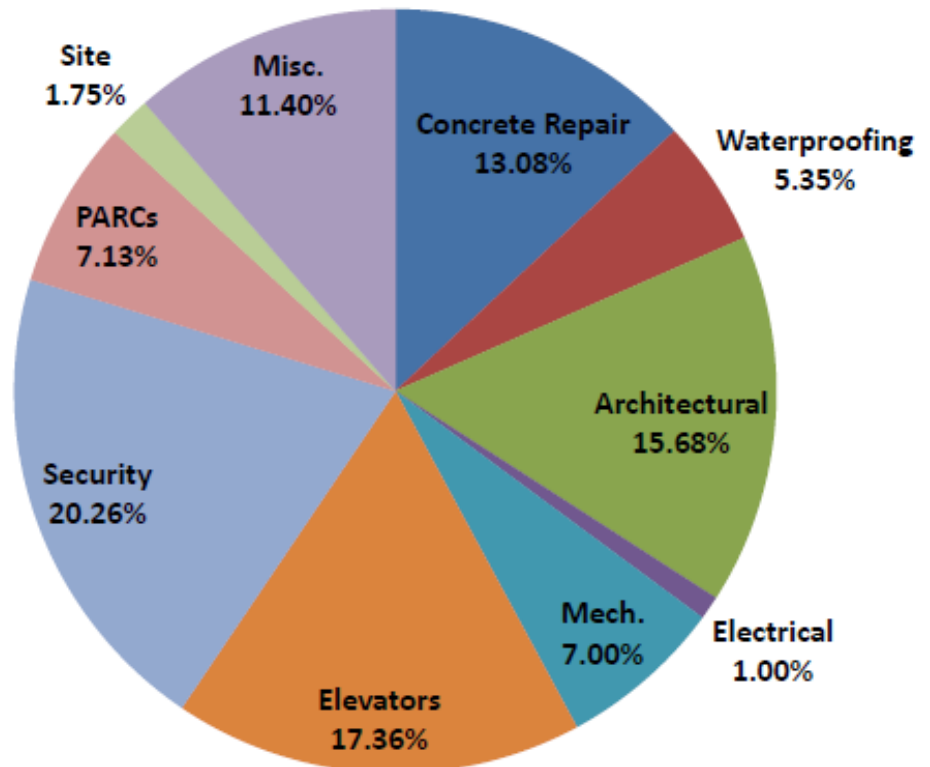
The repairs recommended to be performed over the next five years have been prioritized into five courses of action: Prioritized Repairs (FY 2021), Early Repairs (FY 2022), Programmed Repairs (FY 2023), Long-Term Repairs (FY 2024) and Extended-Term repairs (FY 2025). The table below is a summary of DESMAN's estimated construction cost for each category of work.

| RECOMMENDED REPAIR PROGRAM | ESTIMATED CONSTRUCTION COST |
|------------------------------------|-----------------------------|
| Prioritized Repairs (FY 2021) | \$3,407,500.00 |
| Early Repairs (FY 2022) | \$3,230,600.00 |
| Programmed Repairs (FY 2023) | \$4,119,450.00 |
| Long-Term Repairs (FY 2024) | \$6,600,400.00 |
| Extended-Term Repairs (FY 2025) | \$1,983,600.00 |
| TOTAL ESTIMATED COST | \$19,341,550.00 |

To further summarize, the projected costs may be split into the following discipline categories, in accordance with the associated percentages, as represented by the following pie chart:



| | |
|-----------------------|---------------|
| Concrete Repair: | 13.08% |
| Waterproofing: | 5.35% |
| Architectural: | 15.68% |
| Mechanical: | 7.00% |
| Electrical: | 1.00% |
| Elevators: | 17.36% |
| Security: | 20.26% |
| PARCs: | 7.13% |
| Site: | 1.75% |
| <u>Miscellaneous:</u> | <u>11.40%</u> |
| | 100.00% |



Recommended Repairs & Improvements split into Disciplines



Photo #5



Photo #6



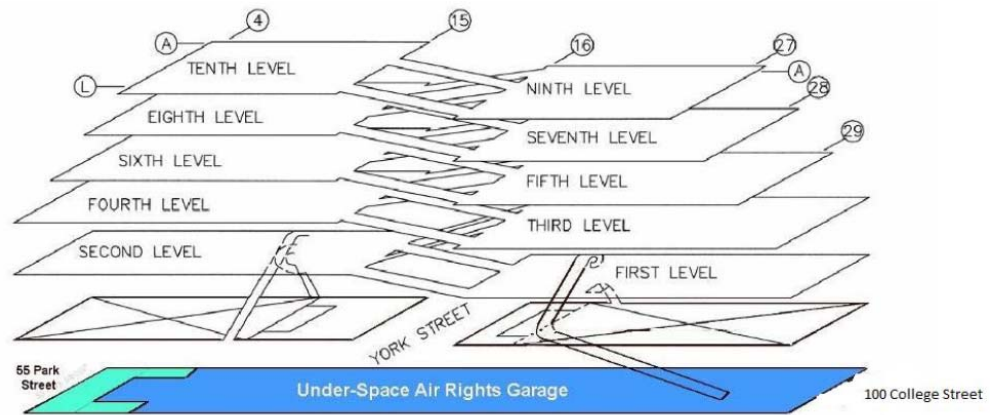
Photo #7



Photo #8

3. DESCRIPTION OF THE STRUCTURE

The Air Rights Parking Garage is a five level, staggered split-level (into east & west halves) parking facility constructed above the right-of-way of what was to have been the extension of Route 34, now abandoned. This former right-of-way serves as parking for approximately 182 parking spaces (**Photo #5**). This area also serves as a loading dock area (**Photo #6**), a garage exit ramp to the service drives at the Highway Level, as well as a garage entry ramp from the service drives at the Highway Level. Use of these parking spaces is dedicated to Connecticut Mental Health Center. The 55 Park Street Building occupies the space immediately west of the Air Rights Garage (**Photo #7**) and the new 100 College Street Building and Garage occupies the area to the east (**Photo #8**).



The Air Rights Garage has a parking capacity of approximately 2,600 cars and serves Yale New Haven Hospital, Yale University School of Medicine and other adjacent businesses and medical establishments.

An enclosed pedestrian walkway over South Frontage Road connects the garage with the Yale New Haven Hospital medical complex located to the south of the garage (**Photo #9**). The parking structure spans York Street, essentially splitting the garage in half into east and west portions. The facility has commercial space located at street level along York Street.



Photo #9



Photo #10



Photo #11

The maximum plan dimensions of the rectangular shaped structure are roughly 244 feet (north to south) by 800 feet (east to west), with each level varying in length in the long direction, stepping back slightly at the east and west ends of the structure on each succeeding level up through the garage.

The levels of the garage are interconnected by two-way, crossover ramps that are 26'-0" wide and have an 8.5% slope between levels (**Photo #10**). There are four one-way ramps from the surrounding surface streets and the service drives below 100 College Street that enter and exit the garage via Level 1 & Level 2 of the facility. There is direct access and egress to the service drives under 100 College Street which opened in Fall 2015.

Vehicle access into Level 2 is currently restricted through the use of dedicated access control gates and proximity card readers.

The traffic control islands and protective bollards installed to restrict access to Level 1 were removed in 2008, and modifications were also made to allow motorcycle access and parking on this level. Curbing, fencing, and access gates have been installed on Level 4 to limit access and provide dedicated and exclusive use of Level 4 parking by Smilow Cancer Hospital patrons. The remainder of the parking garage's (upper levels) is unrestricted.

Facility floor levels are staggered into East (odd numbered floors) and West (even numbered floors) segments. As mentioned previously, individual parking levels are vertically staggered on the east and west-ends, reducing in size from the lower levels to the roof (**Photo #11**). There are two elevator/stair towers and five stairs (**Photo #12**), which provide pedestrian access between the various levels of the garage.

The structural system is typically composed of cast-in-place, post-tensioned concrete, with the post-tensioned floor slabs varying in thickness from 6" to 10", typically spanning 28'-8". The concrete decks frame into 3'-0" deep post-tensioned beams that span anywhere from 46 to 61 feet.





Photo #12

The 1st and 2nd level post-tensioned decks located over the grade level commercial space incorporate an intermediate waterproofing membrane with a 4" thick topping slab reinforced with mild reinforcing steel.

The total supported floor area in the parking garage is approximately 849,500 SF, with about 24,000 SF of this area located over occupied commercial space.

Currently there are various portions of the supported concrete deck protected by an elastomeric traffic bearing waterproofing membrane. Discounting the floor area protected with a topping slab and an intermediate waterproofing membrane, the balance of the supported decks is currently protected by a corrosion inhibitor and clear penetrating concrete sealer.

Four expansion joints are provided on each level of the garage (this counting east and west levels as one combined level), located between column lines 6-7, 12-13, 18-19 and 24-25 to accommodate thermal and lateral movements in this structure.

Floor plans, displaying the basic grid and architectural layout of the garage are included in Appendix A – Schematic Floor Plans.

The facility has had a series of repairs implemented historically to assure the continued safe usage of the facility.

1994: This year's work consisted of miscellaneous structural renovations and miscellaneous waterproofing repairs.

1995: This year's work consisted of miscellaneous signage & graphics improvements, installation of a comprehensive security system (i.e., CCTV and audio duress system, etc.), and various mechanical/electrical upgrades and repairs.

- 1997: This year's work consisted of miscellaneous structural renovations and miscellaneous waterproofing repair work, inclusive of, but not limited to, sealant work, drainage improvements, and various electrical/mechanical upgrades and repairs (fire alarm and intercom repair as well as installation of a pressurized wash down system, etc.)
- 1998 This year's work consisted of miscellaneous mechanical, electrical, and plumbing (M.E.P.) upgrades and repairs, inclusive of, but not limited to, boiler replacement, emergency generator installation, electric heater installation, and plumbing repairs and modifications. Miscellaneous electrical work included branch circuit modifications, battery (inverter) system repair, garage lighting alterations (quartz re-strike light fixture installation), level 1 – access control improvements, and lighting control system modifications. Miscellaneous security system improvement work was also performed which included audio duress system modifications, new security camera installations, security camera replacement, and security monitor replacement.
- 1999 This year's work consisted of miscellaneous structural renovations and miscellaneous waterproofing repairs, inclusive of, but not limited to, concrete deck repair, miscellaneous vertical/overhead concrete and concrete curb repair, expansion joint repair, membrane repair and installation, penetrating sealer application, crack repair and control/construction joint detailing. New awnings were installed at all stair and elevator louvered openings to prevent blowing snow and rain from entering into the stair towers

2001 This year's work consisted of miscellaneous structural renovations and miscellaneous waterproofing repairs, inclusive of, but not limited to, concrete deck repair, miscellaneous vertical/overhead concrete and concrete curb repair, expansion joint repair, membrane repair and installation, penetrating sealer application, crack repair and control/construction joint detailing. The New Haven Parking Authority also installed a new revenue control system, and a comprehensive audit of the facility's security system and security operations was performed in the anticipation of making improvements to the security system.

2004 Based upon the security system audit performed in 2001, the facility's entire security system was upgraded starting in the Fall of 2004 (**Photo #13**).



Photo #13

Additionally, another construction project was implemented this year which consisted of miscellaneous structural renovations and miscellaneous waterproofing repairs, and various electrical repairs and improvements. The electrical work was inclusive of, but not limited to, the replacement of light fixtures and light stanchions on Levels 9 and 10, a review of the intermittent electrical problems (electrical short) on Levels 9 and 10, and the correction of the emergency electrical generator shutoff and elevator breaker problem.

A major streetscape enhancement project was also started in 2004 and completed in 2005. This work consisted of various improvements, including, but not limited to, the removal of the existing temporary concrete "Jersey" barriers along North Frontage Road, Park Street, and down South Frontage Road, along with the removal of the existing chain-link fence, and the subsequent installation of new ornamental steel fence. New sidewalk was also placed, inclusive of a stenciled concrete border along North Frontage Road and South Frontage Road, and two stenciled concrete plazas at the two Park Street corners adjoining the two Frontage Roads. Miscellaneous improvements also included new overhead lighting along North Frontage Road and South Frontage Road as well as planting new street trees and other miscellaneous plantings.



Photo #14

Another project started in late 2004, and continuing through to the fall of 2005, included implementation of various architectural enhancements and improvements to the parking facility. This work included, but was not limited to, installation of new tile floors throughout the facility's elevator lobbies and within the pedestrian bridge connecting the parking facility to Yale-New Haven Hospital, painting all miscellaneous metals within the elevator lobbies and stair cores (**Photo #14**), and the implementation of significant lighting improvements throughout the stairs, lobbies, and the pedestrian bridge, the installation of new fire alarm components, and the installation of new facility signage with new signage and lighting controls.

To provide a more cohesive architectural relationship between the Air Rights Garage and Yale-New Haven Hospital, the colors for the tile flooring installed in the elevator lobbies were chosen to match the color scheme currently utilized in the Hospital's elevator lobbies (**Photo #15**), the walls were painted white, and the metal handrails were painted to match the Hospital's standard shade of blue.

Expanded metal lathe was installed in lieu of the grating, outboard of the handrails in the pedestrian walkway to reduce infiltration of windblown snow.



Photo #15

- 2007 The four (4) elevators were completely modernized. These improvements include a complete upgrade of elevator mechanical and electrical equipment, and improvements to the interior of the elevator cabs with new stainless steel and Corian™ paneling, new flooring tile and new lighting (**Photo #16**).

Work performed in 2007 also included concrete repair, surface scaling repair, post tensioning tendon repair, comprehensive removal and replacement of broken window glazing, miscellaneous door repair, miscellaneous waterproofing repairs (membrane and sealant repairs), miscellaneous painting (fire suppression system piping, window frame touch-up, doors, parking stall and lane



Photo #16



striping), and miscellaneous mechanical/electrical repairs and improvements (installation of fire protection pipe sleeve in foundation wall, boiler inspection, testing and servicing, sprinkler and standpipe system inspection, testing and servicing, flushing of deck drainage system and sand/oil separators, replacement of miscellaneous ceiling exhaust fans & related control hardware, HVAC Unit inspection, testing & servicing, installation of replacement valve handles on fire standpipe in stairs, replace cashier's booth supply fans, duct heaters and related control hardware, 275 kW natural gas emergency generator inspection, testing and servicing).

2008 This year's work consisted of miscellaneous concrete repair (partial depth concrete repair, overhead concrete repair, concrete repair at door thresholds and misc. surface scaling repair), creation of motorcycle access and parking(**Photo #17**), miscellaneous signage improvements (**Photo #18**), miscellaneous door repair/replacement, miscellaneous waterproofing repairs and improvements (crack repair, control/construction joint repair, cove joint repair, waterproofing membrane repair, application of corrosion inhibitor), abandonment & removal of miscellaneous revenue control equipment on Level 1 and Level 2, miscellaneous drainage work (cleaning and flushing of drainage system, supplemental drain installation), miscellaneous painting work within stairwells (concrete masonry surfaces, metal surfaces, and facility restriping

2010 This year's work consisted of miscellaneous concrete repair (partial depth concrete repair, overhead concrete repair, curb repair, miscellaneous surface scaling repair), programmed expansion joint replacement, installation of a heavy-duty waterproofing membrane on the entry/exit ramps, miscellaneous drainage repairs, as well as facility restriping.



Photo #17



Photo #18

Work also started in 2010 (completed in 2013) consisted of replacement of the facility's pre-existing HPS light fixtures with new high intensity discharge (HID) metal halide lighting fixtures, conversion of stairwell lighting to emergency power, emergency generator preventative maintenance, as well as emergency exit signage repair.

2012 This year's work consisted of miscellaneous concrete repair (partial depth concrete repair, overhead concrete repair, curb repair, miscellaneous surface scaling repair), programmed expansion joint replacement, installation of a standard-duty and heavy-duty waterproofing membrane, miscellaneous drainage repairs and fire standpipe repairs and replacement, as well as facility restriping.

2015-2020 Work, in Project #13-002, started in 2015 and currently in the process of closeout and includes the following:

A. Concrete Repair:

1. Partial Depth Concrete Repairs
2. Surface Scaling Repair
3. Miscellaneous Vertical and Overhead Concrete Repair

B. Waterproofing Issues:

1. Traffic Bearing Waterproofing Membrane Repair
2. New Traffic Bearing Waterproofing Membrane Installation
3. Replacement of Urethane Sealants
4. Roofing Repairs over Stairs and Elevators

C. Miscellaneous Electrical Repairs:

1. Replacement of T12 Fluorescent Lamps
2. Thermal Scanning
3. Miscellaneous Electrical Repairs



D. Miscellaneous Drainage Repairs:

1. Cleaning Floor Drains (inclusive of Sand/Oil Separators)

E. Miscellaneous Coordination Work:

1. Refurbishment of the Clearance Bar Assemblies
2. Parking Stall & Lane Striping
3. Mobilization & Associated Work

2017 Work, in Project #12-002, officially started the Fall 2017 and currently in progress includes the following:

- A miscellaneous repair and improvement project, inclusive of, but not limited to the following work:
 - A. Painting - concrete/masonry surfaces
 - B. Painting - metal surfaces
 - C. Storefront Repair and Maintenance
 - D. Replacement of Broken Glass and Cleaning of Glass
 - E. Miscellaneous Flooring/Tile Repair
 - F. Miscellaneous Door Repair
 - G. Mechanical Improvements
 - H. Exterior Pressure Washing
 - I. Coating of Exterior PT Anchorage
 - J. Railing Repair and Modifications
 - K. Miscellaneous Coordination.

