

**CONDITION APPRAISAL
(FY 2020)**

**CROWN STREET PARKING GARAGE
NEW HAVEN, CONNECTICUT**



**NEW HAVEN
PARKING
AUTHORITY**

PREPARED FOR:

NEW HAVEN PARKING AUTHORITY

232 GEORGE STREET

NEW HAVEN CONNECTICUT 06510

PREPARED BY:

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

APRIL 2020



CONDITION APPRAISAL CROWN STREET PARKING GARAGE

NEW HAVEN PARKING AUTHORITY FACILITIES
NEW HAVEN, CONNECTICUT

APRIL 2020

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1. INTRODUCTION

The Condition Appraisal of the Crown Street Parking Garage was performed by DESMAN in accordance with the executed agreement by and between the New Haven Parking Authority and DESMAN (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 Crown Street 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 Crown Street Garage consists of 720 parking spaces. Opened on October 27, 1971, this garage consists of seven (7) level of precast concrete, single tee construction with cast-in-place concrete topping, in excess of 257,000 gross square footage of parking area. The street level of the garage also contains commercial space. This 49 year old facility is in generally good condition.

Currently there are three (3) projects in design which represent a combined project cost of approximately a minimum \$3M (including contingencies and design/management fees). Between 2021 and 2025, an additional expenditure of approximately **\$2,454,850.00** can be expected to properly repair and maintain the Crown Street Garage over the next five years.

Currently, a major concrete repair and waterproofing project, as well as a lighting replacement project, have been designed and are funded through a State grant in process.

Items which DESMAN recommends to be performed at this facility over the next five years are inclusive of, but not limited to the following items of work:

- Architectural enhancements to the vehicular and pedestrian entrances and corridors.
- Painting of concrete & masonry surfaces, exposed metal surfaces

The Capital Projects currently in progress consist of the following:

PROJECT NUMBER	PROJECT TITLE	OPINION OF COST*	STATUS
15-004B/ 19-006	Lighting & Electrical Repairs & Improvements	\$720,000	In Design
16-033	Area Sustainability	TBD	In Design
17-006/ 19-005	Repairs & Improvements	\$2,300,000	In Design

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



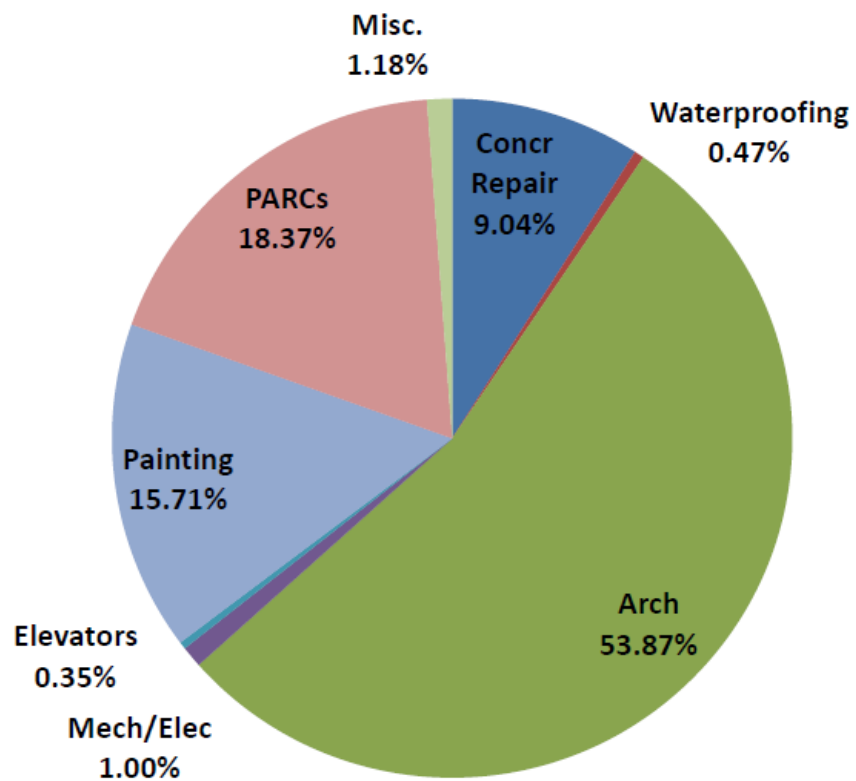
The costs associated with the implementation of future repairs and preventative maintenance for this garage is presented in more detail later in this report.

The repairs recommended to be performed over the next five years have been prioritized into three courses of action: Prioritized Repairs (FY 2021), Early Repairs (FY 2022), Programmed Repairs (FY 2023), and Long-Term Repairs (FY 2024 - 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)	\$0.00
Early Repairs (FY 2022)	\$1,248,450.00
Programmed Repairs (FY 2023)	\$674,250.00
Long-Term Repairs (FY 2024 – 2025)	\$532,150.00
TOTAL ESTIMATED COST	\$2,454,850.00

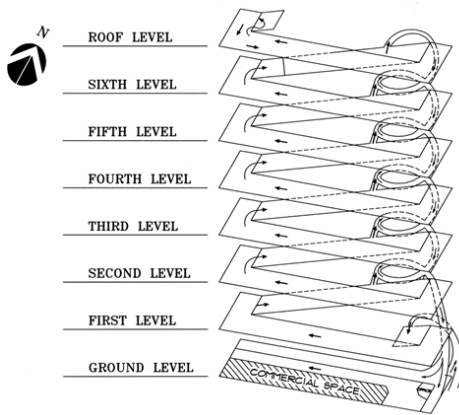
To further summarize, the projected costs may be split into the following discipline categories, in accordance with the associated percentages, as represented by the following pie chart:

Concrete Repair:	9.04%
Waterproofing:	0.47%
Architectural:	53.87%
Mechanical/Electrical:	1.00%
Elevators:	0.35%
Painting:	15.71%
PARCs:	18.37%
<u>Miscellaneous:</u>	<u>1.18%</u>
	100.00%



Recommended Repairs & Improvements split into Disciplines

3. DESCRIPTION OF THE STRUCTURE



The Crown Street Garage is a seven level precast concrete structure located on the northeast corner of Crown and College Streets. It is a self-park facility having a capacity of approximately 720 vehicles and serves retail, office, and theaters in the area. Commercial space and travel lanes occupy the majority of the facility's ground level; the commercial space has recently become vacated and requires renovation, including abatement of hazardous building materials, however the treatment of the commercial space is not part of the scope of services for this appraisal report.

The garage is rectangular in plan (127 ft. wide x 279 ft. long) and has an attached helical exit ramp located at the northeast corner of the facility (*ref. Isometric*). A helical entrance ramp is interwoven with the exit ramp to the facility's first level. The rectangular portion of the garage is divided into two 63 feet wide bays. The northern parking bay has a 5.43% slope and the south bay is essentially flat with minimum drainage slopes to the facility's center column line deck drainage.

Vehicle access to the facility's upper parking level is provided by traversing each level in a clockwise direction (one-way). To exit the facility from the garage's second level through the roof, patrons utilize a dedicated helical ramp via a ramp connector provided at each garage level.

The deck's structural frame consists of pre-cast concrete columns spaced at 9 foot centers along column lines "D" & "G" and pre-cast concrete tree (cruciform) columns spaced at 18 foot centers along column line "A". The facility's floor system is comprised of pre-cast concrete single tees with a 3 to 4 inch non-structural concrete topping. The tees are 9 foot wide and 3 foot deep spanning approximately 63'-0" between supports.

The garage's helical ramp construction is conventionally reinforced cast-in-place concrete (**Photo #1**). The ramp's slabs (entry and exit ramps) cantilever out from an interior concrete ring approximately 15'-0" and the ramp's slab thickness tapers from 11 ½" to 6" thick (from inner ring to outboard end). Cast-in-place concrete parapet walls exist on both the inside and outside circumference of the helical ramps.



Photo #1

Expansion joints are provided between column lines 16 and 17, in the parking deck, and at the interface between the parking deck and the helical ramps.

This facility has had a series of repairs implemented historically to help to assure the continued safe usage of the facility, but much work remains:

1998: Approximately \$1,000,000 was spent on structural improvements to the Crown Street Garage.

The facility's seven-story exit silo was repaired in its entirety. Now only minor repairs are required to correct overhead concrete spalling, weathered concrete curbing on the roof level and to remove metal shoring brackets left in place by the previous contractor. Part of repairs performed was the installation of a protected waterproofing membrane (**Photo #2**); this installation continues to perform in acceptable condition.

The scope of work performed included, but was not limited to, concrete repairs to the spiral exit ramp concrete overlay, repair to the roof level concrete topping, and miscellaneous concrete topping repair on the lower levels of the facility. Waterproofing work performed at this time included miscellaneous crack and control/construction joint detailing, and waterproofing strip membrane installation above tee joints located between individual pre-cast concrete tees on the facility's first supported level (i.e., areas above commercial spaces).

Other work included ADA improvements (i.e., handicap ramps to elevator lobbies) (**Photo #3**) and drainage modifications. Handicapped access modifications were made to all levels of the garage to provide suitable access to the facility's elevators on the east and west ends of the garage.



Photo #2



Photo #3



Photo #4

2001: New high-pressure sodium (HPS) lighting was installed in the facility, along with new surface-mounted electrical conduit.

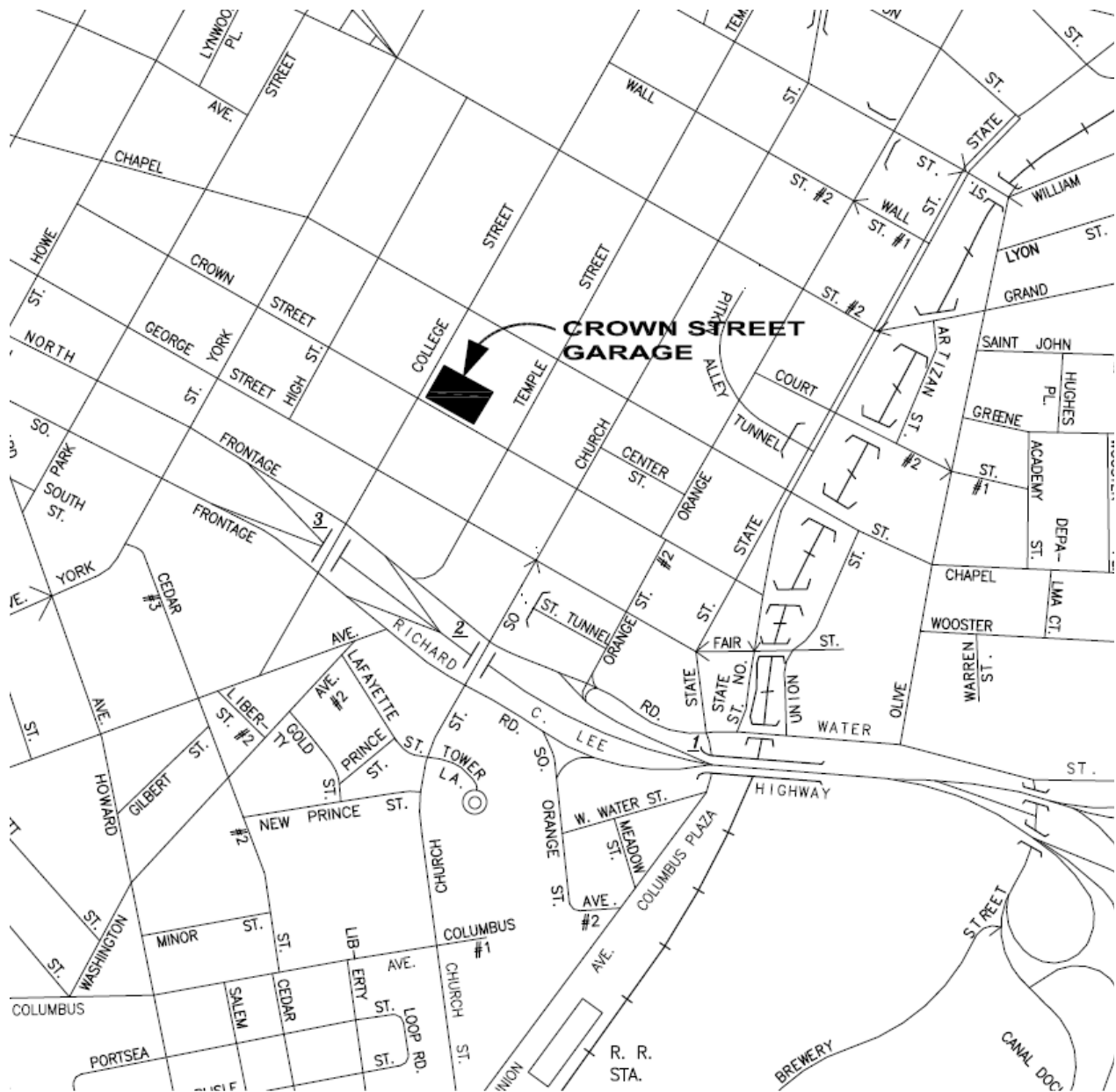
The New Haven Parking Authority also installed entirely new revenue control system and lane control equipment (i.e. ticket machines, traffic gates, card readers, loop detectors, cashiering equipment, etc.).

2008: Repairs were implemented to address the five (5) remaining expansion joints of this facility's thirteen (13) expansion joints (**Photo #4**). The repairs implemented were similar to the repairs performed historically, although some minor changes were made to coordinate this work with the future repairs envisioned along the centerline of the garage. Part of this year's scheduled repair work is simply to closely inspect all interior and exterior concrete surfaces for delaminated concrete and to remove the deteriorated concrete in a safe and controlled fashion.

2013 A comprehensive repair program included, but was not limited to, concrete repair, waterproofing repairs, expansion joint repair, lighting replacement and improvements, miscellaneous electrical repairs, plumbing repairs and improvements, stair railing replacement, office and bathroom renovations, miscellaneous painting, installation of new wayfinding signage and other incidental work.

2014 New light fixtures were installed along Crown Street, along with a lighting control panel and related incidental electrical work.