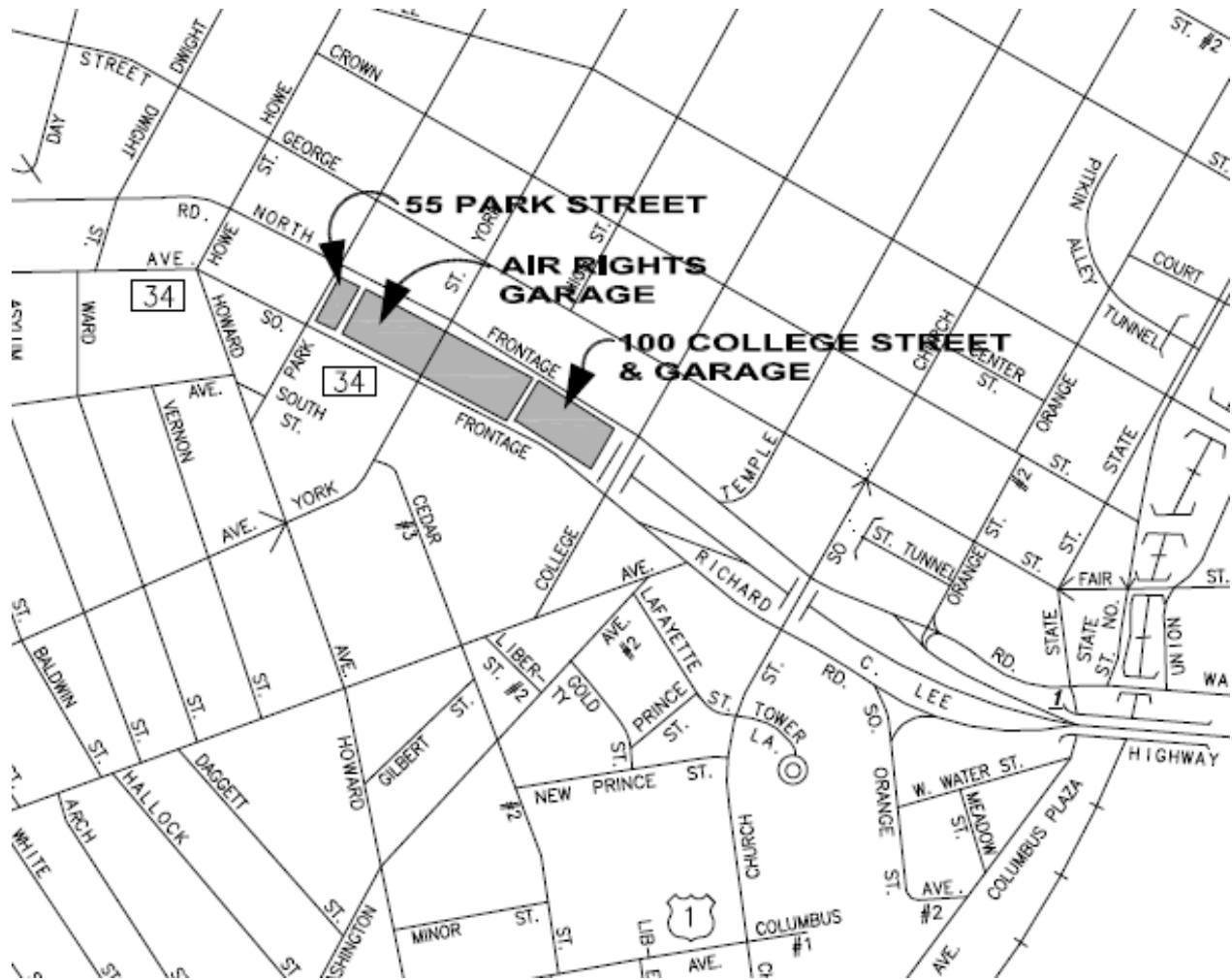
2019 Work, in project #17-003 and incorporated into project #12-002, currently in progress includes HVAC repairs and improvements to the mechanical systems serving the secondary rooms behind the security control room as well as the manager's office.

2019 Work, in project #20-003 and incorporated into project #12-002, currently in progress includes the replacement of the existing roof level awnings at the stair and elevator towers, with new standing seam metal roof systems.



- 2020 Work, in project #18-011A, currently in progress includes miscellaneous pavement & drainage repairs.
- 2020 Work currently in design or in the process of bidding at the Air Rights Garage, but is awaiting a scheduled release or adjusted timeframe, includes the following:
- Concrete Repairs and Waterproofing (Project #20-002); delayed due to the coronavirus disruption.
 - Sidewalk improvements around the eastern half of the garage, including bollard installation (Projects #17-002 & #19-022) (design completed but now being bid and administered by the City of New Haven)
 - Electrical and Lighting Repairs and Improvements (Project #18-003); project was placed on hold due to funding limitations, but later released and placed on bid list for 2020.
 - Perimeter Enclosures and Related Security Measures (Project #20-037); study in progress.





Site Plan

STRUCTURAL DATA

AIR RIGHTS PARKING GARAGE NEW HAVEN, CONNECTICUT

| | |
|-------------------------------|---------------------------|
| DATE OF COMPLETION: | 1982 |
| AGE OF STRUCTURE: | 38 years |
| PARKING CAPACITY: | 2,600 cars |
| PLAN DIMENSIONS: | Roughly 800 ft. x 244 ft. |
| FLOOR TO FLOOR HEIGHT: | 11'-0" Minimum |
| TYPICAL BAY SIZE: | 28'-8" wide |

PARKING FLOOR AREAS:

| | |
|--------------------------|------------|
| Supported Slab w/topping | 24,500 SF |
| Supported Slab (exposed) | 825,000 SF |
| Total | 849,500 SF |

STRUCTURAL SYSTEM:

| | |
|-------------|--|
| Floor Slabs | Cast-in-place, post-tensioned |
| Beams | Varies from 6" to 10" thick 20" wide x 36" deep |

DESIGN LIVE LOADS:

| | |
|------------------------------|---------|
| Roof Level and Cantilevers | 80 PSF |
| 2nd, 3rd, 4th and 5th levels | 50 PSF |
| Ramps and Cross-over | 50 PSF |
| Retail Space | 125 PSF |

MATERIAL STRENGTHS:

Concrete Compressive Strength

| | |
|-----------------------------|--------------------|
| Supported Slabs | $f'_c = 4,000$ PSI |
| Slab-on-Grade & Foundations | $f'_c = 3,000$ PSI |

REINFORCING STEEL:

| | |
|--|------------------------|
| Pre-stressing Tendon (7 wire strand) | $f_{pu} = 270,000$ PSI |
| Mild Reinforcing Steel (Rebar Ties & Stirrups) | $f_y = 60,000$ PSI |



4. VISUAL OBSERVATIONS & REPAIR RECOMMENDATIONS

The Air Rights Parking Garage is 38 years old and should be considered in generally good condition. All of the repair work implemented historically continues to perform well, though some of these repairs are nearing the end of their expected useful life and showing increased signs of deterioration.

A visual reconnaissance of the Air Rights Garage was performed again this year in the development of this report, as well as incorporation of chain-drag results determined via NHPA Project #13-002 in progress. Included, as part of this reconnaissance was the review of previously repaired concrete deck areas and the surrounding concrete surfaces to determine how well the repairs were performing and to determine if deterioration was progressing beyond these areas.

STRUCTURAL REPAIRS:

Concrete Deck Repair: Visual observation and sounding of the supported decks shows that previous repairs are performing well, but additional limited areas are showing signs of deterioration. As noted in previous reports, limited amounts of concrete delamination continue to be identified throughout the garage (**Photos #19 & #20**); the majority of this deterioration continues to be found on the facility's roof level, the exposed cantilevered ends of the structure's lower levels, and in high traffic areas such as on the facility's central access ramps between levels.

In limited locations, post-tension tendons have been exposed and damaged (**Photo #21**). While the locations are infrequent, and DESMAN does not consider them to have compromised the structural integrity of the garage at this time, DESMAN does recommend that designated locations be monitored and be budgeted for repair. Interim short-term repairs may be required, as NHPA Maintenance has already performed in certain locations.



Photo #19



Photo #20





Photo #21

Due to inadequate coverage of the reinforcing steel and insufficient drainage slopes related to original construction, common deterioration mechanisms (ponding of water, subsequent freeze-thaw damage, followed by corrosion of the reinforcing steel) need attention.

While NHPA and DESMAN have attempted to keep pace with the deterioration, programming concrete repairs and waterproofing at regular intervals such as recently completed under NHPA Project no. 13-002 as well as further repairs to be addressed under NHPA Project no. 20-002 currently in design, it now appears that a more aggressive program should be considered. DESMAN considers various options for implementation, such as:

1. Continuing to address the patching of spalled/delaminated concrete, but at an increased magnitude and frequency,
2. Programming the selective demolition and resurfacing of designated deck areas, focusing on the roof levels (Levels 9 & 10), as well as the cantilever portions of the intermediate levels, with the intent of increasing the coverage of the steel and improving the drainage slopes.



Photo #22

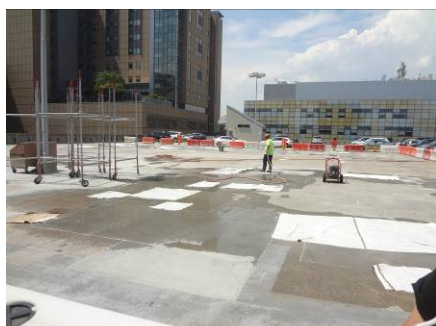


Photo #23

However, before the coverage of the steel can be increased and the slopes improved, thus increasing the depth of the decks and subsequent dead load on the decks, DESMAN recommends that a structural analysis of the garage be performed, reviewing the parking decks' beam and column configuration and potential impact by applicable Codes; additional strengthening methods may be required in order to accommodate the increased dead load. Upon completion of the analysis, DESMAN would then be able to provide a more comprehensive approach for this option. DESMAN notes that this analysis is currently in progress as part of NHPA Project No. 15-005.

While significant areas of deck delamination were addressed in 2007 and 2008 as well as some additional repairs being performed in 2012, 2015, 2016, 2017 & 2018 (**Photos #22 & #23**), the nature of this deck, with its elevated level of chloride contamination and a demonstrated lack of sufficient concrete cover, will continue to

experience concrete deck deterioration. Since NHPA continues to program the application of a corrosion inhibitor and the installation of supplemental drains to eliminate areas of standing water, DESMAN continues to recommend that NHPA budget for the implementation of structural deck repair over the next 5 years. This item of work should be reviewed each year as part of the condition assessment program to determine how well the decks continue to perform and the repair quantities adjusted accordingly.

Typically, NHPA has planned to perform repairs at approximate two year intervals and DESMAN recommends that NHPA continue to do so. In the interim, though, Desman recommends that NHPA prepare to address minor “potholes” that may appear, thus minimizing the chance that the “potholes” expand to become a larger and more expensive repair. Therefore, DESMAN recommends that “pothole” repair be programmed and NHPA budget accordingly.



Photo #24



Photo #25

Surface Scaling/Shallow Repair: There also continues to be a need to address concrete surface scaling and shallow-depth concrete repairs and to replace thin cementitious concrete overlay installed historically in an attempt to address this facility's insufficient concrete cover and poor drainage slopes. The majority of the thin cementitious overlay material described was installed during the facility's original construction; though similar cementitious overlay material has been installed historically to address areas of the originally applied material needing replacement, or to address new areas of surface scaling (loss of surface and exposure of concrete aggregate due to cyclical freeze-thaw damage) (**Photo #24**). Recent scaling repairs have utilized a polymer/epoxy/aggregate overlay material in lieu of cementitious material. The polymer/epoxy/aggregate overlayment is expected to outperform the cementitious materials previously installed.

Over time additional areas of the thin cementitious overlay will need to be replaced with the polymer/epoxy/aggregate overlayment due to deterioration of the original material, and due to the fact that exposed areas of the concrete decks will continue to experience cyclical freeze-thaw damage; various locations were recently addressed as part of NHPA Project No. 13-002 and further repairs will be addressed as part of NHPA Project no. 20-002.

While the shallow-depth repairs are an option in select areas, where the depth of the repair is appropriate, it may be recommended to consider a deeper repair (partial-depth) to achieve a more durable and long-term repair, as related to the concrete deck repairs noted above. DESMAN recommends that shallow-depth repairs continue to be programmed, but the repair locations be reviewed on a case-by-case basis.

Miscellaneous Concrete Curb Repair: Although minor in nature, DESMAN recommends that miscellaneous curb repair be programmed. With any concrete parking structure, miscellaneous damage by vehicles and snow removal equipment, as well as other conditions exist (**Photo #25**), which are likely to result in the need to implement repairs periodically.

Miscellaneous Vertical and Overhead Concrete Repair: Although minor in nature, DESMAN recommends that miscellaneous vertical and overhead concrete repairs be programmed. With any concrete parking structure, conditions exist which are likely to result in the need to implement miscellaneous repairs periodically (**Photo #26**). This work is currently scheduled to be performed as part of NHPA Project No. 20-002, currently in design.

WATERPROOFING ISSUES:

Waterproofing Membrane Repair: The entry/exit ramps had been exhibiting increased need for repair of the elastomeric traffic bearing waterproofing membrane, due to normal wear and tear, in the recent years; underlying concrete had become exposed and unprotected. These ramps received a new wear coat of a heavy-duty membrane system as part of the repair program of 2010.

Similarly, waterproofing membrane exists in other areas of the garage [i.e., speed ramps between levels, on expansion joint approach aprons, above negative moment regions of the deck (*Those areas of the supported slab where reinforcing steel is placed in the top of the supported concrete slabs.*), etc.]. The deterioration of the waterproofing membrane is consistent with exposure to higher volumes of vehicular traffic, or in certain instances is worn or damaged due to exposure to direct sunlight (UV degradation) or because of damage caused during snow removal operations (**Photo #27**). Select miscellaneous locations have received new membrane, throughout the garage, as part of the various repair programs.



Photo #26



Photo #27



Photo #28

Repairs recently implemented in the current repair program will address additional waterproofing membrane problems identified (**Photo #28**), but the nature of these surface-applied waterproofing membranes dictates that periodic repairs and reapplication will always be required. This work is currently scheduled to be performed as part of NHPA Project No. 20-002, currently in design.

New Waterproofing Membrane: As this facility gets older and the level of chloride contamination increases within the deck, and as this contamination migrates further into the deck there will be an ever increasing need to protect the deck to prevent moisture infiltration. Areas of the deck showing the greatest propensity for concrete delamination and deterioration will likely need to have some form of waterproofing membrane installed. The costs associated with this work have been programmed into our estimated repair and preventative maintenance costs.

Topically Applied Corrosion Inhibitor: As discussed in previous Condition Assessment Reports, there has been a program in place at this garage for the periodic application or re-application of clear penetrating concrete sealers on exposed surfaces of the supported concrete decks of this parking facility. Due to the amount of chloride contamination, it was determined that the application of a corrosion inhibitor was more appropriate to reduce corrosive activity within the supported concrete decks. The application of a corrosion inhibitor was done in 2008 and was recently re-applied as part of NHPA Project No. 13-002 in 2019. Re-application of this material and/or the re-application of a clear penetrating concrete sealer will still need to be done periodically.

Because neither of these materials are able to bridge cracks in concrete, it is preferred that their application or re-application be done in conjunction with a program of crack and control/construction joint repair and quite possibly combined with the application of an elastomeric traffic bearing waterproofing membrane in certain areas.

Alternative Waterproofing Options:

Recently, DESMAN has begun to consider more aggressive approaches to the historic waterproofing concerns, in lieu of repeated and additional membrane installation. While the membranes do address a waterproofing concern, installation of an increasing amount of membrane adds an increasing cost to maintenance.

As a more aggressive and durable waterproofing system, in lieu of a traditional traffic bearing membrane, DESMAN may suggest that an epoxy-based overlay system be considered, supplemental to the topically-applied corrosion inhibitor. Since a traditional membrane system, which typically consists of two coats of urethane or other such similar materials, has demonstrated to wear down and in some cases, de-bond from the substrate surface, thus prompting subsequent maintenance and repair in the past, an epoxy-based overlay system may provide a greater bond, thus providing a more durable adhesion to the substrate and greater wearing tolerance than the urethane-based system has apparently had.

Since the epoxy overlay system, by itself, would not provide the waterproofing needs of the garage, though, DESMAN would recommend that the epoxy base-coat be followed by a urethane top-coat or pre-empted by a urethane primer/base coat system, all as recommended by the applicable manufacturer.

To start, DESMAN may recommend that the roof level (Levels 9 & 10) be considered as a priority, due to the regular deterioration that occurs as a result of the heaviest impact by weather conditions, followed by the cantilever-potions of the intermediate decks. Therefore, DESMAN notes that installation of an epoxy-overlay system could be developed in conjunction with installation of a traditional membrane system in the remaining areas.

DESMAN notes that installation of an epoxy-based system is not to be viewed as a substitute for concrete repairs, and should be performed following the completion of the applicable concrete repair work. However, similar to the traffic bearing membrane, installation of an epoxy overlay system could provide the additional benefit of covering the concrete patches that are present throughout the garage, thus minimizing the aesthetic impact of a history of various repair projects.