2015 The three pre-existing elevators were modernized, as well as an additional fourth elevator installed.



Site Plan



Structural Data

Crown Street Parking Garage New Haven, Connecticut

Legend: Square Feet SF
 Pounds per Square Inch PSI
 Pounds per Square Foot PSF

Date of Completion: 1971
Age of Structure: 49 Years

Plan Dimension:

- Parking Deck 127 FT x 279 FT
- Helical Ramp
 - Inside Diameter 62 FT
 - Outside Diameter 87 FT

Floor Area:

- Slab-on-Grade 21,000 SF
- Parking Deck 234,000 SF
- Helical Ramp 25,000 SF
- Total 280,000 SF

Parking Capacity: 720 Vehicles
Parking Efficiency: 388 SF/ Vehicles

Note: All values listed above are approximations of actual values

Structural System:

- Pre-cast concrete columns
- Pre-cast concrete single tees with a 3" to 4" concrete topping
- Pre-cast tees are 9' wide and 3' deep, spanning approximately 63'-0" between supports
- Helical ramps are conventionally reinforced cast-in-place concrete with slabs which taper from 11 ½" to 6" thick

Design Loads:

- Parking Deck Slab 80 PSF
- Beams & Columns (1st & Roof Level) 75 PSF
- Beams & Columns (2nd, 3rd, 4th, 5th & 6th Level) 50 PSF
- Helical Ramp Slab 75 PSF
- Helical Ramp Girders 50 PSF



Material Strengths:

▪ Pre-cast Concrete	$f_c' = \text{Unknown}$
▪ Concrete Topping	$f_c' = 3,000 \text{ PSI}$
▪ Concrete Parapet Walls	$f_c' = 4,000 \text{ PSI}$
▪ Helical Ramp Girders & Slabs	$f_c' = 5,000 \text{ PSI}$
▪ Pre-stressing Steel	$f_{pu} = \text{Unknown}$
▪ Reinforcing Steel	$f_y = 60,000 \text{ PSI}$



4. VISUAL OBSERVATIONS & REPAIR RECOMMENDATIONS

A visual examination of the facility's structural, mechanical, and electrical components was performed as part of Desman Associates' review of the Crown Street Parking Garage this year.

CONCRETE REPAIR:

Miscellaneous Concrete Topping Repair: Upon completion of the 2013 comprehensive capital project, including the installation of a topically applied corrosion inhibitor to this facility's supported concrete decks, concrete deterioration has reached an extent now worth considering for a repair project. Although not as significant as the project completed in 2013, the condition should be regularly monitored and addressed as required (**Photo #5**). Certain work is currently scheduled to be performed as part of NHPA Project No. 17-006, currently in design. In addition, an extensive amount of deterioration has become further evident on the roof level since; DESMAN recommends that this additional square footage of topping repair be programmed accordingly.

Miscellaneous Vertical & Overhead Concrete Repair: In conjunction with the repair program recommended above, DESMAN suggests that a nominal amount of vertical and overhead concrete repair be anticipated as well and addressed accordingly.

However, the top surfaces of the columns, the portions that protrude from the roof level and are most exposed to the elements, exhibit more significant wear-and-tear such as exposed aggregate and cracking (**Photos #6 & #7**). DESMAN recommends that these column portions be repaired as needed, either with a polymer-modified repair mortar or epoxy injected, as well as coated with a waterproofing material.

This work is currently scheduled to be performed as part of NHPA Project No. 17-006, currently in design.



Photo #5



Photo #6



Photo #7



Photo #8



Photo #9



Photo #10



Photo #11



Photo #12

In addition, specific deterioration has become evident at the concrete wall facing the Shubert Theater, at the exit to College Street (**Photo #8**); DESMAN recommends that this deterioration be repaired accordingly.

Miscellaneous Concrete Curb Repair: Placement of new curbing along the column lines "D" and "G" was addressed as part of the 2013 comprehensive capital project; the installation of the new concrete curbing was also coordinated with the modifications to the centerline vehicle guardrail located along both sides of column line "D" (**Photo #9**). Miscellaneous curbing repair was also performed as part of this same project, addressing the majority of deterioration to date, as well as miscellaneous repair as part of NHPA Project No. 17-006.

However, the curbing throughout the silo appears to have experienced an increase in deterioration recently, likely due to the joint opening, at these locations, in the silo parapets (**Photo #10**). The joint openings present a challenge due to the movement in the parapets but the curb/beam element around the perimeter of the silo being a fixed element. DESMAN recommends that the curbing be repaired as required and coated with a waterproofing material accordingly. This work is currently scheduled to be performed as part of NHPA Project No. 17-006, currently in design.

In addition, DESMAN has observed water and debris collecting behind the wheelstop, specifically on the roof level; wheeps through the wheelstops have deteriorated and/or clogged and no longer serve their purpose (**Photo #11**). DESMAN recommends that the void space behind the wheelstops, on the roof level, be filled with concrete, sloping the surface for positive drainage. This work, as well, is currently scheduled to be performed as part of NHPA Project No. 17-006, currently in design.

Concrete Scaling Repair: In conjunction with the repair program recommended above, DESMAN suggests that scaling repair be anticipated as well and addressed accordingly. DESMAN recommends that an epoxy-based healer/sealer system may be more appropriate to accommodate shallow cracking in lieu of more extensive demolition and concrete repair that may not be as durable due to its shallow nature. This work is currently scheduled to be performed as part of NHPA Project No. 17-006, currently in design.



Photo #13

Sidewalk Repairs: the sidewalks surrounding the garage on Crown Street and College Street are exhibiting various stages of deterioration (**Photo #12 & #13**). DESMAN recommends that a comprehensive replacement be planned for the sidewalks accordingly.

WATERPROOFING REPAIRS:

Miscellaneous Expansion Joint Repair: New expansion joint glands were installed in selected locations in 2008, and the remaining joints were repaired as part of the 2013 capital repair project (**Photo #14 & #15**). Although visual examination of the expansion joint seals and expansion joint nosings indicates a variety of conditions, some being in good condition while others are exhibiting wear-and-tear, Desman recommends that the joint glands be monitored and considered for miscellaneous repair, if not full replacement, in conjunction with the anticipated imminent waterproofing repairs recommended; a comprehensive approach would result in a uniformly aged expansion joint system throughout the garage in lieu of multiple warranties and gland systems. This work is currently scheduled to be performed as part of NHPA Project No. 17-006, currently in design.

DESMAN reiterates that expansion joint glands are adversely impacted by accumulated sand and debris within the joint; sand, grit and debris which is not being swept clear periodically will cause premature deterioration/failure of the joint. As vehicles traverse the joints, accumulated material is ground into the rubber expansion joint glands wearing them prematurely. The accumulated debris also restricts the elongation and compression of the joint material also causing premature wear.

Topically Applied Corrosion Inhibitor: A corrosion inhibitor was applied on all areas of the facility's supported concrete deck as part of the 2013 comprehensive capital repair project. Because these materials are unable to bridge cracks in concrete, similar to the inability of penetrating sealers to bridge cracks, the application of corrosion inhibitors was done in conjunction with a program of crack and control/construction joint repair and in some cases combined with the application of an elastomeric traffic bearing waterproofing membrane in certain areas. Considering the duration of the warranty, re-application of the inhibitor is not anticipated until at least 2023; DESMAN recommends that corrosion levels be monitored accordingly.



Photo #14



Photo #15



Photo #16





Photo #17



Photo #18



Photo #19

Lower Level Traffic Bearing Waterproofing Membrane

Repair/Installation: A full elastomeric traffic bearing waterproofing membrane system was installed on the first supported level of the garage, specifically the portion located above the facility's commercial space (**Photos #16 & #17**); previously, only the caulked joints had been protected by the application of 2-foot wide strips of membrane along the length of the individual tee joints. DESMAN recommends that the membrane be monitored and repaired as required.

Traffic bearing membranes are approximately 85%-90% effective as moisture and chloride screens inhibiting future chloride-ion migration into the deck; an elastomeric membrane will also traverse cracks that may form and joints that may be tooled. However, upon completion of the membrane installation, DESMAN suggests developing a yearly service contract with a qualified waterproofing contractor to assure that damaged portions of the membrane are successfully repaired each spring and autumn. It is important that all damage to waterproofing membranes be repaired, as continued and progressive de-bonding of the membrane will result if left unattended.

Cracks Repair, Control/Construction Joint Repair, & Cove Joint

Installation/Repair: Although a miscellaneous amount of crack and joint repair was addressed as part of the (2013) repair program, additional repairs should be anticipated in the future due to sealant deterioration associated with normal wear and tear. This work is currently scheduled to be performed as part of NHPA Project No. 17-006, currently in design.



Photo #20



Photo #21



Photo #22

Roofing Repairs at Stairs and Elevator Cores: The facility's roofing materials were replaced (**Photos #18 & #19**) as part of the 2013 comprehensive capital repair project; an elastomeric membrane was installed on both tower roofs. DESMAN recommends that the membrane be monitored and repaired as required.

Flashing along the Center-line (Column-line D) and related flashing: Although new curbing was installed along column-line D which is intended to eliminate extensive areas of standing water throughout the garage, redirecting surface run-off into preexisting drains, the slopes of the parking decks are such that a significant opening is provided between the roof level and the immediate level below that allows rain water to intrude onto the lower levels (**Photo #20**).

DESMAN recommends that an aluminum storefront system be installed within this opening to prevent and/or minimize the water intrusion. This work is currently scheduled to be performed as part of NHPA Project No. 17-006, currently in design.

Waterproofing Coating on Interior of Silo: Shallow steel placement and exposure to weather conditions have provided opportunity for moisture contamination and subsequent unsightly corrosion (**Photo #21**). Although the silo surface has not experienced extensive delamination and the surfaces appear intact (significant spalling not yet observed), DESMAN recommends that the surfaces be protected with a waterproofing coating so as to minimize further moisture contamination. This work is currently scheduled to be performed as part of NHPA Project No. 17-006, currently in design.

Asphaltic/Protected Membrane System on Silo Ramp Surface: an asphaltic/protected membrane system was installed throughout the Exit Silo approximately 20 years ago (circa 1999). Although generally performing well, miscellaneous deterioration is observed throughout requiring repair to the asphalt (**Photo #22**). DESMAN recommends that these repairs be addressed before damage can be had to the membrane below. This work is currently scheduled to be performed as part of NHPA Project No. 17-006, currently in design.

ARCHITECTURAL ENHANCEMENTS:

Exterior Pedestrian Corridor and Entrance Enhancement at the Crown Street Stair/Elevator Tower:

DESMAN recommends that the pedestrian corridor leading to the stair and elevators on Crown Street be enhanced (**Photo #23**); the close proximity of the adjacent property has provided a challenge to separate this space and make it unique and welcoming. In conjunction with the installation of decorative accent lighting, the existing concrete may be removed and/or resurfaced with a decorative stamped/stenciled concrete, providing an aesthetically enhanced pathway highlighting the route to the stair and elevators.

Additional enhancements could include cladding the stair/elevator tower with an accent material to separate and highlight it from the garage, as well as incorporating an architectural element/plane to direct patrons to the circulation, such as painted metal or wood lattice with additional accent lighting. (various concepts as follows)

DESMAN understands that this work would be subject to funding, and so DESMAN recommends that NHPA program this work accordingly.

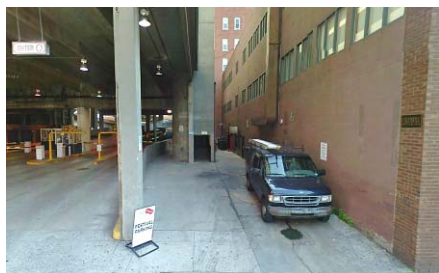


Photo #23



Photo #24



Garage Entrance (from Crown Street) Enhancements:

The façade of the Crown Street Garage along Crown Street has become aged (**Photo #24**). Although architecturally unique, the recent and ongoing development in the immediate area continues to provide a challenge for the garage to stay current.



Photo #25



Photo #26



Photo #27

Recently, with NHPA's re-branding efforts fully underway, additional opportunities have developed that could assist in revitalizing the garage. Enhancements, such as the installation of signage, color-changing accent lighting, relocating column wraps, as well as providing a polycarbonate paneling system that could wrap the jamb and head conditions at the column bays, could assist in transforming the garage (various concepts as follows).

DESMAN understands that this work would be subject to funding, and so DESMAN recommends that NHPA program this work accordingly.



Lobby Enhancements at the College Street Stair/Elevator Tower:

As an effort to enhance the lobby at the College Street stair/elevator tower, a major contributing factor to the pedestrian experience at the garage due to the adjacent Shubert Theater, an enhancement project was undertaken consisting of accenting the rear wall of the lobby with an architectural signage box (i.e. entertainment theme) along with installation of an illuminated ceiling element, and painting the walls with theater-themed coloring (**Photo #25**).

In addition to the architectural enhancements, a storefront system was incorporated to provide a protective vestibule (from the weather) for the elevators [due to the modernization work competed in 2015] (**Photo #26**).

Due to the valuable aesthetic experience now provided by this lobby, DESMAN recommends that the various materials be monitored and repaired or touched-up as required (i.e. the vibrant colors now provided by the walls (**Photo #27**) will inevitably fade over time, and thus should be re-coated upon exhibiting wear).



Garage Entrance (from College Street) Enhancements:

The entrance and façade of the Crown Street Garage along College Street has become aged (**Photo #28**). Although architecturally unique, the recent and ongoing development in the immediate area continues to provide a challenge for the garage to stay current.

Recently, with NHPA's re-branding efforts fully underway, in conjunction with the adjacent Shubert Theater, additional opportunities have developed that could assist in revitalizing the garage. Unlike the entrance on Crown Street, the College Street façade includes the stair/elevator tower which results in an interruption to the façade, thus providing a more immediate opportunity to create an updated impact on the surrounding environment. Enhancements, such as accenting the concrete form to compliment and contrast with the lobby, providing accent cove lighting protruding from the concrete form, as well as providing a band of planters on the façade over the vehicular entrance to soften the face, could assist in transforming the garage (various concepts as follows).

DESMAN understands that this work would be subject to funding, and so DESMAN recommends that NHPA program this work accordingly.



Photo #28



Typical Stair/Elevator Lobby Enhancements (Crown Street Stair/Elevator Tower):

The interior lobbies of the stair/elevator tower on College Street provide opportunities for significant enhancements (**Photo #29**); the solid rear wall has provided a challenge to make this space unique and welcoming. In conjunction with the recent color-coding of the levels [completed as part of the recent comprehensive repair program (2013)], enhancements could include accenting the rear



Photo #29



Photo #30

wall with a mural, mosaic, or wall panel system washed by accent cove lighting, coordinating the major colors and/or themes with the level identification colors, resurfacing the lobby floors with stamped/stenciled concrete or other long-term durable material (various concepts as follows).

DESMAN understands that this work would be subject to funding, and so DESMAN recommends that NHPA program this work accordingly.



Storage Privacy: When new handrails & guardrails were installed in the stairs in 2014, the guardrail system was extended to the ground level, providing a storage area below the lowest landing. Due to the open mesh placed within the adjacent windows, however, PNH cannot maintain privacy for this area without placing some sort of covering (**Photo #30**); PNH has therefore requested that some form of permanent barrier be placed, such as colored plexiglass or similar material for privacy.

ELECTRICAL WORK:

Replacement of all Garage Lighting: The garage lighting was replaced as part of the 2013 comprehensive capital repair project. Work included the stairwell fixtures, as well as the roof level poles/fixtures and helical ramp fixtures (**Photos #31, #32 & #33**).