Photo #29



Photo #30

Since the different waterproofing options all have advantages and disadvantages with varying impact to programmed maintenance costs, DESMAN recommends that the choice of a more aggressive and durable waterproofing system be reviewed and carefully considered further. This review can be performed in conjunction with the recommended structural analysis to be performed, thus providing NHPA with a comprehensive approach to improving the integrity and durability of the parking decks. This review is currently in progress, as part of NHPA Project No. 15-005.

Repair / Replace Expansion Joint: Visual examination of expansion joint seals and expansion joint nosings indicates that the majority of the expansion joints are in relatively fair condition, but they are not being well maintained (**Photos #29 & #30**). The longevity of expansion joint seals requires the periodic removal of accumulated sand, grit and debris which can accumulate within the folds of the joint. This accumulated debris prevents proper joint movement and vehicles traversing across the joints tend to grind debris into seals wearing them prematurely. A limited amount of repairs to expansion joints was performed in 2007 and 2008, and additional programmed repairs to the facility's expansion joints were included as part of the comprehensive repair programs of 2010 and 2012, with subsequent joints replaced in 2018 as part of NHPA Project #13-002. Further replacement is programmed for the future.

In the process of **DESMAN** performing its annual condition appraisals of the Air Rights Garage, we noted the apparent failed condition of the expansion joints through York Street, which passes through the Air Rights Parking Garage; see photos below. These joints were observed allowing water to pass through the joint openings, thus reaching the structure below. This moisture, if left unchecked and managed, will contribute to deterioration of the concrete structure and asphalt below. We understand that the maintenance and repair of York Street is the responsibility of the City of New Haven, and that Park New Haven informed the City of the suggested maintenance and repair so as to prevent further deterioration to the Air Rights Garage.



Due to the heavy pedestrian traffic experienced by the sidewalks of York Street due to the tenant spaces as well as traffic passing through, maintenance of the joints throughout the sidewalks has been challenging; however, due to the recent observance of leaking through the joints of the street (see above), the condition of the sidewalk joints has become a more significant concern. DESMAN therefore recommends that the construction & expansion joints throughout the sidewalk areas be programmed for replacement; DESMAN notes that the expansion joint within the entrance area (from York Street into the garage) had already been replaced as part of Project No. 13-002 with the remaining joint glands replaced in 2019.



Photo #31

Replace Urethane Sealants: A significant amount of polyurethane sealant material which has been installed historically to seal leaking cracks, construction joints and cove joints is showing signs of deterioration consistent with exposure to higher volumes of vehicular traffic, or in certain instances is worn or damaged due to exposure to direct sunlight (UV degradation) or because of damage caused during snow removal operations. Although there were crack, control/construction joint and cove joint repairs performed in 2007 and 2008 as well as 2012, additional work was performed as part of the recent repair programs, Project Nos. 12-002 & 13-002, and further work is currently scheduled to be performed as part of NHPA Project No. 20-002, currently in design.





Photo #32

Although further replacement of sealant materials can be expected, and the costs associated with this have been programmed into our estimated repair and preventative maintenance costs to be performed in the future, DESMAN now considers it appropriate to recommend a more aggressive comprehensive replacement program. Historically, we have approached the sealant replacement work on a miscellaneous basis since the majority of the urethane materials have performed well. Recently, though, apparently coupled with the increasing concrete repair work, it has now become recommended to consider a formal comprehensive replacement program, phased as appropriate due to the magnitude of sealant work, to achieve a more durable and long-term waterproofing system, all with updated warranties.



Photo #33

Exterior Coating of Stairs and Elevator Cores, Roof Level: Although all sealant materials throughout the stair and elevator cores were replaced as part of NHPA Project No. 12-002, continued exposure to the roof level elements has taken their toll on the cores' exterior surfaces and moisture penetration with subsequent deterioration may continue to be anticipated (**Photos #31 & #32**). DESMAN therefore recommends that an acrylic waterproofing coating be applied that can bridge cracks (that may not be readily visible), provide comprehensive waterproofing protection for the cores by incorporating the sealant material, as well as enhance the cores' aesthetics. This work was completed as part of NHPA Project No. 13-002.



Photo #34

Recoating of P/T Anchorages: The P/T (post-tensioning tendon) anchor points located around the perimeter of the garage were protected with an architectural waterproofing material (Modac®) approximately 15 years ago (**Photos #33 & #34**), and this material has performed extremely well, showing little or no significant deterioration of the coating material or the underlying anchors. Even though no problems have been identified, as a preventative maintenance, DESMAN had included the costs of recoating the concrete along the perimeter strips at the anchorages within our estimated repair and preventative maintenance costs; this work was completed as part of NHPA Project No. 12-002.



Photo #35

Roofing Repairs at Stairs and Elevator Cores: Although no significant water or moisture infiltration has been identified indicative of a problem with this facility's various roofing, the roofs are all original to the facility, and various components are exhibiting their age (**Photo #35**). Related roofing repairs, such as the replacement of the copper coping materials and re-securement of the batten closures, was recently completed as part of NHPA Project No. 13-002.

ARCHITECTURAL ENHANCEMENTS:

Garage Façade Enhancements, northern and southern approaches:



Photo #36

Although the original construction of the Air Rights Garage in 1982 represented a significant milestone and enhancement for the gateway to the City of New Haven at the time, the façade of the garage has become aged (**Photos #36 & #37**). The recent and ongoing development in the immediate area continues to provide a challenge for the garage to stay current; the massive size alone of the garage presents a significant hurdle since any improvement work would have to be large enough to provide an impact but yet be cost-effective.



Photo #37

Recently, with NHPA's re-branding efforts fully underway, additional opportunities have developed that could assist in revitalizing the garage. Enhancements, such as replacing the gateway architectural forms, as well as signage and lighting, combined with rebranding graphics as well as installation of a sculptural screen cladding over the central ramps, could assist in transforming the garage (various concepts as follows).



Stair A/Elevator 1 & 2 Lobby and Stair G/Elevator 3 & 4 Lobby,
Ground Level, Entrance Enhancements (Exterior) and Streetscape
Improvements:



Photo #38

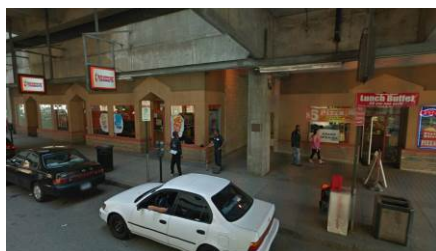


Photo #39

In conjunction with improvements to the lobby entrances to the Air Rights Garage and streetscape improvements to the Rev. Dr. Martin Luther King Jr. Boulevard and South Frontage Road, DESMAN recommends that the lobby entrances along with the sidewalks of York Street be considered for improvement (**Photos #38 & #39**). Although the storefronts and related lighting are the responsibility of the tenant owners, the sidewalks can be enhanced with a decorative stamped/stenciled concrete providing an improved aesthetic appeal, as well as localized updated signage and lighting with new materials that can highlight the entrance, making it more visible from the sidewalk (various concepts as follows).



Photo #40

In addition to the decorative concrete or graphical improvements, there may be opportunity for localized greening of the sidewalk and hardscape, perhaps on the eastern sidewalk of York Street (which has more of an “open” atmosphere). As the concepts are further developed, this opportunity can be reviewed further as well.



Stair A/Elevator 1 & 2 Lobby and Stair G/Elevator 3 & 4 Lobby,
Ground Level, Improvements: In 2004, architectural improvements were undertaken to improve the elevator lobbies throughout the garage, incorporating a combination of porcelain and quarry tile, as well as coating the walls and ceilings with a bright, reflective paint



Photo #41



Photo #42



Photo #43



Photo #44

Photo #40). Although the finishes appear to be performing well with anticipated preventative maintenance, the lobbies are beginning to appear aged; Desman recommends that related improvements be programmed accordingly, such as the removal of existing tile grout and installation of new grouting, as well as related lighting repairs.

DESMAN does note that the substantial wall surfaces of the lobbies, although painted and bright, appear to be space (**Photos #41 & #42**) that could be enhanced by decorative artwork, paneling, electronic display boards or other related finished system that could further connect the lobbies to the Hospital décor. Additional enhancements, such as accenting with a new material or artwork that draws patrons into the space as well as painting vertical joints in the walls to develop texture and depth, could be programmed accordingly (various concepts as follows); the door at the rear of the Stair G/Elevator 3 & 4 Lobby may be replaced with a more attractive option that is coordinated with the artwork or architectural accent on the wall, as well.



Vehicular Enhancements, corner of Rev. M.L.K. Boulevard and York Street:

The vehicular entrance from Rev. M.L.K. Jr. Boulevard and York Street has recently been transformed, due to the adjusted entering traffic into the garage from Route 34 (**Photos #43 & #44**). Although the resultant space presents a challenge for significant architectural enhancements due to the busy nature of the space, there may be some opportunity for accented lighting to assist in incorporating the space into the streetscape improvements to York Street.

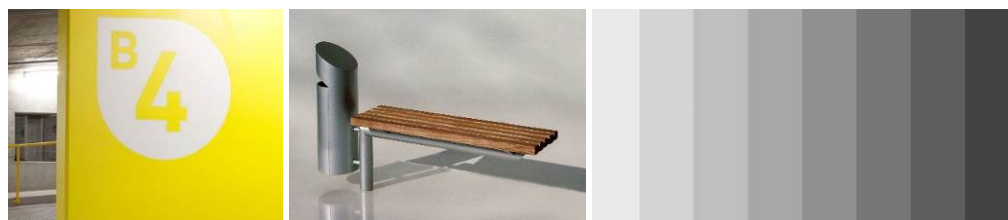
Stair A/Elevator 1 & 2 Lobby, Level 2 Enhancements:

The area surrounding Stair A/Elevator 1 & 2 on the second level provides a larger lobby atmosphere with additional space compared to the other lobby areas, and also presents the patron with the first pedestrian exposure to the Hospital (**Photo #45**). Although a consistent theme has been attempted throughout the lobby spaces, there may be the opportunity to differentiate this space from the others, by refinishing the interior walls with color that contrasts with the ceiling and window mullions/door, as well as updating the visual graphics and provide additional accent lighting.

Although this space is not intended to attract loiterers, there may also be the opportunity to provide an integrated public bench seating (due to the larger lobby footprint) with a trash receptacle that is coordinated with the level identification color/and theme (various concepts as follows).



Photo #45



Level 2, Skywalk Connection/Paystation Kiosk Enhancements:

In conjunction with improvements to the second level lobby of Stair A/Elevator 1 & 2, along with the recent creation of a kiosk for new paystations, the space around the kiosk and the connection to the skywalk has become a more substantial gateway to the Hospital (**Photos #46 & #47**), and thus would benefit from certain aesthetic improvements. Enhancements, such as accenting with a new material or artwork as well as updating the connection with new materials that correspond with a new material scheme on street level, could be programmed accordingly (various concepts as follows).



Photo #46



Photo #47



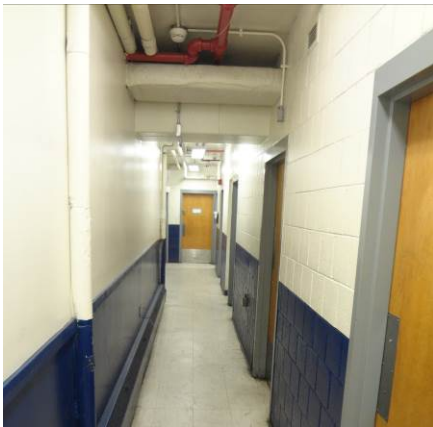


Photo #48



Photo #49

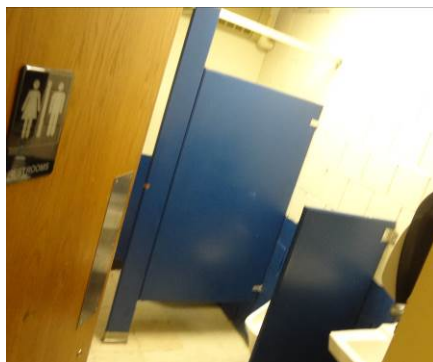


Photo #50



Photo #51



In conjunction with these improvements, DESMAN understands that wind and rain continue to pose a challenge for maintenance to minimize and subsequently clean up ponding rain and snow in this area, thus minimizing potential slip hazards. PNH has therefore requested that DESMAN consider incorporating a barrier, such as a potential storefront-type system for an additional enhancement.



Restroom Renovations:

The restrooms, behind the Security Control Room and the Manager's Office would benefit from certain functional and aesthetic improvements, such as new flooring, new lighting, painting, as well as ADA updates as may be required, could be programmed accordingly (**Photos #48 #49 & #50**).

Railing Modifications:

PNH has expressed concern with specific railing systems around the perimeter of the vehicular exit ramps on Levels 1 & 2 (**Photo #51**); due to the height and spacing of the intermediate posts, PNH has requested that modifications be made to minimize the openings accordingly; this work was addressed as part of NHPA Project #12-002.

MISCELLANEOUS REPAIRS & IMPROVEMENTS:

Miscellaneous Signage Repairs and Improvements: This garage has a multitude of traffic and pedestrian way-finding signage installed throughout the facility (**Photo #52**). Additionally, a graphic signage program was implemented historically which identifies individual parking levels by various health and fitness activities. Over time, depending on environmental exposure, vandalism and abuse, and normal wear, this signage will require repair and update.



Photo #52

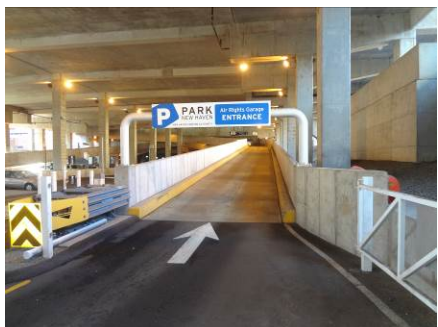


Photo #53



Photo #54

In addition to periodic signage repairs mentioned previously, conditions change where additional signage may be required to address changes in patron usage, or new building development in close proximity to the facility which dictates that additional signage or older signage be updated. Costs associated with these changes and for periodic repairs to facility signage are included within the projected five year construction costs.

Certain signage improvements were implemented in 2008 and 2010, and additional improvements are currently in progress; further improvements are anticipated in future years.

In conjunction with potential improvements to the signage, PNH has observed that incoming vehicles from Route 34 have a potential of damaging the clearance bar assembly at the base of the ramp (**Photo #53**), simply due to their speed and lack of awareness of the posted clearance. PNH therefore has requested that a secondary clearance bar assembly be considered, potentially located at the top of the ramp where vehicles slow down prior to turning into the garage (**Photo #54**), incorporating some form of audio/visual warning as well, such as a horn or blinking light system.

In lieu of and/or supplemental to continuous improvements to the existing program, NHPA requested that DESMAN consider a full program replacement, with updated directional text and more durable signage materials, as well as more modern graphics. Prior to undertaking the full replacement, DESMAN has prepared a study of the facility's traffic patterns and applicable destination routes so as to determine the needs and expectations of the new and/or updated program. This study was completed as part of NHPA Project No. 17-004. Implementation is recommended for the near future as funding permits.





Photo #55



Photo #56



Photo #57

Miscellaneous Painting - Concrete/Masonry Surfaces: This work relates to the need to periodically repaint concrete and masonry surfaces as an enhancement to general aesthetics. Previously painted surfaces can degrade over time depending on environmental exposure, vandalism and abuse, and normal wear and tear.

Designated areas, primarily focusing on the stair towers and elevator lobbies, were re-painted as part of NHPA Project No. 12-002.

In the past, various columns had been painted for aesthetic purposes. Due to wear-and-tear and the cost to maintain the painted surfaces, the coating materials on miscellaneous columns are planned for removal.

Miscellaneous Painting - Metal Surfaces: This work relates to the need to periodically repaint metal surfaces as an enhancement to general aesthetics and to protect otherwise exposed metal surfaces prone to the effects of corrosion. Previously painted surfaces can degrade over time depending on environmental exposure, vandalism and abuse, and normal wear and tear.

Although designated areas, primarily focusing on the stair towers and elevator lobbies (**Photo #56**), were recently re-painted as part of NHPA Project No. 12-002, additional railings along the street level sidewalks remain (**Photo #57**). DESMAN therefore recommends that these railings be programmed for re-painting accordingly.





Photo #58



Photo #59

Access Hatches & Metal Stair Replacement (into Mechanical Rooms below): The access hatches on the street level, which allow access into the mechanical rooms below (**Photos #58 & #59**), no longer sit properly into position, thus allowing water and debris, into the spaces below, thus corroding the metal stairs. DESMAN recommends that these stairs be replaced, as well as the hatches also replaced so as to provide full closure and protection.

Awning Repairs: Awnings were previously installed above louvered ventilation openings on the roof levels of the deck at each of the various stairs and elevator cores. The installation of these hoods was done to eliminate blowing rain and snow from entering into these openings. While the awning framing remains in good condition, the awning fabric itself can degrade over time due to environmental exposure and normal wear-and-tear (**Photo #55**); now that Project No. 12-002 is in progress, which includes the construction of new enclosures at the stairs (involving new metal roofs), replacement of the awning systems with new awnings/roofs to match the metal roofs is in progress as part of Project No. 20-003. **DESMAN** recommends that the anticipated budget be adjusted accordingly.