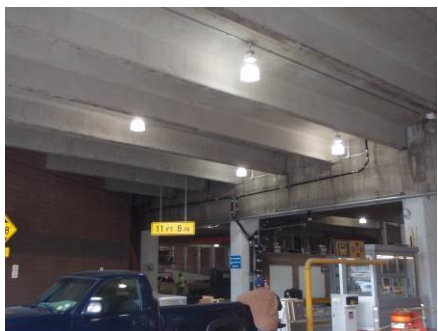


Photo #31



Photo #32

The existing metal halide fixtures were installed in 2013. Lighting technology continues to improve and thus options for improvements should continually be reviewed and considered. There are 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, LED lighting should be considered for use when the existing garage fixtures near the end of their useful life. LED garage



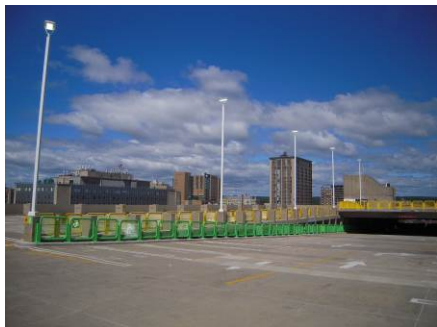


Photo #33

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. 19-006 now in design.

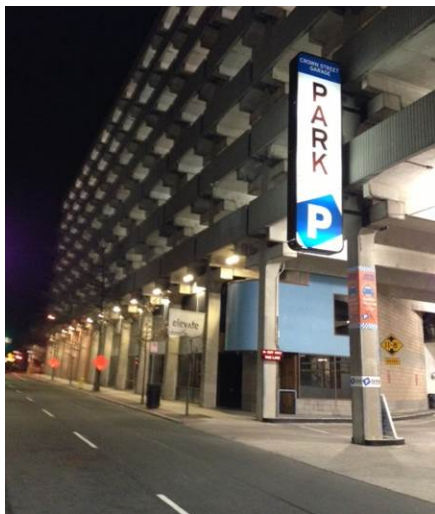


Photo #34

In conjunction with the monitoring of the lighting throughout the interior of the garage, review of the light fixtures along the sidewalk should be performed as well and monitored as required. Although the City of New Haven is typically responsible for maintaining and addressing concerns regarding the surrounding sidewalks, NHPA addressed certain minimal improvements to enhance the lighting along the sidewalk and limited to within the garage footprint (**Photo #34**).

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 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, as part of NHPA Project No. 19-006 now in design.

Emergency Lighting Maintenance: All of the emergency lighting units evaluated were replaced as part of the 2013 comprehensive capital repair project.



Ordinarily the ongoing maintenance of a facility's emergency lighting is not an item typically carried within a capital improvement program. These systems are life safety items which should be reviewed periodically by maintenance staff and repaired as necessary. It is duly noted however that these items do have a finite life expectancy and periodic replacement is required and as such it is sometimes necessary to carry a replacement cost estimate within capital repair and replacement budgets.

Standardize Emergency Exit Signage w/ Outdoor LED Units: The removal and replacement of all preexisting emergency exit signage with LED units suitable for exterior use was performed as part of the 2013 comprehensive capital repair project.

Ordinarily the ongoing maintenance of a facility's emergency exit signage is not an item typically carried within a capital improvement program. These signs are life safety items which should be reviewed periodically by maintenance staff and repaired as necessary. It is duly noted however that these items do have a finite life expectancy and periodic replacement is required and as such it is sometimes necessary to carry a replacement cost estimate within capital repair and replacement budgets.



Photo #35



Photo #36

Emergency Generator: The Crown Street Garage currently does not have an emergency generator, and therefore NHPA has questioned the feasibility and practicality of installing a generator. Since the load requirements are currently unknown and thus the size of the generator and subsequent cost of installation cannot yet be determined, DESMAN recommends that a study be performed first to determine the specification requirements of the generator, currently being performed as part of NHPA Project No. 17-006, followed by subsequent installation, programmed as required.

Miscellaneous Electrical Repairs: Although the recent 2013 comprehensive capital repair project included extensive electrical improvements, certain miscellaneous "clean-up" will remain due to a history of materials installed at various times but now abandoned, as well as organization of new materials in a more efficient manner, such as provision of new 120V branch circuits to the stairwells as well as replacement of the feeder and associated unused taps in the stair risers (**Photos #36**). All electrical equipment, including fixtures,

conduit, boxes, panelboards, transformers, etc. will continue to be monitored for physical evidence of corrosion or other deterioration. This work is currently scheduled to be performed as part of NHPA Project No. 19-006, currently in design.

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 #37



Photo #38



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 Crown Street Garage has a surge protection device on the main electrical service (**Photo #37**). There is also some protection at a few specific pieces of equipment but more comprehensive coverage could certainly be considered. This work is currently scheduled to be performed as part of NHPA Project No. 19-006, currently in design.



Photo #39

Telephone Block Clean-up: Over time, various modifications have resulted in a web of cabling that is unsightly as well as simply difficult to manage (**Photo #38**). DESMAN therefore recommends that PNH consider testing the cables to confirm activity with subsequent coordination with the phone company along with replacement with shorter lines, proper support and a new block. This work is currently scheduled to be performed as part of NHPA Project No. 19-006, currently in design.

Area Sustainability Enhancements: in the pursuit of sustainability opportunities, charter bus power stations, electric vehicle charging stations, and trash compactor electrical service will be installed in the garage and adjacent streets. These improvements are part of NHPA Project #16-033, currently in design.

PLUMBING AND MECHANICAL REPAIRS & IMPROVEMENTS:

Trench Drain and Storm Drainage Piping Repair: Cleaning of floor drains and trench drains were performed as part of the 2013 comprehensive capital repair program, as well as the installation of a new sand/oil interceptor (to accommodate the separation of the storm and sanitary systems); at the time, all damaged, excessively corroded and/or missing drain gratings were replaced, all of the facility's broken or corroded pipe hangers were repaired or replaced, all broken or leaking pipe and associated pipe fittings were repaired (**Photo #39**).

However, miscellaneous damaged drains and piping should be repaired and/or replaced as required, and Desman recommends that NHPA budget accordingly. Certain miscellaneous work is currently scheduled to be performed as part of NHPA Project No. 17-006, currently in design.

Fire Standpipe Repair: The facility's fire standpipe system has been replaced as part of the 2013 comprehensive capital repair program (**Photo #40**).



Photo #40

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



Photo #41



Photo #42



Photo #43

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 costs associated with periodic inspection work is considered as being an operational cost and has not been included within our estimated repair and preventative maintenance costs.

Supplemental Drains & Associated Supplemental Drain Piping: Areas of localized ponding were addressed as part of the 2013 comprehensive capital repair program by installing concrete curbing along the centerline of the garage on all levels of the facility, and the installation of additional supplemental drains and associated piping which in turn were connected to new drainage system risers(**Photo #41**).

Pressurized Garage Wash-Down System: A pressurized garage wash-down system has been installed at the Crown Street Garage as part of the 2013 comprehensive capital repair program (**Photo #42**). NHPA's utilization of the high pressure wash-down systems in its other garages has been beneficial in reducing the extent of concrete deck deterioration and the cost of periodic concrete repairs needing to be performed. The facility's wash-down system has been designed to provide a sufficient volume of water at high pressure to assist in cleaning the concrete decks and remove accumulated road salt (chloride) on their surface, thus greatly reducing the amount of structural deterioration taking place over time.

It is highly recommended that parking facilities be washed down quarterly or as a minimum 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.





Photo #44



Photo #45



Photo #46

Cleaning Floor Drains: Accumulation of sand and debris noted in and around drains, or deposited in unused corners of the parking garage was removed as part of the 2013 comprehensive capital repair program.

While it is noted that garage repairs typically include the cleaning of floor drains and associated drainage prior to starting repairs and upon completion of the work, the costs associated with the flushing of a garage's drainage system are typically considered an operational cost. In combination with periodic garage wash down, it is imperative that the facility's drainage system be kept clean and operational, including the new sand/oil separator installed in 2013.

Any drainage system within a parking facility should be flushed and tested annually to prevent debris collection and checked for system leaks.

Ductwork serving the Tenant Space: An existing full-height ductwork system (**Photos #43 & #44**) currently runs from the roof down to a unit behind the tenant space which has now become vacated. DESMAN recommends that this system be removed and a new system installed as may be needed when the tenant space is re-fitted out.

Mechanical Preventative Maintenance: Desman recommends the periodic maintenance and repair of various components of the buildings mechanical systems; the costs are considered operational costs and are therefore not included as separate and distinct items within our projected repair and preventive maintenance costs. Periodic maintenance and service of the mechanical systems should be in accordance with the O&M requirements for the individual systems and include but are not limited to the following:

- Office HVAC Equipment including Split System Air Conditioning and Toilet Exhaust Fans
- Electrical Room Ventilating Equipment & Temperature Controls
- Elevator Machine Room HVAC Equipment (**Photo #45**)





Photo #47

- Facility Washdown System
- Collection Booth HVAC Systems
- Sump Pump

SECURITY ENHANCEMENTS:

NHPA has requested that DESMAN review the opportunities for enhancing security at the Crown Street Garage, including opportunities for video surveillance, access control and audio communication systems; improvements may include a control room and may be coordinated with other facilities. DESMAN has recommended that a study be performed first to review NHPA's needs and subsequently to provide appropriate recommendations; design and installation of the security system would follow and be programmed for implementation accordingly. A draft report of the study for NHPA Project No. 15-002 was presented for consideration.

Desman understands that this work would be subject to funding, and so Desman recommends that NHPA program this work accordingly.

ELEVATOR UPGRADES AND IMPROVEMENTS:

Modernization of Elevator Nos. 1, 2 & 3 was completed in 2015. New controls, hoist-way motors, machine room wiring, switch assemblies, governors with position sensing encoders, new door packages and elevator interior renovations (**Photo #46**), among other improvements, were required in each of the three elevators, as well as the installation of new electronic elevator controls and improvements to the elevator machine room HVAC, inclusive of the installation of an air conditioning system and supplemental heating. To enhance the entrance lobbies, modernization of the elevators also included the replacement of all elevator doors and door frames at the west end and east end elevators on all levels.

A new elevator No. 4 was also installed in the blanked out hoist-way (**Photo #47**) which is located on the east end of the facility, in order to provide additional elevator service to this busy garage.

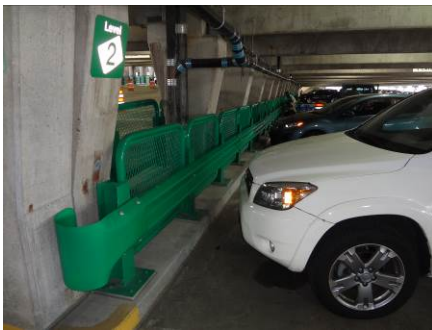


Photo #48



Photo #49



Photo #50



Photo #51

In order to assist PNH in the ongoing execution of its Maintenance Agreement with Schindler Elevator Corp., DESMAN recommended that PNH program the services of DESMAN and its elevator sub-consultant, Sterling Elevator Consultants, to oversee an elevator maintenance audit on a regular basis.

MISCELLANEOUS PAINTING:

Miscellaneous Metal Surfaces: Due to age and wear, DESMAN recommends that the guardrail systems and handrails throughout the garage be programmed for full re-painting; a warranty should be in place for the coating system, so DESMAN recommends that PNH coordinate with the fabricator and coating manufacturer accordingly (**Photos #48, #49 & #50**). Upon re-painting, DESMAN also recommends that all anchors be cold-galvanized as well (**Photo #51**). When the painting work is programmed, DESMAN also recommends that all corbel/bearing pads be cold-galvanized as well (**Photo #52**).

Miscellaneous Concrete & Masonry Surfaces: Upon completion of the repairs performed in 2013, there will only be a nominal amount of painting work that will need to be done in the near future.

Parking Stall & Lane Striping: The parking facility was re-striped in 2013. As with any parking facility, periodic re-striping will be required, the cost of this periodic re-striping has been included within our projected repair costs for this facility.

SIGNAGE IMPROVEMENTS:

This facility's interior and exterior signage was replaced as part of the 2013 comprehensive capital repair program (**Photos #53, #54, #55 & #56**).

This work was coordinated with the aesthetic improvements to the facility, inclusive of guardrail coatings, to provide an improved graphic representation and coloring of individual parking levels.

The exterior identification signage was also renovated (**Photo #57**). In conjunction with NHPA's current re-branding program, the signage was refurbished and updated with new sign box materials and new graphic faces to be more in keeping with NHPA's new logo and graphic standards.



Photo #52



Photo #53



Photo #54





Photo #55

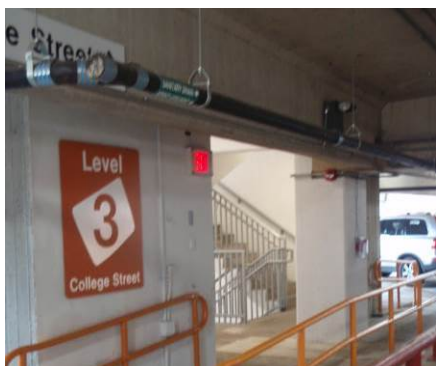


Photo #56



Photo #57

With new development occurring within downtown New Haven, conditions sometimes change where additional signage may be required to address changes in patron usage, or because of new building construction in close proximity to a facility, all of which may dictate the need for additional signage or updating of the older previously installed signage. Costs associated with these changes and for periodic repairs to facility signage are included within the projected five year construction costs.

Although new illuminated sign boxes were installed in 2013, improved LED technology now exists that would provide a more appropriate illuminated box suitable for the exterior glare that causes the illuminated sign boxes to be difficult to see (**Photos #58 & #59**). This work is currently scheduled to be performed as part of NHPA Project No. 19-006, currently in design.

REVENUE CONTROL EQUIPMENT REPLACEMENT:

The existing revenue control and parking access equipment was replaced in 2013. However, due to new and improved technology, DESMAN recommends that PNH review the current system for potential enhancements and/or replacement, and plan accordingly.

MISCELLANEOUS CONSIDERATIONS:

Garage Cleaning: A comprehensive cleaning and degreasing of the entire facility (interior and exterior surfaces) was performed as part of the 2013 comprehensive capital repair program.

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** has regularly observed excessive amounts of ice-melt materials being used. **DESMAN** does understand that winters in New England can be challenging, however we caution any operator to take care when using ice-melt materials in excess. The large size of the aggregate (being driven over and walked upon) in combination with the chemical-makeup of the particles, can be harmful to the concrete structure and metal components of the garage.



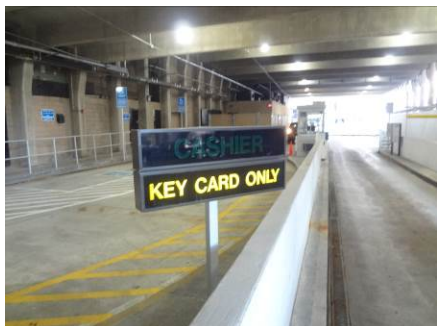


Photo #58

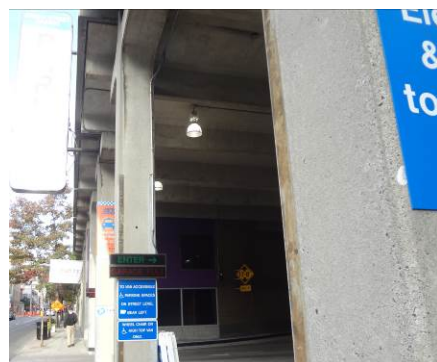


Photo #59



Photo #60



Photo #61

DESMAN notes that chloride-based ice-melt products can be specifically 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 (**Photos#60, 61 & 62**). For that purpose, **DESMAN** has included a sample "Seasonal Washdown Checklist" that can be used to track each scheduled washdown.