Photo #60

Storefront Maintenance/Repair: This work relates to the need to periodically repair damaged or deteriorated sections of metal storefront. The metal storefront can deteriorate due to corrosion and environmental exposure, and can become damaged due to being hit by vehicles, or by vandalism and abuse (**Photo #56**). It should be noted that there were limited repairs performed in 2007 and in 2008 which addressed issues with storefront framing and broken windows (see below).

Although storefront maintenance would typically be considered an operational cost and therefore would not be included as a capital budget item, due to the magnitude of cost, DESMAN has included the cost in our estimated repair and preventative maintenance costs as a capital budget item. This work is currently being performed as part of NHPA Project No. 12-002.



Photo #61

Modifications to Roof Level Storefronts and Installation of Secondary Storefronts at Roof Level Stair Towers: A history of moisture has damaged the lower level storefronts and stairs (reference items above). Therefore, DESMAN had recommended that actions be taken to minimize future moisture penetration into the towers (**Photos #60**



Photo #62



Photo #63



Photo #64

& #61). In order to protect the elevators and minimize moisture into the elevator lobbies, DESMAN noted that the doors, which regularly swing open during high winds (the main culprit of entering water), may be relocated so as to minimize the impact of the wind and rain. In order to protect the stair towers, DESMAN noted that a secondary storefront enclosure may be installed on the curbing, outside the existing doors, to provide a barrier to rain entering the stair. This work was recently completed as part of NHPA Project No. 12-002.

Replacement of Broken Glass and Cleaning of Glass in Stairwells: In combination with the need to properly maintain or repair the facility's storefront framing, there are always a limited number of windows which are broken each year due to various reasons.

It is DESMAN opinion that window repair is in reality a safety issue and they should be replaced as an operating expense. DESMAN has, however, included an estimated cost for the periodic repair of broken windows, some of which may be related to the maintenance and periodic repair of the storefront framing (see above). This work was recently completed as part of NHPA Project No. 12-002.

Skywalk Bridge Repair and Maintenance:

The Skywalk Bridge, spanning South Frontage Road, is demonstrating various stages of wear and tear, such as miscellaneous vertical and overhead concrete spalls, construction and expansion joint deterioration, and miscellaneous cracking (**Photos #62, #63 & #64**). In conjunction with the inspection report performed by CDOT-Bridge Safety, dated November 11, 2011, Desman recommended that all spalled concrete be repaired (**Photo #65**), joints replaced with durable materials suitable to exterior conditions, cracks injected with an epoxy resin to prevent moisture intrusion, cold-galvanizing of exposed metals, followed by the application of a waterproofing coating across the exterior concrete surfaces, which was recently completed as part of NHPA Project No. 13-002.



Photo #65

Other maintenance-related work is associated with the need to periodically repair damaged or deteriorated portions of the pedestrian bridge (**Photo #62**), such as the snow filters installed within the vent openings along the sides of the bridge, hand railings, glazing materials, etc.

Although skywalk bridge maintenance would typically be considered an operational cost and therefore would not be included as a capital budget item, due to the magnitude of cost, this work was recently completed as part of NHPA Project No. 12-002.



Photo #66

Miscellaneous Flooring Tile Repair: This work relates to the need to periodically repair damaged flooring tile. A limited amount of miscellaneous tile repair was addressed in 2010, but additional repair is anticipated in the future (**Photo #66**).

Although miscellaneous tile repair would typically be considered an operational cost and therefore would not be included as a capital budget item, due to the relation of cracked tile to the apparent electrical conduit embedded in the bridge floor and related magnitude of cost, DESMAN has included the cost in our estimated repair and preventative maintenance costs as a capital budget item. Although certain limited work has recently been addressed as part of NHPA Project No. 13-002 (see photos below), further work was recently completed as part of NHPA Project No. 12-002.



Miscellaneous Door Maintenance/Repair/Replacement: This work relates to the need to periodically repair damaged doors and door hardware. Due to the continuous need to repair the doors and hardware, NHPA has removed the majority of the doors, leaving the roof level doors and the ground level doors in-place, as well as the various rooms and spaces.



Photo #67



Photo #68

The ground level doors, designated for use as emergency exit doors, as well as designated doors associated with the Security Control Room and related spaces, were replaced as part of the comprehensive security improvement project (2015).

This facility's level of use makes periodic repairs on the remaining doors (essentially limited to the roof level) necessary to address doors which have sprung on their hinges, or to replace missing or damaged door hardware and hydraulic door closers (**Photo #67 & #68**).

It is DESMAN's opinion that door repair is in reality a safety and egress issue and they should be repaired or replaced as an operating expense. DESMAN has, however, included an estimated cost for the periodic repair of damaged doors, some of which may be related to the maintenance and periodic repair of the storefront framing. This work was recently completed as part of NHPA Project No. 12-002.

Car Bumper Replacement: The rubber bumpers, installed throughout the perimeter of the garage and at the stair towers acting as vehicle protection, are in various states of disrepair or are lacking completely (**Photos #69 & #70**). In order to continue to provide appropriate vehicle protection, the bumpers should all be replaced.

ELECTRICAL ISSUES:

Programmed Re-lamping of Light Fixtures: DESMAN advises that NHPA investigate implementing a planned maintenance schedule for the replacement of lamps and ballasts whereby these items are replaced throughout the facility at the same time in lieu of the current practice of intermittent replacement on an as-needed basis. Desman recommends that the relamping should be scheduled for every three years, based upon the projected lamp life calculations, at least for the core fixtures which operate 24 hours per day.

There will always be a need to periodically replace a limited number of lamps or individual ballasts due to premature failure, but programmed replacement is more cost effective. While Desman has included the cost for programmed re-lamping as part of NHPA Project No. 15-008, the costs associated with periodic replacement of lamps and ballasts are considered an operational cost and therefore is not included within our estimated repair and preventative maintenance costs as a capital budget item.



Photo #69



Photo #70



Photo #71

Although the existing metal halide fixtures were installed in 2010 (**Photo #71**), lighting technology continues to improve and thus options for improvements should continually be reviewed and considered. There are now a reasonable number of good quality LED garage lighting fixtures available at this time. Many of these fixtures have a proven track record of reliability and good photometric performance. Use of LED lighting will reduce energy use and maintenance expenses. Based on these factors at this time, LED lighting should be considered for use when the existing garage fixtures near the end of their useful life. While some LED retro-fit solutions are available, these raise concerns with UL Listing and they do not typically have the same efficiency levels as dedicated LED fixtures. LED garage fixtures can be more easily controlled via occupancy sensors, daylight sensors and dimming controls. Such control enhancements can significantly increase the energy savings realized by use of the fixtures but must be carefully evaluated during design to ensure that they are a proper fit for the facility. Most enhanced control strategies will either require the installation of separate control wiring or local controls on each fixture.

Due to the balance between ongoing maintenance costs, related to regular re-lamping and other associated expenses, and the potential savings from an improved technology, such as LED, DESMAN recommends that replacement be considered accordingly, as part of NHPA Project No. 18-003 now in design. While this project had been placed on hold due to funding limitations, funding now allows the project to proceed. This project is now scheduled for bid in 2020.

Roof Lighting Replacement: While the roof pole lights are relatively modern, difficulty in maintaining these fixtures would indicate upgrading them to new LED sources sooner than the general garage fixtures. The existing poles, controls and wiring infrastructure can certainly remain (**Photo #72**). The fixtures should be replaced completely since retro-fit solutions for LED lamps in this type of fixture tend to be less efficient and have a generally shorter lifespan. New LED fixtures will have a considerably lower power input and slightly improved lighting performance. This work is being addressed as part of NHPA Project No. 18-003 now in design. While this project had been placed on hold due to funding limitations, funding now allows the project to proceed. This project is now scheduled for bid in 2020.



Photo #72

Emergency Generator Preventative Maintenance & Load Testing: Maintenance, including a load bank and building load test, was last performed on the emergency generator in 2011; however, preventative maintenance should be expected every year. DESMAN therefore recommends that NHPA investigate placing this equipment on a yearly maintenance contract inclusive of emergency generator load testing. Although DESMAN has included the cost for this maintenance and testing in conjunction with the next appropriate project as a capital item, the annual cost associated with emergency generator preventative maintenance is considered an operational cost and therefore is not included.

Emergency Electrical Generator: Given the good physical condition of the generator, the relatively low operating hours (269) and the lack of any red flags raised during periodic testing, it appears likely that a major overhaul of the generator isn't necessary until at least 2025. The cost of this work has been included within our estimated repair and preventative maintenance costs to be performed in the future; however, DESMAN recommends that this item of work be reviewed each year as part of the condition assessment program and scheduling of the overhaul adjusted accordingly

Emergency Exit Signage: DESMAN notes that varying factors can impact battery life, such as the cold weather (on warmer days, the battery condition may be observed as normal). Therefore, DESMAN recommends that the operation of this critical life safety equipment be reviewed periodically by NHPA maintenance staff to assure proper operation. This is not an item which would normally be carried as a capital budget item.

Thermal Scanning: Thermal imaging or scanning of electrical equipment is a tool used to identify heating problems before they result in a failure or outage. Overloading, high contact resistance and material degradation can all cause excessive heating of equipment and terminations. Thermal scanning can detect these problem areas and allow corrective action to be taken on a scheduled basis. This procedure is common for industrial facilities and is typically performed prior to a scheduled shut-down of the equipment so that repairs can be done during that outage. While the electrical characteristics of a parking garage will not tend to cause this type of failure at the same rate as an industrial facility, the age of the equipment, the environment in which it is installed, and the



Photo #73

potential impact of a significant failure are all indications that periodic thermal scanning would be beneficial. Depending on the results of this testing, the Parking Authority may find that testing should be performed in all of its facilities and may want to perform the work on a regularly scheduled basis. The scanning should be done at the time of year when the facility experiences its highest electrical demand and large electrical loads (elevators and HVAC equipment) should be made to run during the testing. The test should also be performed when all potential lighting loads are on; DESMAN recommends that this work be programmed every 3-5 years and planned accordingly (and is planned for this upcoming budget year).

Removal of Existing Abandoned Globe Light Fixtures:

DESMAN recommends that the existing globe light fixtures, mounted on the end parapets of Level 1 and 2 (**Photo #73**), be removed due to previous abandonment and unsightly aesthetics. Removal of the existing parapet-mounted light fixtures, though, is challenging due to limited access and required coordination with adjacent properties. DESMAN recommends that the removal of the fixtures be programmed accordingly but inclusive of associated equipment to achieve access from the levels above (with appropriate fall-arrest equipment) to avoid impacting and/or inconveniencing the adjacent properties. This work is being addressed as part of NHPA Project No. 18-003 now in design. While this project had been placed on hold due to funding limitations, funding now allows the project to proceed. This project is now scheduled for bid in 2020.

Elevator Lobby Aesthetic Improvements:

The existing lobby light fixtures appear to be performing well (**Photo #74**), although typical preventative maintenance is recommended to replace failed bulbs. Should NHPA wish to consider the aesthetic enhancements noted previously, DESMAN recommends that the existing fluorescent light fixtures be re-lamped and cleaned.

Lighting/Signage Control System Programming & Adjustments with Related Training: Although a new control system was installed in 2013, the control of various fixtures appears to be an on-going challenge for PNH. Given the significant operational costs that can go along with their proper operation, DESMAN recommends that PNH coordinate with LC&D for regularly scheduled updating, oversight and training. Although it is DESMAN's opinion that control system



Photo #74

programming is in reality an operating expense, DESMAN has included the cost within this capital repair and replacement budget due to DESMAN's familiarity with the system and recommended coordination with DESMAN; this work is currently being addressed in this year's project, NHPA Project No. 18-003, currently in design. While this project had been placed on hold due to funding limitations, funding now allows the project to proceed. This project is now scheduled for bid in 2020.

Surge Protection: Recent events in several of the facilities have raised concerns about surge protection for the electrical distribution system. Such protection can help prevent damage to equipment connected to the system and limit power outages. Protection can be provided at any point in the distribution system and is typically designed based on the level of protection desired at any point. Multiple levels of protection are often implemented with devices installed at the incoming service, at select subpanels and at the sensitive equipment. Currently the Air Rights Garage has no surge protection equipment on the main electrical service. There is some protection at a few specific pieces of equipment but more comprehensive coverage could certainly be considered; this work is currently being addressed in this year's project, NHPA Project No. 18-003, currently in design. While this project had been placed on hold due to funding limitations, funding now allows the project to proceed. This project is now scheduled for bid in 2020.

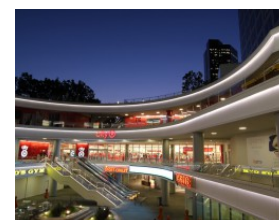
Decorative Lighting: Outdoor rated, linear, colored LED fixtures are available from a number of reliable manufacturers. These fixtures could be used for aesthetic appeal and level identification (**Photos #75 & #76**). Color changing effects can be included to provide season-appropriate lighting. The scope and cost for this type of lighting can vary greatly. A study of acceptable effects, potential installed locations and associated costs may be performed prior to implementation (various concepts as follows)



Photo #75



Photo #76



As miscellaneous repair may be performed, DESMAN recommends that PNH be cognizant of new conduit passing through the floor slab; since the slab tends to be exposed to significant moisture, the metal

conduit is then also exposed, thus corroding and deteriorating over time. To help extend the longevity of the conduit, DESMAN recommends that sleeves be used to protect the conduit from direct, sitting water, followed by a polyurethane cove joint as well.



Photo #77



Photo #78

MECHANICAL/PLUMBING ISSUES:

Cleaning Floor Drains & Sand/Oil Separators: Accumulation of sand and debris continues to be noted in and around drains (**Photo #77**), or deposited in unused corners of various parking decks, particularly the roof where sand has been used during the winter months to address icing conditions. It is important that accumulated sand be removed from the garage decks each spring as they hold concentration of chloride (road salt) and moisture in direct contact with the concrete deck, causing an increase in the amount of deterioration which could take place. As mentioned in previous reports, all sand, dirt and debris accumulated on supported parking decks should be removed periodically, as this dirt and debris tends to hold moisture and chlorides detrimental to the structure.

NHPA's utilization of the facility's high pressure wash-down system is important in reducing concrete deck deterioration and costly repairs. It is highly recommended that the facility be washed down quarterly or minimally twice a year (spring and fall) to remove accumulated sand and debris and to flush accumulated road salt (chlorides) from the surface of the deck. The facility's wash-down system was designed to provide a sufficient volume of water at high pressure to assist in cleaning the concrete decks, thus greatly reducing the amount of structural deterioration likely to take place.

Sand carried into the storm drains can clog drains and associated drain lines and eventually fills the facility's sand/oil separator receptacles which then need to be emptied more frequently. In



Photo #79

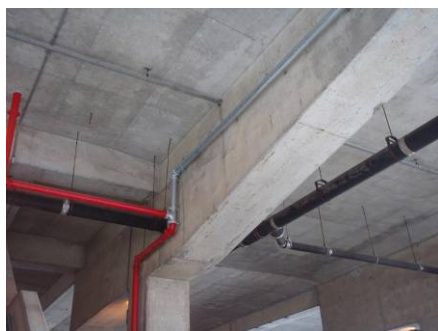


Photo #80



Photo #81

combination with periodic garage wash down, it is imperative that the facility's drainage system be kept clean and operational. The cost associated with the flushing of the drainage system and sand/oil separators have been included within our estimated repair and preventative maintenance costs to be performed in the future only as associated with accompanying concrete and waterproofing repairs. The costs associated with cleaning and flushing down the deck surfaces, otherwise, is an operational cost and is, therefore, not included within projected repair and preventative maintenance costs.

Facility Storm Drainage System: Miscellaneous repairs were performed as part of the repair program in 2012 and also addressed as part of NHPA Project No. 13-002 now completed. **(Photos #78 & 79)**. Due to the age of the system, DESMAN has included the cost for full replacement to be phased over the next five (5) to (10) years; since miscellaneous repairs continue to be performed, Desman recommends that this cost may be reviewed annually and adjusted accordingly.

In the interim, provisions should continue to be made by NHPA for preventive maintenance of the facility's storm drainage system including its periodic inspection and repair as necessary. The cost associated with making these inspections and nominal repairs should be considered an operational cost and are, therefore, not included as a separate and distinct item within projected repair and preventative maintenance costs.

Supplemental Floor Drains & Associated Drain Piping: Installation of a few additional supplemental drains was performed as part of the repair program in 2012, and also addressed as part of NHPA Project No. 13-002 now completed. Due to inadequate drainage slopes, DESMAN has included the cost for installation of additional supplemental drains over the next five (5) to (10) years.

Standpipe System: Repairs to the standpipe system were performed as part of the recent comprehensive repair program (2012), **(Photos #80 & #81)**.

The State Fire Safety Code requires periodic maintenance and testing of Fire Protection Systems in accordance with the provisions of NFPA

25 – “Standard for the Inspection, Testing and Maintenance of Water Based Fire Protection Systems”. At a minimum, owners’ maintenance personnel should conduct a quarterly visual inspection of piping, fire department connections and hose valves to ensure that systems have not been damaged. A more thorough detailed inspection should be conducted annually to verify that all system piping and components are in proper working order which should include testing and inspection of all valves and components. Flow tests should be conducted every five years at a minimum. Additional requirements for inspection testing and maintenance of Standpipe Systems are outlined in NFPA 25.

The cost associated with making these provisions is considered an operational cost and is therefore not included as a separate and distinct item within projected repair costs.