Misc. Door Repair/Maintenance: Although the majority of doors (those being located at the stairs) have previously been removed, there do remain various miscellaneous doors still in place, such as those located at the parking office, machine rooms, and the stair towers at the roof level; all doors were either repaired or replaced as part of the 2013 comprehensive capital repair program.



Photo #62

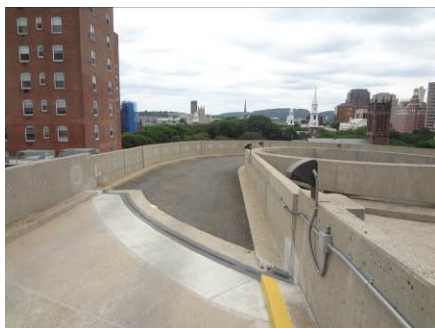


Photo #63

DESMAN anticipates that there will remain a need to periodically repair damaged doors and door hardware. It is DESMAN's opinion that door repair is in reality an operating expense and doors and associated door hardware should be replaced on an as needed basis.

Lighting Maintenance: NHPA should implement a planned lighting maintenance schedule for the facility's lighting; whereby lamps and ballasts are replaced throughout the facility (**Photo #63**) at the same time in lieu of the current practice of intermittent replacement on an as needed basis.

No doubt there is a need to periodically replace a limited number of lamps or individual ballasts due to premature failure, but programmed replacement is typically more cost effective, and is the industry standard.

UPDATING OF RECORD DOCUMENTS:

Given 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.

This work is currently being performed as part of NHPA Project No. 16-007.

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 Crown Street 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- 2025)

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

RECOMMENDED REPAIR PROGRAM	ESTIMATED CONSTRUCTION COST
Prioritized Repairs (FY 2021)	\$0.00
Early Repairs (FY 2022)	\$1,248,450.00
Programmed Repairs (FY 2023)	\$674,250.00
Long-Term Repairs (FY 2024 – 2025)	\$532,150.00
TOTAL ESTIMATED COST	\$2,454,850.00

A detailed cost estimate is provided in the table on the following page, entitled "Projected 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.



Table 1
Crown Street Parking Garage
Projected Five Year Construction Cost
(FY 2020)

Work Description		Prioritized Repairs (FY 2021)	Early Repairs (FY 2022)	Programmed Repairs (FY 2023)	Long-Term Repairs (FY 2024 - 2025)
A. Concrete Deck/Ramp Repair:					
1	Miscellaneous Concrete Topping Repair	\$ -	\$ -	\$ 4,000.00	\$ 4,000.00
2	Miscellaneous Overhead Concrete Repair (Silo)	\$ -	\$ -	\$ 2,000.00	\$ 2,000.00
3	Miscellaneous Vertical Concrete Repair (Silo Parapets)	\$ -	\$ -	\$ 1,000.00	\$ 1,000.00
4	Miscellaneous Overhead Concrete Repair (Garage)	\$ -	\$ -	\$ 1,000.00	\$ 1,000.00
5	Miscellaneous Vertical Concrete Repair (Garage)	\$ -	\$ -	\$ 3,000.00	\$ 3,000.00
6	Miscellaneous Concrete Curb Repair (garage proper) (including behind roof wheelstops)	\$ -	\$ -	\$ 1,000.00	\$ 1,000.00
7	Miscellaneous Concrete Curb Repair (silo)	\$ -	\$ -	\$ 3,000.00	\$ 3,000.00
8	Concrete Scaling Repair/Application of Healer/Sealer	\$ -	\$ -	\$ 1,000.00	\$ 1,000.00
9	Miscellaneous Vertical Concrete Repair (Exterior of Silo Center)	\$ -	\$ -	\$ 5,000.00	\$ 5,000.00
10	Sidewalk Repairs and Replacement	\$ -	\$ 111,000.00	\$ -	\$ -
B. Waterproofing Issues:					
1	Programed Expansion Joint Repair/Replacement	\$ -	\$ -	\$ -	\$ -
2	Misc. Cracks Repair	\$ -	\$ -	\$ 1,000.00	\$ 1,000.00
3	Misc. Control/Construction Joint Repair	\$ -	\$ -	\$ 1,000.00	\$ 1,000.00
4	Misc. Cove Joint Repair	\$ -	\$ -	\$ 2,000.00	\$ 2,000.00
5	Flashing along Center-line (column-line D) and related flashing	\$ -	\$ -	\$ -	\$ -
6	Coating throughout Silo Center	\$ -	\$ -	\$ -	\$ -
7	Study for Silo Enclosure/Protection/Ice-Melt Options	\$ -	\$ -	\$ -	\$ -
8	Repair to Asphaltic/Protected Membrane System	\$ -	\$ -	\$ -	\$ -
C. Architectural Enhancements:					
1	Exterior Pedestrian Corridor and Entrance Enhancement at the Crown Street Stair/Elevator Tower	\$ -	\$ 191,000.00	\$ -	\$ -
2	Garage Entrance (from Crown Street) Enhancements	\$ -	\$ -	\$ 200,000.00	\$ -
3	Garage Entrance (from College Street) Enhancements	\$ -	\$ -	\$ 200,000.00	\$ -
4	Typical Stair/Elevator Lobby Enhancements (Crown Street Stair/Elevator Tower) (including refreshment of College St Lobby, Ground Level)	\$ -	\$ 317,000.00	\$ -	\$ -
5	Installation of Colored Plexiglass/Crown Street Stair, Ground Level	\$ -	\$ 4,000.00	\$ -	\$ -
D. Mechanical & Electrical Work:					
1	Cleaning Floor Drains (w/ Construction)	\$ -	\$ -	\$ -	\$ 14,000.00
2	Cleaning of Sand/Oil Separator	\$ -	\$ -	\$ -	\$ 3,000.00
3	Surge Protection	\$ -	\$ -	\$ -	\$ -
4	Installation of New Illuminated Signage	\$ -	\$ -	\$ -	\$ -
5	Telephone Block Maintenance/Improvements	\$ -	\$ -	\$ -	\$ -
6	Lighting/Signage Control System Programming & Adjustments with Related Training	\$ -	\$ -	\$ -	\$ -
7	Replacement/Installation of New LED Light Fixtures	\$ -	\$ -	\$ -	\$ -
F. Elevator Upgrades and Improvements:					
	Maintenance Audit (Bi-Ennial)	\$ -	\$ 3,000.00	\$ -	\$ 3,000.00
E. Security Improvements					
	Installation of Security System (i.e. Callbox System, Cameras, and other components)	\$ -	\$ -	\$ -	\$ -
F. Miscellaneous Painting:					
1	Concrete & Masonry Surfaces	\$ -	\$ 127,000.00	\$ -	\$ -
2	Exposed Metal Surfaces (including corbel pads)	\$ -	\$ 108,000.00	\$ -	\$ -
3	Parking Stall & Lane Striping	\$ -	\$ -	\$ 10,000.00	\$ 21,000.00
F. Revenue Control Equipment Renewal & Replacement					
1	Study for the Replacement of the Revenue Control Equipment	\$ -	\$ -	\$ 10,000.00	\$ -
2	Replacement of the Revenue Control Equipment	\$ -	\$ -	\$ -	\$ 301,000.00
G. File Management					
1	Preparation of Record Drawings	\$ -	\$ -	\$ 20,000.00	\$ -
2	Scanning of Original Drawings	\$ -	\$ -	\$ -	\$ -
Sub-Total		\$0.00	\$861,000.00	\$465,000.00	\$367,000.00
20% Contingencies (Unless Depicted Otherwise)		\$0.00	\$172,200.00	\$93,000.00	\$73,400.00
25% Engr. & Construction Management, incl. Program Management (Unless Depicted Otherwise)		\$0.00	\$215,250.00	\$116,250.00	\$91,750.00
Total Phased Construction Costs with contingencies:		\$0.00	\$1,248,450.00	\$674,250.00	\$532,150.00
TOTAL Construction Cost with Contingencies:					\$2,454,850.00

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



6. DETERIORATION MECHANISMS

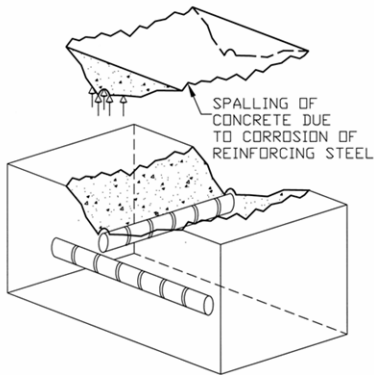


Fig. A

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.