Facility Pressurized Garage Wash-Down System: Preventive maintenance to this facility’s pressurized garage wash-down system was performed in 2012. The cost associated with future repair and preventative maintenance to this wash-down equipment should be considered an operational cost.

Mechanical System Repair & Preventative Maintenance:

There is a need to periodically maintain and repair various components of the facility's HVAC equipment; these costs are considered operational costs and are therefore not included as separate and distinct items within our projected repair and preventative maintenance costs. The costs are inclusive of, but not limited to:

- Cashier Booth Ventilation Equipment - This equipment was repaired in 2007. No problems were reported by NHPA maintenance staff, and no obvious problems or defects were observed during our inspection. The cashier booth ventilation equipment will require periodic servicing including drive belt inspection/ replacement, lubrication of bearings, and air filter replacement. This periodic servicing should be considered an operational cost.



Photo #82



Photo #83



Photo #84

- Elevator Machine Room - Split system air conditioning was added in 2007 along with new electronic controls for ventilation system which will require periodic maintenance; Desman recommends that the unit be inspected and repaired as required. This periodic servicing should be considered an operational cost.
- Office Heating & Ventilation Equipment - Various components of this equipment were repaired in 2007. The office area air handling units will require periodic servicing including drive belt inspection/ replacement, lubrication of bearings, and air filter replacement. This periodic servicing should be considered an operational cost.
- Emergency Generator Ventilation Equipment - The ventilation equipment requires periodic maintenance including replacement of fan motor, drive and bearings. This periodic servicing should be considered an operational cost.
- Service and Clean Gas Fired Boiler - This equipment was inspected and serviced in 2007. This equipment will require periodic servicing. This periodic servicing should be considered an operational cost.
- Washdown System – This equipment was inspected and serviced in 2012. This equipment will require periodic testing and inspection, as well as cleaning and maintenance of the system components in accordance with O&M recommendations.

Permanent water supply to the Snow Dragon on the roof: NHPA notes that water is needed to begin operation of the snow melting unit (**Photo #82**) and transport of the water to the roof is problematic. Installation of a permanently piped, insulated and heat traced water line would allow the system to be filled easily at any time. The line will need to be extended from the water service entrance at the Highway level, up to the roof. This line will either need to be drained after each use, or it will need to be insulated and heat traced. This work has been performed as part of NHPA Project No. 13-002.



Photo #85



Photo #86



Photo #87

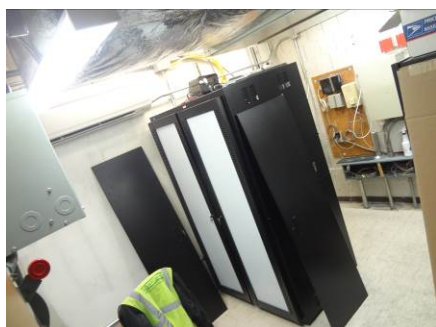


Photo #88

Replacement of Sanitary Piping: Due to freezing conditions, the sanitary piping coming from the bathrooms on Level 2 recently froze and cracked. Subsequently, new insulation and heat trace has been installed as part of Project #13-002, and further improvements are planned as part of Project #17-003 currently in construction.

Canopy System Gutter System: When the canopy system was installed at the entrance to the Smilow Cancer Center, on level 4, a dedicated drainage system was not installed (**Photos #84 & #85**). Therefore, when it rains, water pours off of the canopy onto the floor below. This becomes problematic specifically in the winter when the water may freeze. DESMAN recommends that a gutter system be installed that routes the piping directly into the drainage system so as to avoid any possible slip hazards.

SECURITY EQUIPMENT RENEWAL & REPLACEMENT:

Security System Repairs and Preventative Maintenance: A comprehensive replacement program has recently been completed, addressing replacement and upgrading of the video surveillance system, as well as the access control and audio communication systems (**Photos #86, #87, #88 & #89**). Renovations to the Control Room and Rack Room, along with door replacement and hardware improvements, were also addressed.

Subsequent to the completion of the project, NHPA entered into an appropriate maintenance service contract to address preventative maintenance needs that may arise.



Photo #89



Photo #90



Photo #91

REVENUE CONTROL EQUIPMENT REPLACEMENT:

The existing revenue control and parking access equipment was replaced in 2013, along with installation of a parking guidance system (**Photo #90**) and cashier booths. However, due to new and improved technology, the equipment is nearing the end of its economic life. DESMAN therefore recommends that PNH review and study the current system for potential enhancements and/or replacement, and plan accordingly.

SITE IMPROVEMENTS:

On the north and south sides of the parking garage, at street level, are sloped embankments down to the surface parking below the Air Rights Parking Garage. The northern embankment has been finished with shotcrete while the southern embankment remains as gravel (**Photo #91**); DESMAN recommends that the south side be similarly finished with shot-crete.

Due to development and construction by the east end of the Air Rights Garage, DESMAN was requested by NHPA to review the sidewalk areas in this location. While the sidewalks are limited, existing surfaces are stone covered and provide an unfinished appearance (**Photos #92 & #93**). The existing sidewalks should be continued to connect to the new development with associated handicap ramps; although the design work was completed as part of NHPA Project No. 17-002 with an approximate opinion of construction cost of \$500,000, the project was placed on hold per directive of YNHH, and later transferred to the City of New Haven for construction.





Photo #92



Photo #93



Photo #94

ELEVATOR IMPROVEMENTS AND MODERNIZATION:

In 2007, the four (4) elevators were completely modernized; the mechanical and electrical systems were all upgraded, and the interior of the cabs were all replaced with new finishes and new lighting. Due to heavy usage and wear-and-tear, DESMAN now recommends that modernization of the equipment be programmed sooner, for the upcoming budget year.

In order to assist PNH in the ongoing execution of its Maintenance Agreement with Schindler Elevator Corp., PNH programmed the services of DESMAN and its elevator sub-consultant, Sterling Elevator Consultants, to conduct an elevator maintenance audit. This audit will be programmed regularly.

MISCELLANEOUS CONSIDERATIONS:

Garage Cleaning: Sand and debris have accumulated throughout the garage. Due to the recent intense winter season, aggressive amounts of ice-melt materials were used, thus contributing to the sand and debris. A comprehensive cleaning and degreasing of the entire facility (interior and exterior surfaces) should be performed, and programmed accordingly.

As mentioned previously, it is an important that this facility be cleaned periodically to remove accumulations of sand and other debris that is not only unsightly, but is a hindrance to proper deck drainage.

Ice-Melt and Snow Removal: DESMAN notes that chloride-based ice-melt products can be detrimental to the long-term durability of the concrete matrix, and DESMAN therefore recommends that an alternative product be used. While DESMAN does not specifically endorse a specific product or manufacturer, DESMAN does suggest that in lieu of a calcium chloride product, an alternative product such as Cryotech NAAC[®], as manufactured by Cryotech Deicing Technology, of Fort Madison, IA be used.

However, we do acknowledge that use of an alternate product can be more expensive (Cryotech NAAC[®] is used frequently at airports), and many snow-removal vendors have not budgeted and are not prepared to obtain and use the alternate product. Since NHPA is performing its snow/ice removal operations in-house, NHPA may be able to find an equal product in mind by forwarding a performance-based requirement to various sources and that the source provide simply a non-chloride-based product (not necessarily Cryotech NAAC[®]).

As a final option, should it be necessary that NHPA use a chloride-based ice-melt, we strongly recommend that NHPA continue to remove the ice-melt product immediately after the snow and ice is melted, and the slabs be washed clean as soon as temperatures allow.

Regardless, DESMAN strongly recommends that the facility be cleaned and washed at least twice a year, using the washdown system installed for that purpose, typically coinciding with the spring season and fall season, to remove contaminants and specifically remove the excess ice-melt materials (used over the winter) from the garage. For that purpose, DESMAN has included a sample “Seasonal Washdown Checklist” that can be used to track each scheduled washdown.





Photo #95

Due to the construction of 100 College Street, removal and depositing of snow over the east end and down to the ground level below, had become challenging due to a new roadway now in place at the southeastern corner and a new parking garage built in close proximity to the northeastern corner. Therefore, NHPA procured a snow melter for installation on the roof level (**Photo #95**). The snow melter will receive the snow, via bobcat, and then melts the snow for subsequent depositing into the garage's drainage system.

Other miscellaneous considerations include the following:

- Parking Stall and Lane Striping
- Temporary Traffic Control Signage during Construction
- Extra Duty Police
- Miscellaneous Work Allowance (Site coordination and protection of work areas during implementation of repairs)
- Contractor Mobilization & Demobilization

UPDATING OF RECORD DOCUMENTS:

Given the large size of this facility and the need to perform regular maintenance and the need to correctly oversee future repair and preventative maintenance projects, NHPA will benefit from the continuous updating of a set of record drawings. Such drawings will identify the locations of previously repaired concrete, installation of membrane systems and expansion joint glands, as well as urethane sealants, so that NHPA will be able to readily determine the age of the applicable product and the applicability of any such warranties. Such drawings will also identify the locations and ratings of all electrical distribution components, locations and manufacturers of fire alarm and security systems, and the location and circuiting of all regular lighting, emergency lighting, and exit signs. Mechanical systems (boilers, fans, HVAC equipment, pumps and sprinkler systems) would also be documented. DESMAN recommends that the record documents be updated as required.

In conjunction with the benefit of preparing Record Drawings, it is becoming more cumbersome and inefficient for NHPA to maintain a hard-copy set of the original/past documents from the garage's original construction. The documents are becoming more aged and the paper more susceptible to damage. Considering the valuable

nature of the historic documentation with regards to future repair work, DESMAN recommends that NHPA arrange for the scanning of all documentation into electronic (PDF) format; converting the documents into electronic format would allow for easier sharing of documents, as well, which can then easily be transmitted via e-mail as required.

A recommended maintenance schedule and associated facility checklists which can be used or referenced in the preventative maintenance of this parking facility are included in Appendix B – Maintenance Schedules and Checklists.

In summary, DESMAN recommends that the above outlined repair and preventative maintenance program be implemented to assure the continued safe usage and long-term durability of the structure.



5. PRIORITIZED REPAIR PROGRAMS & ESTIMATED COSTS

A revised repair and preventive maintenance program has been developed to assure the long-term durability of the Air Rights Parking Garage. The repairs required have been prioritized into three courses of action:

- Prioritized Repairs (FY 2021)
- Early Repairs (FY 2022)
- Programmed Repairs (FY 2023)
- Long-Term Repairs (FY 2024)
- Extended-Term Repairs (FY 2025)

Below is a summary of the estimated construction cost for each category.

| RECOMMENDED REPAIR PROGRAM | ESTIMATED CONSTRUCTION COST |
|------------------------------------|-----------------------------|
| Prioritized Repairs (FY 2021) | \$3,407,500.00 |
| Early Repairs (FY 2022) | \$3,230,600.00 |
| Programmed Repairs (FY 2023) | \$4,119,450.00 |
| Long-Term Repairs (FY 2024) | \$6,600,400.00 |
| Extended-Term Repairs (FY 2025) | \$1,983,600.00 |
| TOTAL ESTIMATED COST | \$19,341,550.00 |

A detailed cost estimate is provided in the table on the following page, entitled “Projected Five Year Construction Costs.”

The construction costs are based on current prices in the New Haven area for labor, equipment and materials. The estimated construction costs also include a 20% contingency factor to account for uncertainties in the restoration market at the time of bidding, and a preliminary design, construction management fee and program management fee estimated at 25% of total construction cost has been provided for budgeting purpose.



Air Rights Parking Garage
Projected Five Year Construction Costs
(FY 2020)

| Work Description | Prioritized Repairs (FY 2021) | Early Repairs (FY 2022) | Programmed-Term Repairs (FY 2023) | Long-Term Repairs (FY 2024) | Extended-Term Repairs (FY 2025) | Future Repairs (FY 2026 - FY 2030) |
|---|-------------------------------|-------------------------|-----------------------------------|-----------------------------|---------------------------------|------------------------------------|
| A. Structural (see note 9 below) | | | | | | |
| 1 Concrete Repairs (Partial Depth) | \$ - | \$ 413,000.00 | \$ 134,000.00 | \$ 699,000.00 | \$ 147,000.00 | \$ 2,332,000.00 |
| 2 Surface Scaling Repair | \$ - | \$ - | \$ 134,000.00 | \$ - | \$ 147,000.00 | \$ 341,000.00 |
| 3 Miscellaneous Vertical and Overhead Repair | \$ - | \$ - | \$ 34,000.00 | \$ - | \$ 37,000.00 | \$ 86,000.00 |
| 4 Miscellaneous Vertical and Overhead Repair at Pedestrian Bridge | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 5 Structural Analysis of Garage for Development of Structural Repair Options | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| B. Waterproofing Issues (see note 9 below) | | | | | | |
| 1 Traffic Bearing Waterproofing Membrane Repair | \$ - | \$ - | \$ 40,000.00 | \$ - | \$ 45,000.00 | \$ 49,000.00 |
| 2 New Traffic Bearing Waterproofing Membrane Installation | \$ - | \$ - | \$ 134,000.00 | \$ - | \$ 147,000.00 | \$ 162,000.00 |
| 3 Topically Applied Corrosion Inhibitor | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 4 Programed Repair / Replace Expansion Joint | \$ - | \$ 80,000.00 | \$ - | \$ - | \$ - | \$ 300,000.00 |
| 5 Install/Replace Urethane Sealants | \$ - | \$ 127,000.00 | \$ - | \$ 140,000.00 | \$ - | \$ 343,000.00 |
| 6 Recoating of P/T Anchorages | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 7 Roofing Repairs over Stairs and Elevators | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 8 Waterproofing of Exterior of Stair/Elevator Cores | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 9 Waterproofing of Pedestrian Bridge | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 10 Street Level, Sidewalk EJ/Sealant Replacement | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| C. Architectural Enhancements (see note 9 below) | | | | | | |
| 1 Garage Façade Enhancements, southern approach | \$ - | \$ - | \$ 333,000.00 | \$ - | \$ - | \$ - |
| 2 Garage Façade Enhancements, northern approach | \$ - | \$ - | \$ 333,000.00 | \$ - | \$ - | \$ - |
| 3 Stair A/Elevator 1 & 2 Lobby, Ground Level, Entrance Enhancements (Exterior) and Streetscape Improvements | \$ - | \$ - | \$ 167,000.00 | \$ - | \$ - | \$ - |
| 4 Stair A/Elevator 1 & 2 Lobby, Ground Level, Improvements | \$ - | \$ - | \$ 67,000.00 | \$ - | \$ - | \$ - |
| 5 Stair G/Elevator 3 & 4 Lobby, Ground Level, Entrance Enhancements (Exterior) and Streetscape Improvements | \$ - | \$ - | \$ 167,000.00 | \$ - | \$ - | \$ - |
| 6 Stair G/Elevator 3 & 4 Lobby, Ground Level, Improvements | \$ - | \$ - | \$ 67,000.00 | \$ - | \$ - | \$ - |
| 7 Vehicular Enhancements, corner of Rev. M.L.K. Boulevard and York Street | \$ - | \$ - | \$ 67,000.00 | \$ - | \$ - | \$ - |
| 8 Stair A/Elevator 1 & 2 Lobby, Level 2 Enhancements | \$ - | \$ - | \$ 67,000.00 | \$ - | \$ - | \$ - |
| 9 Level 2, Skywalk Connection/Paystation Kiosk Enhancements | \$ - | \$ - | \$ 134,000.00 | \$ - | \$ - | \$ - |
| 10 Restroom Renovations (behind Security Control Office/behind Manager's Office) | \$ - | \$ 96,000.00 | \$ - | \$ - | \$ - | \$ - |
| 11 Replacement of Rubber Bumper Guards | \$ - | \$ - | \$ 466,000.00 | \$ - | \$ - | \$ - |
| 12 Railing Modifications around at Exit Ramps, Levels 1 & 2 | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 13 Replacement of Access Hatches & Metal Stairs (Street Level into Mech Rooms below) | \$ - | \$ 127,000.00 | \$ - | \$ - | \$ - | \$ - |
| D. Electrical Issues (see note 9 below) | | | | | | |
| 1 Programed Relamping of Light Fixtures | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 2 Replacement/Installation of New LED Light Fixtures | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 3 Miscellaneous Electrical Repairs | \$ 31,000.00 | \$ - | \$ - | \$ - | \$ - | \$ - |
| 4 Rebuilding of Emergency Generator | \$ - | \$ - | \$ - | \$ - | \$ 74,000.00 | \$ - |
| 5 Replacement of T12 Fluorescent Lamps | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 6 Thermal Scanning | \$ 10,000.00 | \$ - | \$ - | \$ 11,000.00 | \$ - | \$ - |
| 7 Miscellaneous Electrical Repairs | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 8 Removal of Abandoned Globe Fixtures | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 9 Relamping and Cleaning of Elevator Lobby Fixtures | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 10 Emergency Generator Preventative Maintenance & Load Test | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 11 Surge Protection | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 12 Replacement of Roof Level Light Fixtures | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 13 Lighting/Signage Control System Programming & Adjustments with Rel | \$ - | \$ - | \$ 7,000.00 | \$ - | \$ - | \$ - |
| E. Mechanical/Plumbing Issues | | | | | | |
| 1 Cleaning Floor Drains | \$ - | \$ 13,000.00 | \$ - | \$ 14,000.00 | \$ - | \$ 35,000.00 |
| 2 Installation/Replacement of Floor Drains | \$ - | \$ 39,000.00 | \$ - | \$ 42,000.00 | \$ - | \$ 104,000.00 |
| 3 Replacement of Drainage System | \$ - | \$ - | \$ - | \$ - | \$ 734,000.00 | \$ - |
| 4 Clean and Flush Sand/Oil Separators | \$ - | \$ 7,000.00 | \$ - | \$ 7,000.00 | \$ - | \$ 18,000.00 |
| 5 HVAC Improvements/Replacement to Office Corridor & Secondary Rooms) | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 6 Water Line Connection to Snowmelter | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 7 Removal of Abandoned Boiler | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 8 Misc. Repairs/Improvements to Drainage System (related to 16-011; all | \$ - | \$ 9,000.00 | \$ - | \$ - | \$ - | \$ 11,000.00 |
| 9 Replacement of Sanitary Piping with new insulation/heat trace | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 10 Replacement of Boiler | \$ - | \$ - | \$ - | \$ - | \$ 37,000.00 | \$ - |
| 11 Installation of Gutters at Smilow Canopy | \$ - | \$ 32,000.00 | \$ - | \$ - | \$ - | \$ - |
| E. Elevator Upgrades and Improvements: | | | | | | |
| 1 Maintenance Audit (Bi-Ennial) | \$ - | \$ 3,000.00 | \$ - | \$ 3,000.00 | \$ - | \$ 4,000.00 |
| 2 Replacement of Car Safety Governors | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 3 Modernization of (4) Elevators | \$ 2,309,000.00 | \$ - | \$ - | \$ - | \$ - | \$ - |
| F. Security System Replacement (see note 7 below) | | | | | | |
| 1 Study for the Replacement of the Security System | \$ - | \$ - | \$ 47,000.00 | \$ - | \$ - | \$ - |
| 2 Replacement of the Security System | \$ - | \$ - | \$ - | \$ 2,656,000.00 | \$ - | \$ - |
| G. Revenue Control Equipment Renewal & Replacement (see note 8 below) | | | | | | |
| 1 Study for the Replacement of the Revenue Control/Guidance Equipment | \$ - | \$ - | \$ 27,000.00 | \$ - | \$ - | \$ - |
| 2 Replacement of the Revenue Control Equipment | \$ - | \$ - | \$ - | \$ 602,000.00 | \$ - | \$ - |
| 3 Replacement of the Guidance System Equipment | \$ - | \$ - | \$ - | \$ 322,000.00 | \$ - | \$ - |



Air Rights Parking Garage
Projected Five Year Construction Costs
(FY 2020)

| Work Description | Prioritized Repairs (FY 2021) | Early Repairs (FY 2022) | Programmed-Term Repairs (FY 2023) | Long-Term Repairs (FY 2024) | Extended-Term Repairs (FY 2025) | Future Repairs (FY 2026 - FY 2030) |
|---|-------------------------------|-------------------------|-----------------------------------|-----------------------------|---------------------------------|------------------------------------|
| H. Site Improvements (see note 9 below) | | | | | | |
| 1 Cover Sloped Gravel Areas with Concrete (Garage Under-Space) | \$ - | \$ - | \$ 233,000.00 | \$ - | \$ - | \$ - |
| 2 Extension of Sidewalks and Miscellaneous Improvements | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| I. Miscellaneous Repairs & Improvements (see note 9 below) | | | | | | |
| 1 Misc. Signage Repairs & Improvements (Interior & Exterior Signage) | \$ - | \$ 16,000.00 | \$ - | \$ - | \$ - | \$ - |
| 2 Study of Facility Signage Requirements | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 3 Full Replacement of Signage Program | \$ - | \$ 1,182,000.00 | \$ - | \$ - | \$ - | \$ - |
| 4 Installation of Supplemental Clearance Bar with Warning | \$ - | \$ 32,000.00 | \$ - | \$ - | \$ - | \$ - |
| 5 Misc. Painting - Concrete/Masonry Surfaces | \$ - | \$ - | \$ 14,000.00 | \$ - | \$ - | \$ - |
| 6 Misc. Painting - Metal Surfaces | \$ - | \$ - | \$ 14,000.00 | \$ - | \$ - | \$ - |
| 7 Awning Replacement | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 8 Store Front Maintenance | \$ - | \$ - | \$ 20,000.00 | \$ - | \$ - | \$ - |
| 9 Modifications to Storefronts at Elevator Towers, Roof Level | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 10 Installation of Storefronts at Stair Towers, Roof Level | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 11 Replacement of Broken Glass and Cleaning of Glass in Stairwells | \$ - | \$ - | \$ 20,000.00 | \$ - | \$ - | \$ - |
| 12 Skywalk Bridge Maintenance | \$ - | \$ - | \$ 14,000.00 | \$ - | \$ - | \$ - |
| 13 Misc. Flooring/Tile Repair | \$ - | \$ - | \$ 7,000.00 | \$ - | \$ - | \$ - |
| 14 Misc. Door Repair/Replacement | \$ - | \$ - | \$ 14,000.00 | \$ - | \$ - | \$ - |
| 15 Cleaning and Degreasing (Interior and Exterior of Garage) | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 16 Painting of Sidewalk Railings | \$ - | \$ - | \$ 80,000.00 | \$ - | \$ - | \$ - |
| J. Miscellaneous Coordination Work | | | | | | |
| 1 Parking Stall & Lane Striping | \$ - | \$ 32,000.00 | \$ - | \$ 35,000.00 | \$ - | \$ 129,000.00 |
| K. File Management | | | | | | |
| 1 Preparation of Record Drawings | \$ - | \$ 20,000.00 | \$ - | \$ 21,000.00 | \$ - | \$ 79,000.00 |
| 2 Scanning of Original Drawings | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| Sub-Total | \$2,350,000.00 | \$2,228,000.00 | \$2,841,000.00 | \$4,552,000.00 | \$1,368,000.00 | \$3,993,000.00 |
| 20% Contingencies (Except Depicted Otherwise) | \$470,000.00 | \$445,600.00 | \$568,200.00 | \$910,400.00 | \$273,600.00 | \$798,600.00 |
| 25% Engr. & Construction Management, incl. Program Management (Unless Depicted Otherwise) | \$587,500.00 | \$557,000.00 | \$710,250.00 | \$1,138,000.00 | \$342,000.00 | \$998,250.00 |
| Total Phased Construction Costs with contingencies: | \$3,407,500.00 | \$3,230,600.00 | \$4,119,450.00 | \$6,600,400.00 | \$1,983,600.00 | \$5,789,850.00 |

TOTAL Construction Cost with Contingencies (5-years, 2021-2025): \$19,341,550.00

TOTAL Construction Cost with Contingencies (10-years, 2026-2030):

\$25,131,400.00

Note 1: Costs Presented do not Include Typical Operational & Maintenance Costs Except as Noted.

Note 2: Costs include a 15% allowance for General & Special Conditions.

Note 3: Future costs incorporate a cumulative 5% inflation for all costs, to be adjusted annually.

Note 4: Costs associated with NHPA Project No. 12-002 are included with FY 2016, and include engineering & construction management fees, a 15% construction contingency, as well as a cumulative 5% inflation for all costs adjusted annually.

Note 5: Depending on actual of completion of NHPA Project No. 13-013 and performance of new system currently being installed, scheduling of future work may be adjusted accordingly.

Note 6: Depending on actual of completion of NHPA Project No. 11-012 and performance of new system currently being installed, scheduling of future work may be adjusted accordingly.

Note 7: The Work anticipates that the following quantity of parking spaces will be taken out of service in order to perform the work (based upon NHPA Project #13-002): from June 1st to August 31, a maximum of 100 spaces may be taken out of service between 6:00 AM and 6:00 PM, from September 1st to May31, a maximum of 50 spaces may be taken out of service between 6:00 AM and 6:00 PM, during evenings from 6:00 PM to 6:00 AM as well as weekends, a maximum of 400 spaces may be taken out of service. Regarding Level 4, from 6:00 AM to 6:00 PM, a maximum of 5 parking spaces may be taken out of service, and from 6:00 PM to 6:00 AM as well as weekends, a maximum of 25 parking spaces may be taken out of service.



6. DETERIORATION MECHANISMS

Reinforced concrete deterioration is typically caused by one or more factors of deterioration mechanisms including corrosion of reinforcement, water penetration, freeze-thaw cycling, volume change, or chemical attack. Any one or combination of these deterioration mechanisms can adversely affect the behavior/performance of a reinforced concrete structure. These adverse impacts include corrosion-induced distress, loss of reinforcing cross section, scaling, leaking, cracking, and delamination of concrete. The following is a brief discussion of each of the mechanisms noted above, and their effect on reinforced concrete structures.

WATER PENETRATION:

The primary cause of the majority of reinforced concrete deterioration within parking structures is directly related to the penetration of water into the concrete. Reinforcing corrosion, concrete scaling, water leakage, leaching, and concrete delamination are all caused at least partially by water penetration.

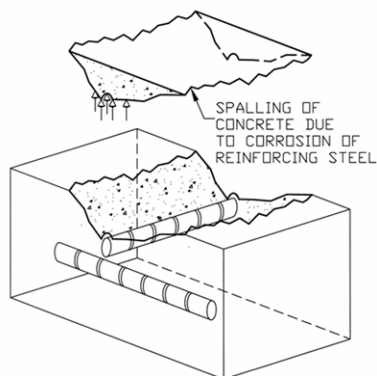


Fig. A

Concrete is a porous material, susceptible to water penetration which can result in increased potential for deterioration. Corrosion of reinforcing steel is an electrochemical process accelerated by the presence of water acting as an electrolyte. In addition, water penetrating into concrete (*Fig. A*) can carry water-soluble chlorides (de-icing salts) to the reinforcing. The combination of chlorides and water further accelerates this corrosion process.

Scaling is also directly related to water penetration into concrete. Scaling is a surface deterioration resulting from pressures by freeze-thaw cycling of saturated concrete. These pressures within the pore structure cause progressive failure of the cement/sand paste. This progressive failure begins with degradation of the exposed surface, advances to the exposure of coarse aggregate, and in severe cases, causes paste failure surrounding the coarse aggregate, destroying the paste/aggregate bond.

Water penetration through a concrete section, cracked or not, can cause leaching of minerals from within the concrete matrix. Leaking of the parking deck exposes embedded reinforcing steel and underlying structural members to water and chloride ions (road salt) resulting in structural deterioration and potentially a loss of load carrying capacity of these building elements. Leaching is the result of frequent water penetration carrying water-soluble products from within the concrete to the surface below. Leached materials that tend to collect on overhead concrete surfaces are unsightly and potentially damaging to patron's vehicles using the parking facility.

Water penetration can also cause delamination of concrete along subsurface fractures through pressures generated during freeze-thaw cycling.

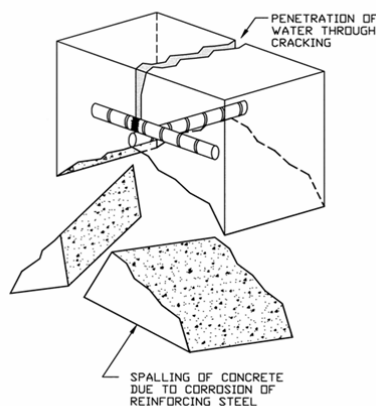


Fig. B

CORROSION OF REINFORCEMENT:

Corrosion of reinforcing steel or other embedded ferrous items such as electrical conduit is a second major factor contributing to deterioration of reinforced concrete (*Fig B*).

The corrosion process is an electrochemical process, which produces iron oxide (rust) and other by-products. These by-products occupy a minimum of 250% of the volume of the parent metal. This increase in volume produces tensile stresses within the surrounding concrete.

Because concrete has poor tensile strength properties, cracking occurs within the concrete matrix allowing additional moisture and chlorides to reach the reinforcing causing acceleration of the corrosion process. The deterioration caused by this corrosion includes the reduction of cross sectional area of the reinforcing, and the delamination of concrete surrounding the reinforcement.

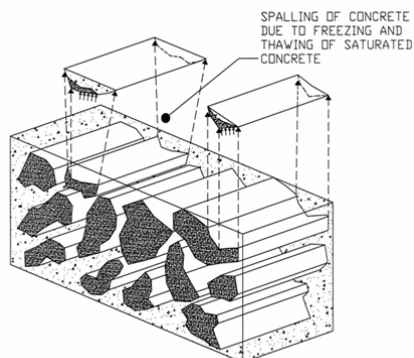


Fig. C

FREEZE-THAW DAMAGE:

Concrete deterioration caused by freeze-thaw cycles is a third major deterioration mechanism. The mechanism occurs within saturated concrete subjected to freezing and thawing due to the pressures generated within the pores of the concrete paste resulting from the volume changes of water during the freeze/thawing process. These pressures are even greater in the presence of de-icing chemicals/chlorides as these chemicals reduce the freezing point and indirectly increase the pore pressures.

As previously mentioned, these pressures can cause progressive failure of the cement paste and result in scaling of the concrete, and delamination of concrete along subsurface fracture planes (*Fig. C*).

VOLUME CHANGES:

Volume changes are a fourth major contributing factor of deterioration of reinforced concrete structures. These volume changes occur in both plastic and cured concrete. These volume changes can cause various types of cracking within the concrete member.

These cracks allow access for water and contaminants to the concrete and reinforcing, resulting accelerated deterioration to occur. The cracking most often associated with plastic concrete is shrinkage cracking produced by the reduction in volume of the concrete during curing. Improper detailing, proportioning, placement, or curing of the concrete can affect the extent of this cracking, but the primary cause is the volume change that occurs during curing.

Volume changes due to thermal movement, shrinkage, creep, and loading can also contribute to the deterioration of reinforced concrete. These volume changes will produce stress in restrained members, often resulting in cracking of the member (*Fig. D*). These cracks also provide access to water and other deterioration mechanisms to attack the member.

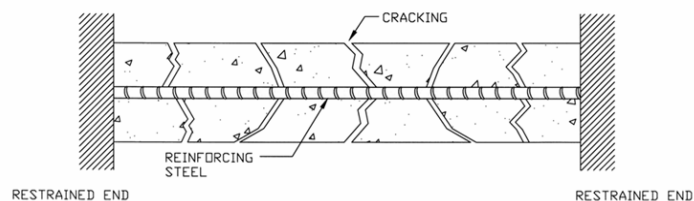


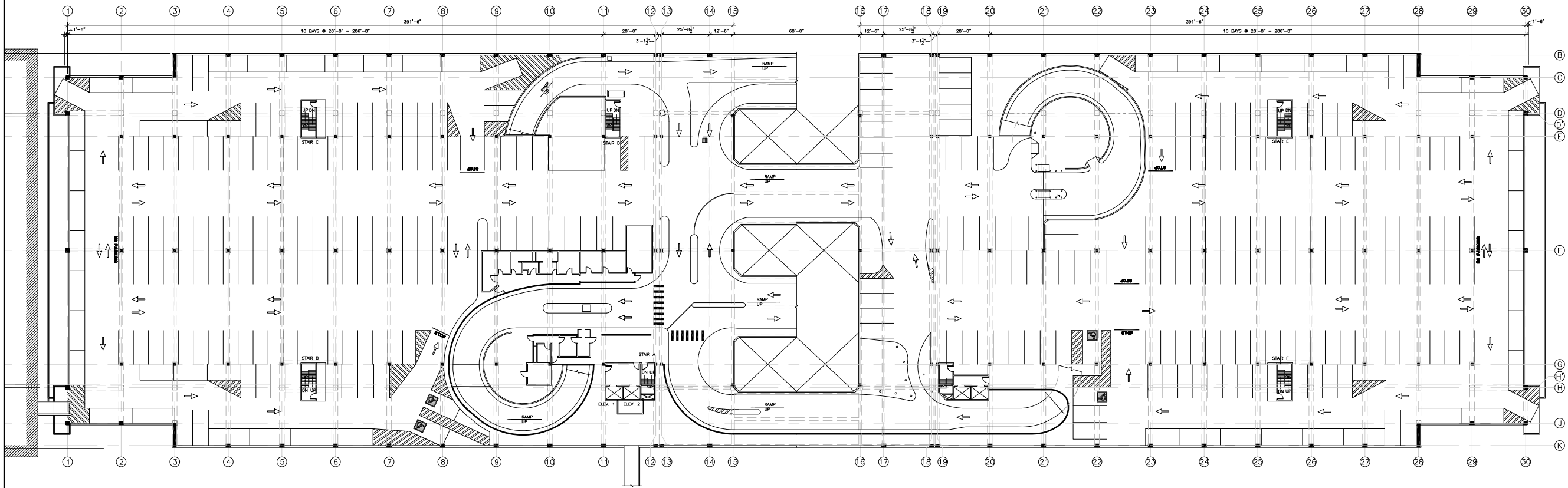
Fig. D

CHEMICAL ATTACK:

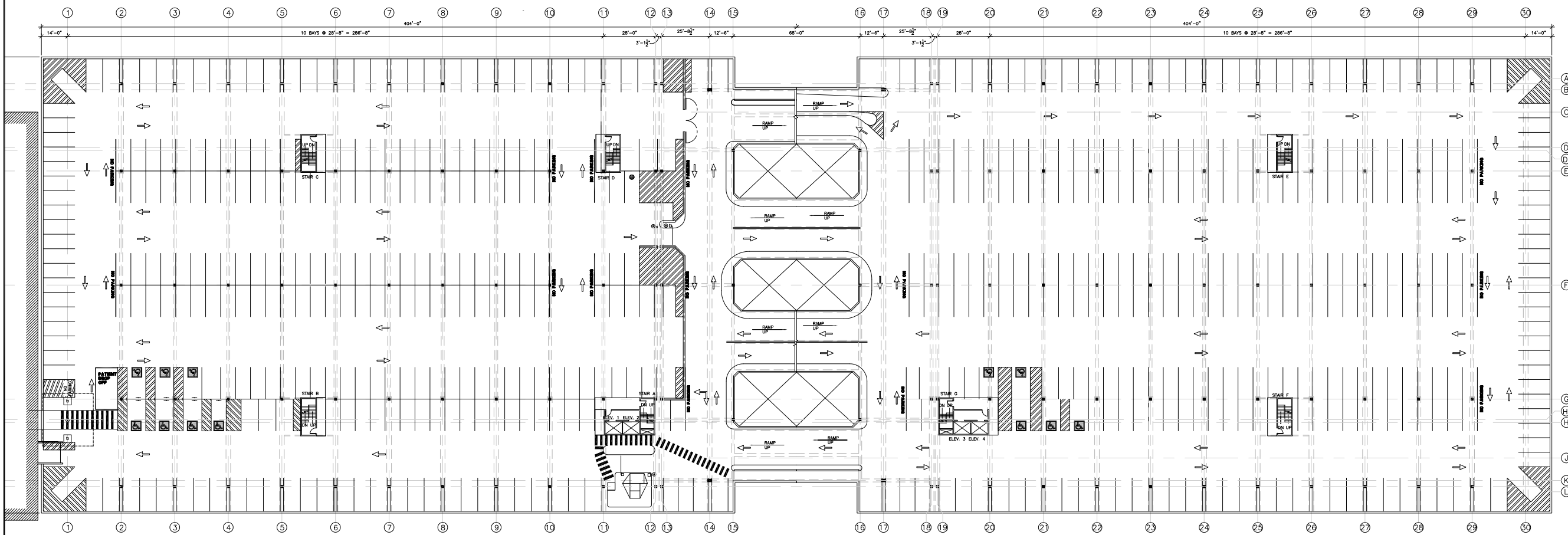
Chemical attack is a fifth major deterioration mechanism affecting the performance of reinforced concrete. The effect of de-icing chemical/chlorides upon reinforcing steel and scaling is one example of chemically influenced deterioration. Severe exposure to other chemicals, notably sulfates and acids, can also cause deterioration of cement paste, cement paste/aggregate bond, and reinforcing steel. Chemical properties occurring within certain types of aggregates can also cause an adverse reaction with the cement paste. The resulting volume changes can cause cracking of the concrete.

7. APPENDIX A – SCHEMATIC FLOOR PLANS



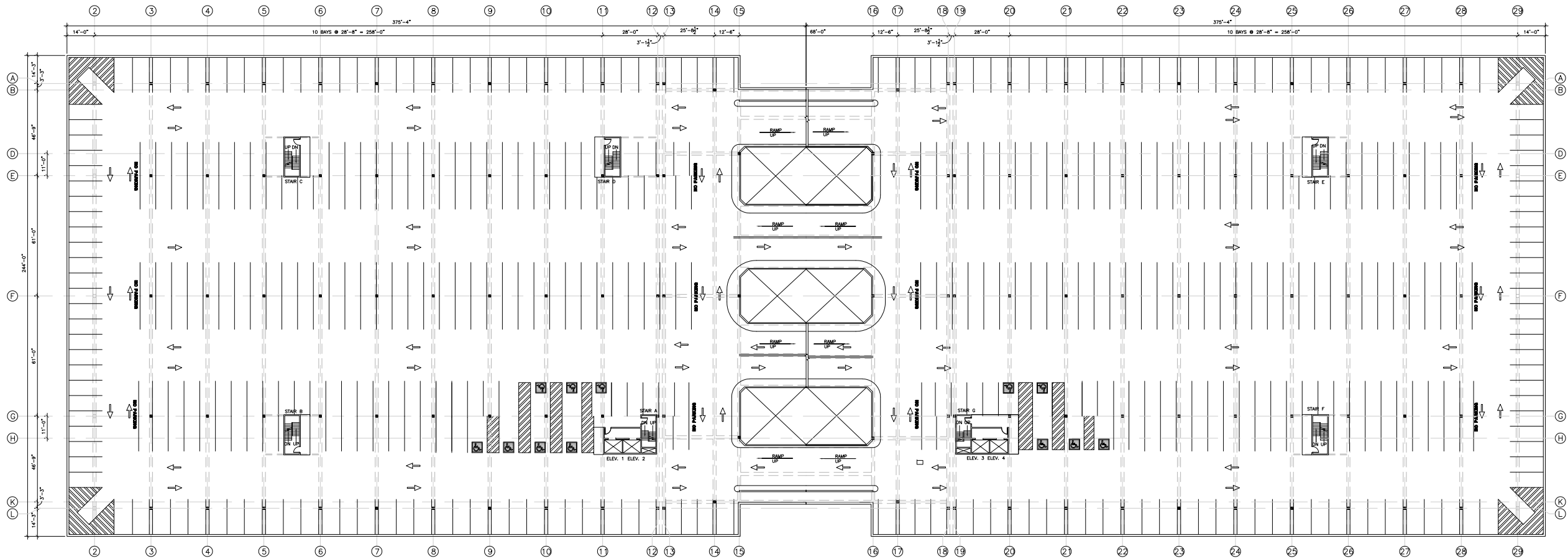


1 FIRST AND SECOND LEVEL STRIPING PLAN
ST-1.1 SCALE: N.T.S.

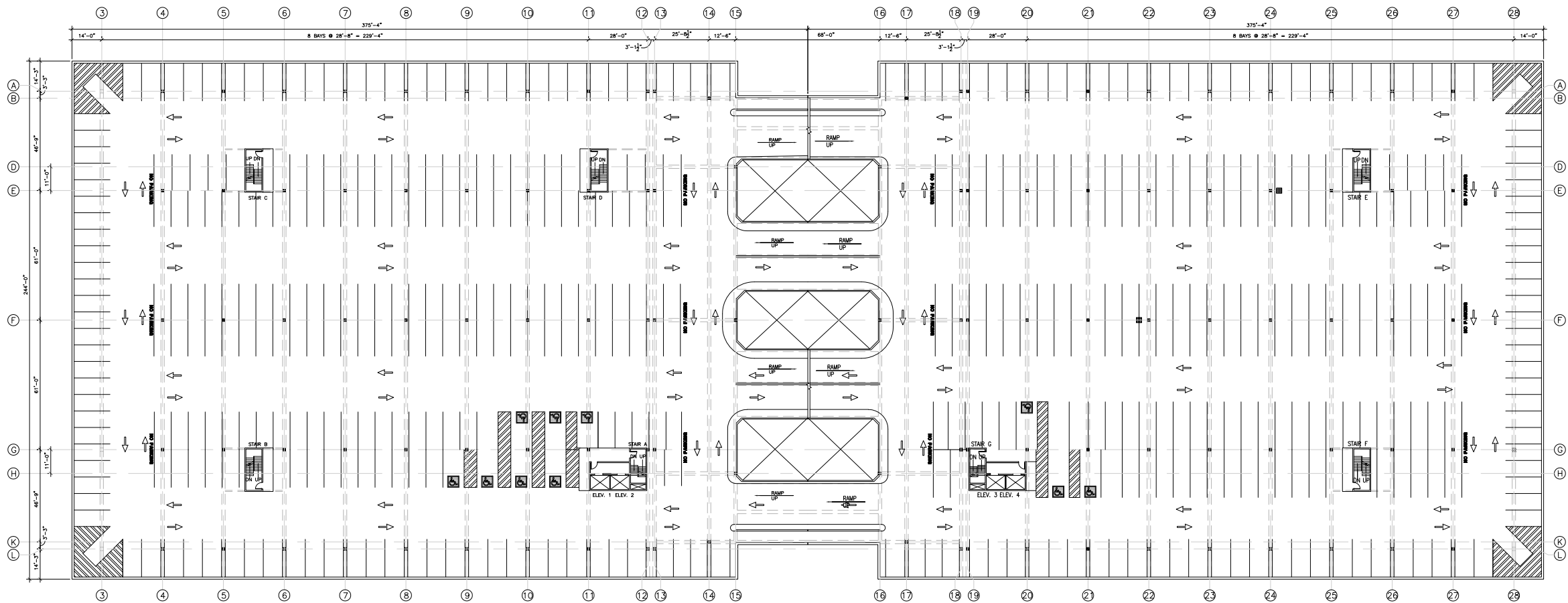


2 THIRD AND FOURTH LEVEL STRIPING PLAN
ST-1.1 SCALE: N.T.S.

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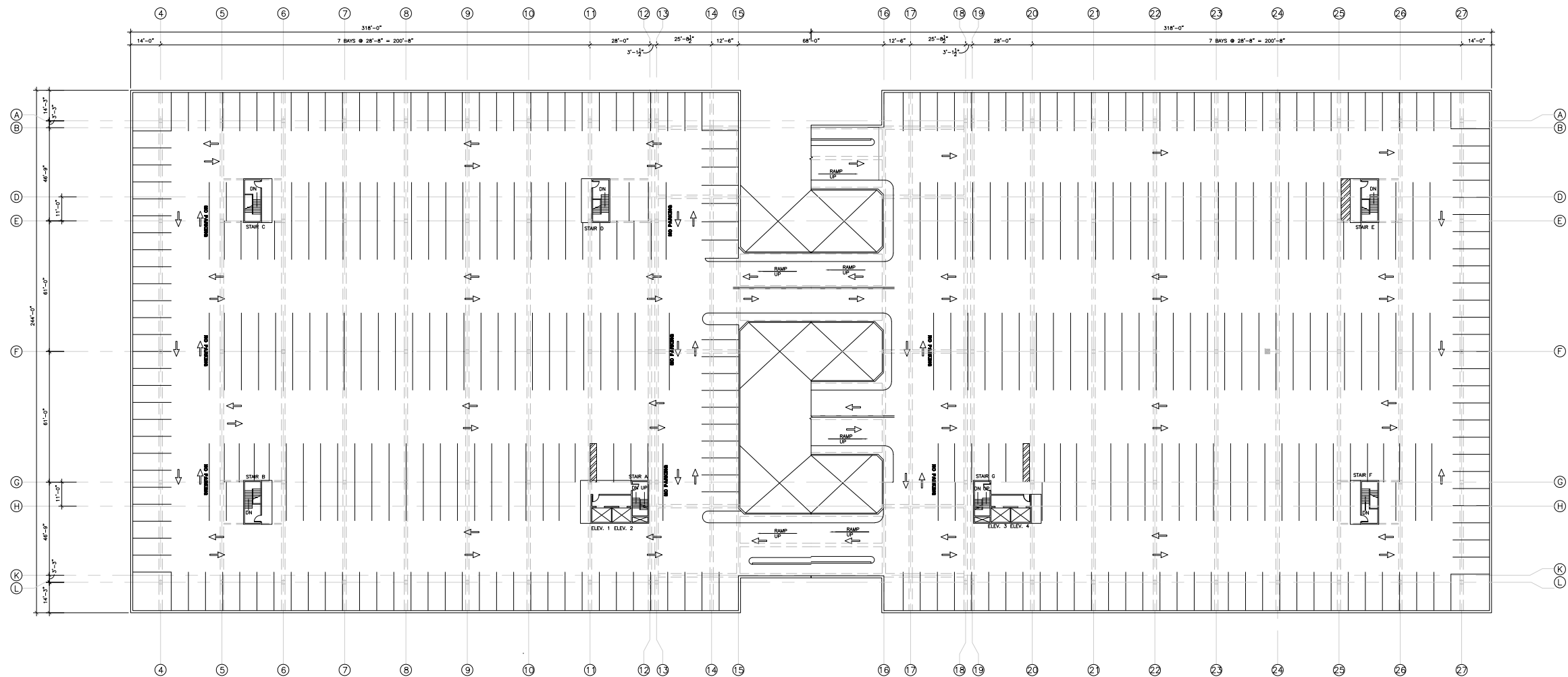
1 FIFTH AND SIXTH LEVEL STRIPING PLAN
ST-1.2 SCALE: N.T.S.



2 SEVENTH AND EIGHTH LEVEL STRIPING PLAN
ST-1.2 SCALE: N.T.S.

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| NO. | DATE | BY |
|---|-------|--------|
| REVISIONS | | |
| DRAWING TITLE | | |
| FIFTH AND SIXTH & SEVENTH AND EIGHTH LEVEL STRIPING PLANS | | |
| DRAWING NO. | | |
| ST-1.2 | | |
| SCALE: NTS | | |
| DATE: APRIL 2020 | | |
| PROJECT NO. 20-19171.00-2 | | |
| NHPA NO. 20-001 | | |
| DESIGN | DRAWN | CH'KD. |
| KDS | KDS | KDS |



1 NINTH AND TENTH LEVEL STRIPING PLAN
ST-13 SCALE: N.T.S.

[illegible]

| | | | |
|----|-----------------|--------------|---------------|
| d. | NHPA NO. 20-001 | | |
| | DESIGN KDS | DRAWN KDS | CH'KD. KDS |

8. **APPENDIX B – MAINTENANCE SCHEDULES AND CHECKLISTS/
SEASONAL WASHDOWN CHECKLIST**



MAINTENANCE SCHEDULE

| A. Cleaning: | Daily | Weekly | Monthly | 4 Month Interval | 6 Month Interval | Yearly | Other |
|---|-------|--------|---------|------------------|------------------|--------|--------|
| 1. Sweeping - Localized | R | M | | | | | |
| 2. Sweeping - all Areas (including curbs) | | R | M | | | | |
| 3. Expansion Joints | | R | M | | | | |
| 4. Empty Trash Cans | R | M | | | | | |
| 5. Restrooms: | | | | | | | |
| a. Floors | R | M | | | | | |
| b. Fixtures | | M | | | | | |
| c. Walls | | R | M | | | | |
| 6. Cashier's Booths: | R | | | | | | |
| a. Floors | | M | | | | | |
| b. Fixtures | | M | | | | | |
| c. Walls | | R | M | | | | |
| d. Windows | R | R | M | | | | |
| 7. elevators: | | | | | | | |
| a. floors | R | M | | | | | |
| b. Doors | | R | M | | | | |
| c. Door Tracks | | M | | | | | |
| d. Windows (if glass back elevator): | | | | | | | |
| - Interior Elevator Glass | | R | M | | | | |
| - Exterior Elevator Glass (exterior of cab/interior of shaft) | | | | | | R/M | |
| 8. Stairs: | | | | | | | |
| a. Floors | | R | M | | | | |
| b. Handrails | | R | M | | | | |
| c. Windows: | | | | | | | |
| - Interior Window Surfaces | | | R | M | | | |
| - Exterior Window Surfaces (inclusive of exterior of back elevator shaft) | | | | | | R/M | |
| 9. Offices (Management/Security): | | | | | | | |
| a. Floors | R | M | | | | | |
| b. Windows: | | | | | | | |
| - Interior Surfaces | | R | M | | | | |
| - Exterior Surfaces | | | R | M | | | |
| 10. Electrical/Mechanical Rooms | | | | | | | |
| 11. Wash Down Parking Decks | | | | | *R | *M | |
| 12. Wash Down Revenue Control Equipment | | R | M | | | | Note 3 |



MAINTENANCE SCHEDULE

| B. Doors & Door Hardware: | Daily | Weekly | Monthly | 4 Month Interval | 6 Month Interval | Yearly | Other |
|--|-------|--------|---------|------------------|------------------|--------|--------|
| 1. Doors close & Latch Properly | R | M | | | | | |
| 2. Mechanized Doors: | | | | | | | |
| a. Pedestrian Doors | R | M | | | | | |
| b. Rolling Grill Doors | R | M | | | | | |
| 3. Panic Hardware at Security Doors | R | M | | | | | |
| 4. Lubricate mechanized Doors: | | | | | | | |
| a. Pedestrian Doors | | | R | | M | | |
| b. Rolling Grill Doors | | | R | | M | | |
| C. Electrical System: | Daily | Weekly | Monthly | 4 Month Interval | 6 Month Interval | Yearly | Other |
| 1. Check Lighting Fixtures | | R | M | | | | |
| 2. relamp Fixtures | | R | | M | | | |
| 3. Replace Fixture Ballasts | | | R | M | | | |
| 4. Inspect - Specialized Electrical Equipment: | | | | | | | |
| a. Time Clocks | | | | R | M | | Note 3 |
| b. Photo Cells | | | | R | M | | Note 3 |
| c. Lighting Control Equipment | | | | R | M | | Note 3 |
| d. Other | | | | | | R/M | Note 1 |
| 5. Electrical Distribution Panels | | | | | R | M | |
| 6. surface Mounted conduit | | | | | R | M | |
| 7. Sprinkler System Compressor | | | | | R | M | |
| 8. fire alarm System | | | | R | M | | Note 2 |
| D. Elevator Operation: | Daily | Weekly | Monthly | 4 Month Interval | 6 Month Interval | Yearly | Other |
| 1. Check for Normal Operation | R | M | | | | | |
| 2. Check Elevator Indicator Lights: | | | | | | | |
| a. Interior | R | M | | | | | |
| b. Exterior | R | M | | | | | |
| 3. Check Audible Tones (ADA level enunciators) | | R | M | | | | |
| 4. Elevator Service - Preventive Maintenance | | | | | R | M | Note 2 |
| E. Heating, Ventilation & Air Conditioning: | Daily | Weekly | Monthly | 4 Month Interval | 6 Month Interval | Yearly | Other |
| 1. Check for Proper Operation: | | | | | | | |
| a. Heating Equipment | | R | | M | | | Note 3 |
| b. Ventilation Equipment | | R | M | | | | Note 3 |
| c. A/C Equipment | | R | | M | | | Note 3 |
| 2. Check Filters | | | | | | R/M | Note 1 |
| 3. HVAC Service - Preventive Maintenance | | | | | | R/M | Note 1 |



MAINTENANCE SCHEDULE

| F. Painting: | Daily | Weekly | Monthly | 4 Month Interval | 6 Month Interval | Yearly | Other |
|--|-------|--------|---------|------------------|------------------|--------|--------|
| 1. Check for repaint Failure & Rusting: | | | | | | | |
| a. Doors & Door Frames | | | | R | M | | |
| b. Handrails & Guardrails | | | | R | M | | |
| c. Steel Bollards/Pipe Guards | | | | R | M | | |
| d. Exposed Piping (fire suppression system & storm drainage) | | | | | R | M | |
| e. Other Miscellaneous Metals | | | | R | M | | |
| 2. Check for Appearance: | | | | | | | |
| a. Striping | | | | R | M | | |
| b. Curbs | | | R | | M | | |
| c. Walls | | | | R | M | | |
| d. Ceilings | | | | | R | M | |
| e. Signs | | | R | M | | | |
| f. Touch-up Paint | | | R | | M | | |
| 3. Repainting | | | | | | R/M | Note 1 |
| G. Parking/Revenue Control Equipment: | Daily | Weekly | Monthly | 4 Month Interval | 6 Month Interval | Yearly | Other |
| 1. Check for Proper Operation | R | M | | | | | |
| 2. Parking/Revenue Control Equip - Preventive Maintenance | | | | | | | Note 3 |
| H. Plumbing/Drainage Systems: | Daily | Weekly | Monthly | 4 Month Interval | 6 Month Interval | Yearly | Other |
| 1. Check for Proper Operation: | | | | | | | |
| a. Sanitary Facilities | R | M | | | | | |
| b. Portable Water System | | | R | | M | | |
| c. Deck Wash down System | | | | | | | |
| d. Floor Drains/Storm Risers | | | | | R | M | |
| e. Fire Suppression Systems: | | | | | | | |
| - Sprinkler System | | | | | | R/M | Note 3 |
| - Dry Fire Standpipe System | | | | | | R/M | Note 3 |
| 2. Drain Down Systems for Winter | | | | | | R/M | Note 3 |

MAINTENANCE SCHEDULE

| I. Waterproofing: | Daily | Weekly | Monthly | 4 Month Interval | 6 Month Interval | Yearly | Other |
|--|-------|--------|---------|------------------|------------------|--------|-------|
| 1. Check for Leaks: | | | | | | | |
| a. Roofing | | | R | | M | | |
| b. Joint/Crack Sealants | | | R | | M | | |
| c. Expansion Joints | | | R | | M | | |
| d. Windows, Doors & Walls | | | R | | M | | |
| e. Parking Deck - Waterproofing Membrane | | | R | | M | | |
| 2. Check for Deterioration: | | | | | | | |
| a. Roofing | | | | | R | M | |
| b. Joint/Crack Sealants | | | | | R | M | |
| c. Expansion Joints | | | | | R | M | |
| d. Windows, Doors & Walls | | | | | R | M | |
| e. Parking Deck - Waterproofing Membrane | | | | | R | M | |
| J. Safety Checks: | Daily | Weekly | Monthly | 4 Month Interval | 6 Month Interval | Yearly | Other |
| 1. Handrails & Guardrails | | | R | M | | | |
| 2. Emergency Exit Signs | | R | M | | | | |
| 3. Emergency Lights | | R | M | | | | |
| 4. Tripping Hazards: | | | | | | | |
| a. Supported Concrete Slabs | R | M | | | | | |
| b. Concrete Slab-on-grade | R | M | | | | | |
| c. Stairs (interior & exterior) | R | M | | | | | |
| d. Sidewalks & Curbs (interior & exterior) | R | M | | | | | |
| K. Security System: | Daily | Weekly | Monthly | 4 Month Interval | 6 Month Interval | Yearly | Other |
| 1. Check for Proper Operation | | | | | | | |
| a. Elevator Communication Equipment (telephone) | | R | M | | | | |
| b. Intercom System | R | M | | | | | |
| c. CCTV Surveillance System | R | M | | | | | |
| L. Pedestrian & Vehicular Signage: | Daily | Weekly | Monthly | 4 Month Interval | 6 Month Interval | Yearly | Other |
| 1. Check Signs: | | | | | | | |
| a. Proper Placement/Positioning | | R | M | | | | |
| b. Clean | | | | R | M | | |
| c. Legibility | | | R | M | | | |
| d. Illuminated Signs or Changeable Information Signs | R | M | | | | | |



MAINTENANCE SCHEDULE

| M. Snow & Ice Removal: | Daily | Weekly | Monthly | 4 Month Interval | 6 Month Interval | Yearly | Other |
|---|----------------------------------|--------|---------|----------------------------|------------------|-------------------------------|-------|
| 1. Check for Icy Spots (in season) | R/M | | | | | | |
| 2. Remove Snow & Ice (in season) | R/M | | | | | | |
| N. Structural System: | Daily | Weekly | Monthly | 4 Month Interval | 6 Month Interval | Yearly | Other |
| 1. Check Structure for: | | | | | | | |
| a. Soffit (overhead) Deterioration | | | R | M | | | |
| b. Floor Surface Deterioration (see safety checks) | | | | R | M | | |
| c. Wall & Column Deterioration | | | R | M | | | |
| d. Cracking Concrete | | | | R | M | | |
| e. Water Leakage | | | | R | M | | |
| f. Rusting Structural Steel | | | | R | M | | |
| g. Rusting Embedment's within Concrete | | | | R | M | | |
| h. Unusual and/or Unequal Settlement | | | | | R | M | |
| O. Repair | As per Engineer's Recommendation | | | | | | |
| P. Repair and/or Replace Protective Concrete Coatings | As per Engineer's Recommendation | | | | | | |
| Notes for Maintenance Checklist: | | | | Frequency | | | |
| | | | | R=Recommended M=Minimum | | R*=Spring & Fall M*=Spring | |

1. A frequency should be selected that is appropriate for that element in the specific parking garage. Spot repairs or replacements should be performed as needed.
2. This equipment should be under a service contract for regular preventative maintenance and emergency service. The equipment manufacturer's recommendations for inspection and preventative maintenance should be followed.
3. This equipment should either be under a service contract for regular preventative maintenance and emergency service, or in-house staff should be specifically trained to provide the required service. The equipment manufacturer's recommendations for inspection and preventative maintenance should be followed.



MAINTENANCE CHECKLISTS

DAILY CHECKLIST

A. Cleaning:

1. Sweeping - Localized ☐
2. Empty Trash Cans ☐
3. Restrooms:
 - a. Floors ☐
 - b. Fixtures ☐
4. Cashier's Booths:
 - a. Floors ☐
 - b. Fixtures ☐
5. Elevators:
 - a. Floors ☐
 - c. Door Tracks ☐
6. Offices (Management/Security):
 - a. Floors ☐

B. Doors & Door Hardware:

1. Doors Close & Latch Properly ☐
2. Mechanized Doors:
 - a. Pedestrian Doors ☐
 - b. Rolling Grill Doors ☐
3. Panic Hardware at Security Doors ☐

C. Elevator Operation:

1. Check for Normal Operation ☐
2. Check Elevator Indicator Lights:
 - a. Interior ☐
 - b. Exterior ☐

D. Landscaping:

1. Remove Trash ☐
2. Water/Irrigate (*dependent upon time of year & type of planting*) ☐

E. Parking/Revenue Control Equipment:

1. Check for Proper Operation ☐

F. Plumbing/Drainage Systems:

1. Check for Proper Operation:
 - a. Sanitary Facilities ☐

G. Safety Checks:

1. Tripping Hazards:
 - a. Supported Concrete Slabs ☐
 - b. Concrete Slab-on-Grade ☐
 - c. Stairs (Interior & Exterior) ☐
 - d. Sidewalks & Curbs (Interior & Exterior) ☐

H. Security System:

1. Check for Proper Operation
 - b. Intercom System ☐
 - c. CCTV Surveillance System ☐

I. Pedestrian & Vehicular Signage:

1. Check Signs:
 - a. Illuminated Signs or Changeable Information Signs ☐

J. Snow & Ice Removal:

1. Check for Icy Spots (in season) ☐
2. Remove Snow & Ice (in season) ☐

Supervisor: _____

Date: _____



MAINTENANCE CHECKLISTS

WEEKLY CHECKLIST

A. Cleaning:

1. Sweeping - All Areas (*including curbs*) ☐
2. Expansion Joints ☐
3. Restrooms:
 - a. Walls ☐
4. Cashier's Booths:
 - a. Walls ☐
 - b. Windows ☐
5. Elevators:
 - a. Doors ☐
 - b. Windows (*if glass back elevator*):
 - Interior Elevator Glass ☐
6. Stairs:
 - a. Floors ☐
 - b. Handrails ☐
7. Offices (Management/Security):
 - a. Windows:
 - Interior Surfaces ☐
8. Wash Down Revenue Control Equipment ☐

B. Electrical System:

1. Check Lighting Fixtures ☐
2. Relamp Fixtures ☐

C. Elevator Operation:

1. Check Audible Tones (*ADA level annunciators*) ☐

D. Heating, Ventilation & Air Conditioning:

1. Check for Proper Operation:
 - a. Heating Equipment ☐
 - b. Ventilation Equipment ☐
 - c. A/C Equipment ☐

E. Landscaping:

1. Mow Lawns ☐

F. Safety Checks:

1. Emergency Exit Signs ☐
2. Emergency Lights ☐

G. Security System:

1. Check for Proper Operation
 - a. Elevator Communication Equipment (Telephone) ☐

H. Pedestrian & Vehicular Signage:

1. Check Signs:
 - a. Proper Placement/Positioning ☐

Supervisor: _____
Date: _____



MAINTENANCE CHECKLISTS

MONTHLY CHECKLIST

A. Cleaning:

1. Stairs:
 - a. Windows:
 - Interior Window Surfaces
2. Offices (Management/Security):
 - b. Windows:
 - Exterior Surfaces

☐☐

B. Doors & Door Hardware:

1. Lubricate Mechanized Doors:
 - a. Pedestrian Doors
 - b. Rolling Grill Doors

☐☐

C. Electrical System:

1. Replace Fixture Ballasts

☐

D. Landscaping:

1. Weed Landscaping

☐

E. Painting:

1. Check for Appearance:
 - a. Curbs
 - b. Signs
 - c. Touch-up Painting

☐☐☐

F. Plumbing/Drainage Systems:

1. Check for Proper Operation:
 - a. Potable Water System

☐

G. Roofing & Waterproofing:

1. Check for Leaks:
 - a. Roofing
 - b. Joint/Crack Sealants
 - c. Expansion Joints
 - d. Windows, Doors & Walls
 - e. Parking Deck Waterproofing Membrane

☐☐☐☐☐

H. Safety Checks:

1. Handrails & Guardrails

☐

I. Pedestrian & Vehicular Signage:

1. Check Signs:
 - a. Legibility

☐

J. Structural System:

1. Check Structure for:
 - a. Soffit (overhead) Deterioration
 - b. Wall & Column Deterioration

☐☐

Supervisor:

Date:



MAINTENANCE CHECKLISTS

QUARTERLY CHECKLIST

A. Electrical System:

1. Inspect - Specialized Electrical Equipment:
 - a. Time Clocks ☐
 - b. Photo Cells ☐
 - c. Lighting Control Equipment ☐
2. Fire Alarm System ☐

B. Painting:

1. Check for Paint Failure & Rusting:
 - a. Doors & Door Frames ☐
 - b. Handrails & Guardrails ☐
 - c. Steel Bollards/Pipe Guards ☐
 - d. Other Miscellaneous Metals ☐
2. Check for Appearance:
 - a. Striping ☐
 - b. Walls ☐

C. Pedestrian & Vehicular Signage:

1. Check Signs:
 - a. Clean ☐

D. Structural System:

1. Check Structure for:
 - a. Floor Surface Deterioration (See also Safety Checks) ☐
 - b. Cracking Concrete ☐
 - c. Water Leakage ☐
 - d. Rusting Structural Steel ☐
 - e. Rusting Embedment within Concrete ☐

Supervisor: _____
Date: _____



MAINTENANCE CHECKLISTS

6 MONTH & YEARLY CHECKLIST

| | 6 Month Interval | Yearly Interval |
|--|--------------------------|--------------------------|
| A. Cleaning: | | |
| 1. Elevators: | | |
| a. Windows (<i>if glass back elevator</i>): | | |
| - Exterior Elevator Glass (exterior of cab and interior of shaft) | | <input type="checkbox"/> |
| 2. Stairs: | | |
| a. Windows: | | |
| - Exterior Window Surfaces (<i>inclusive of exterior of elevator shaft if glass back elevator</i>) | | <input type="checkbox"/> |
| 3. Wash Down Parking Decks | <input type="checkbox"/> | |
| B. Electrical System: | | |
| 1. Electrical Distribution Panels | <input type="checkbox"/> | |
| 2. Surface Mounted Conduit | <input type="checkbox"/> | |
| 3. Sprinkler System Compressor | <input type="checkbox"/> | |
| C. Elevator Operation: | | |
| 1. Elevator Service - Preventive Maintenance | <input type="checkbox"/> | |
| D. Heating, Ventilation & Air Conditioning: | | |
| 1. Check Filters | | <input type="checkbox"/> |
| 2. HVAC Service - Preventive Maintenance | | <input type="checkbox"/> |
| E. Landscaping: | | |
| 1. Prune Trees | | <input type="checkbox"/> |
| 2. Trim Shrubs | <input type="checkbox"/> | |
| 3. Fertilize | <input type="checkbox"/> | |
| F. Painting: | | |
| 1. Check for Paint Failure & Rusting: | | |
| a. Exposed Piping (fire suppression system & storm drainage) | <input type="checkbox"/> | |
| 2. Check for Appearance: | | |
| a. Ceilings | <input type="checkbox"/> | |
| 3. Repainting | | <input type="checkbox"/> |
| G. Plumbing/Drainage Systems: | | |
| 1. Check for Proper Operation: | | |
| a. Floor Drains/Storm Risers | <input type="checkbox"/> | |
| b. Fire Suppression Systems: | | |
| - Sprinkler System | | <input type="checkbox"/> |
| - Dry Fire Standpipe System | | <input type="checkbox"/> |
| 2. Drain Down Systems for Winter | | <input type="checkbox"/> |
| H. Roofing & Waterproofing: | | |
| 1. Check for Deterioration: | | |
| a. Roofing | <input type="checkbox"/> | |
| b. Joint/Crack Sealants | <input type="checkbox"/> | |
| c. Expansion Joints | <input type="checkbox"/> | |
| d. Windows, Doors & Walls | <input type="checkbox"/> | |
| e. Parking Deck Waterproofing Membrane | <input type="checkbox"/> | |
| I. Structural System: | | |
| 1. Check Structure for: | | |
| a. Unusual and/or Unequal Settlement | <input type="checkbox"/> | |

Supervisor: _____

Date: _____



SEASONAL WASHDOWN CHECKLIST:

FACILITY: AIR RIGHTS PARKING GARAGE

SEASON/YEAR: _____

| | | | |
|---------------|-------|-------------|-------------------|
| 10TH LEVEL: | _____ | DATE: _____ | SUPERVISOR: _____ |
| 9TH LEVEL: | _____ | DATE: _____ | SUPERVISOR: _____ |
| 8TH LEVEL: | _____ | DATE: _____ | SUPERVISOR: _____ |
| 7TH LEVEL: | _____ | DATE: _____ | SUPERVISOR: _____ |
| 6TH LEVEL: | _____ | DATE: _____ | SUPERVISOR: _____ |
| 5TH LEVEL: | _____ | DATE: _____ | SUPERVISOR: _____ |
| 4TH LEVEL: | _____ | DATE: _____ | SUPERVISOR: _____ |
| 3RD LEVEL: | _____ | DATE: _____ | SUPERVISOR: _____ |
| 2ND LEVEL: | _____ | DATE: _____ | SUPERVISOR: _____ |
| 1ST LEVEL: | _____ | DATE: _____ | SUPERVISOR: _____ |
| STREET LEVEL: | _____ | DATE: _____ | SUPERVISOR: _____ |

| | | | |
|------------|-------|-------------|-------------------|
| STAIR 'A': | _____ | DATE: _____ | SUPERVISOR: _____ |
| STAIR 'B': | _____ | DATE: _____ | SUPERVISOR: _____ |
| STAIR 'C': | _____ | DATE: _____ | SUPERVISOR: _____ |
| STAIR 'D': | _____ | DATE: _____ | SUPERVISOR: _____ |
| STAIR 'E': | _____ | DATE: _____ | SUPERVISOR: _____ |
| STAIR 'F': | _____ | DATE: _____ | SUPERVISOR: _____ |
| STAIR 'G': | _____ | DATE: _____ | SUPERVISOR: _____ |