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.

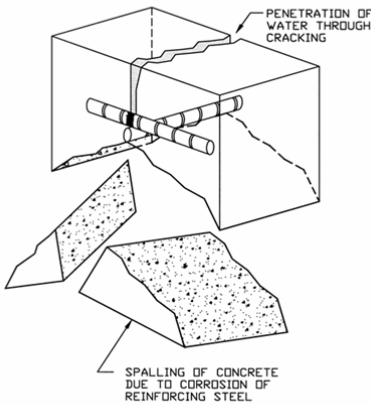


Fig. B

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.

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.

FREEZE-THAW DAMAGE:

Concrete deterioration caused by freeze-thaw cycles is a third major deterioration mechanism. The mechanism occurs within saturated

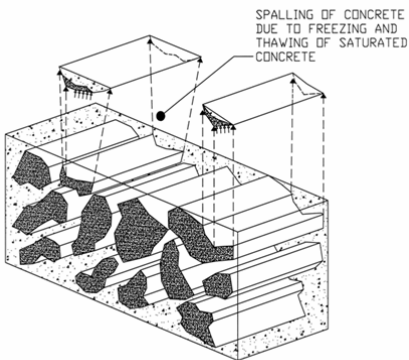


Fig. C

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.

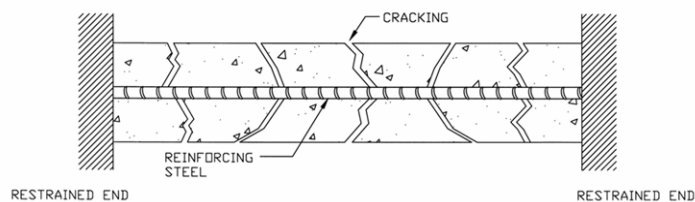


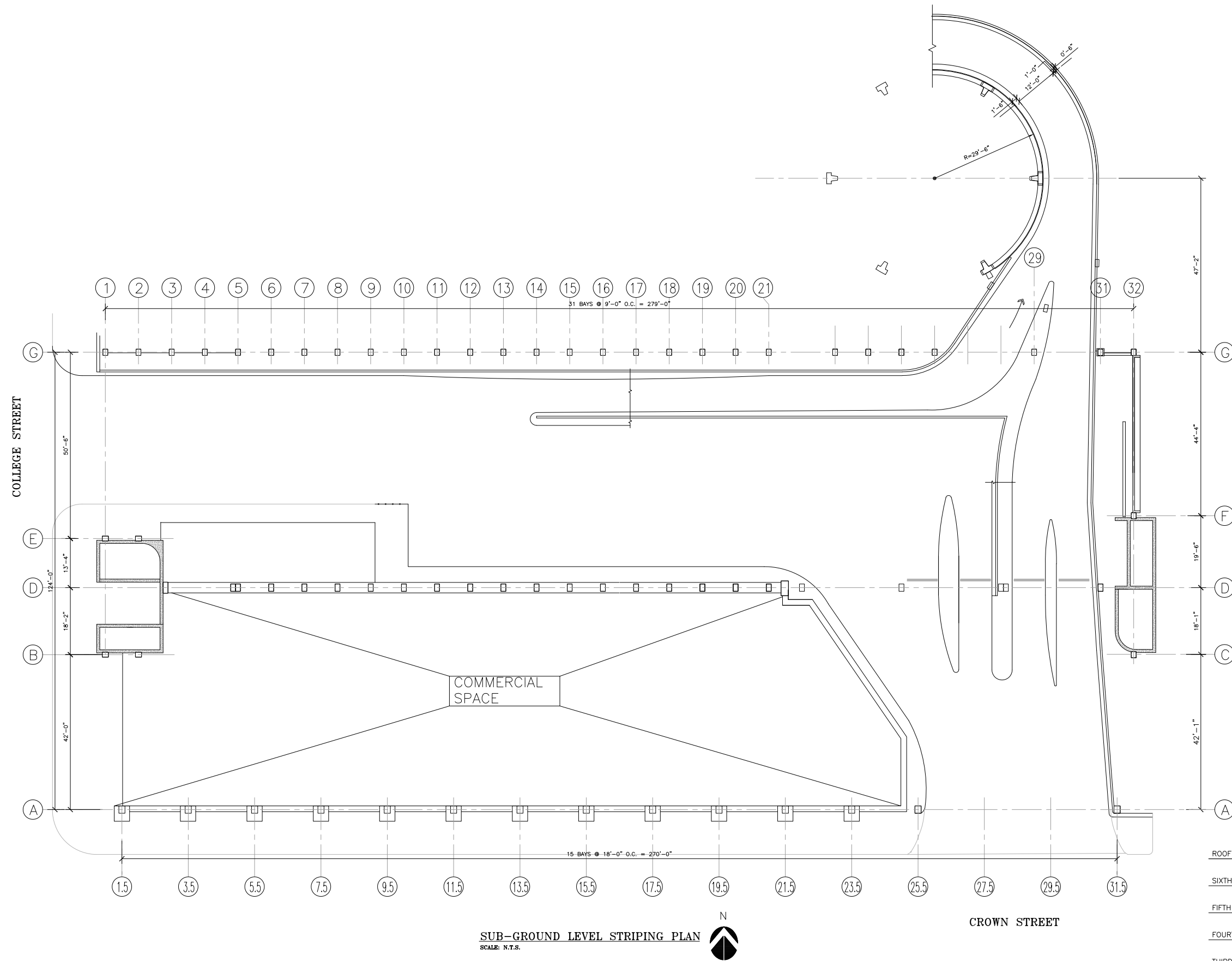
Fig. D

CHEMICAL ATTACK:

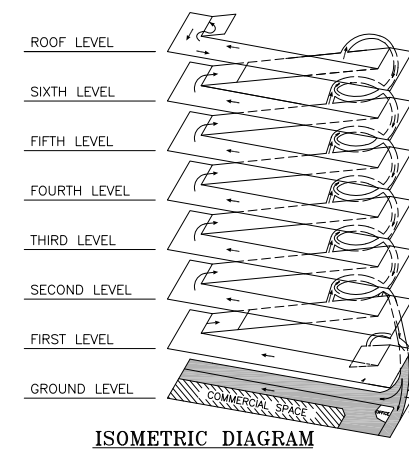
Chemical attack is a fifth major deterioration mechanism affecting the performance of reinforced concrete. The effect of de-icing chemical/chlorides upon reinforcing steel and scaling is one example of chemically influenced deterioration. Severe exposure to other chemicals, notably sulfates and acids, 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.

8. APPENDIX A – SCHEMATIC FLOOR PLANS



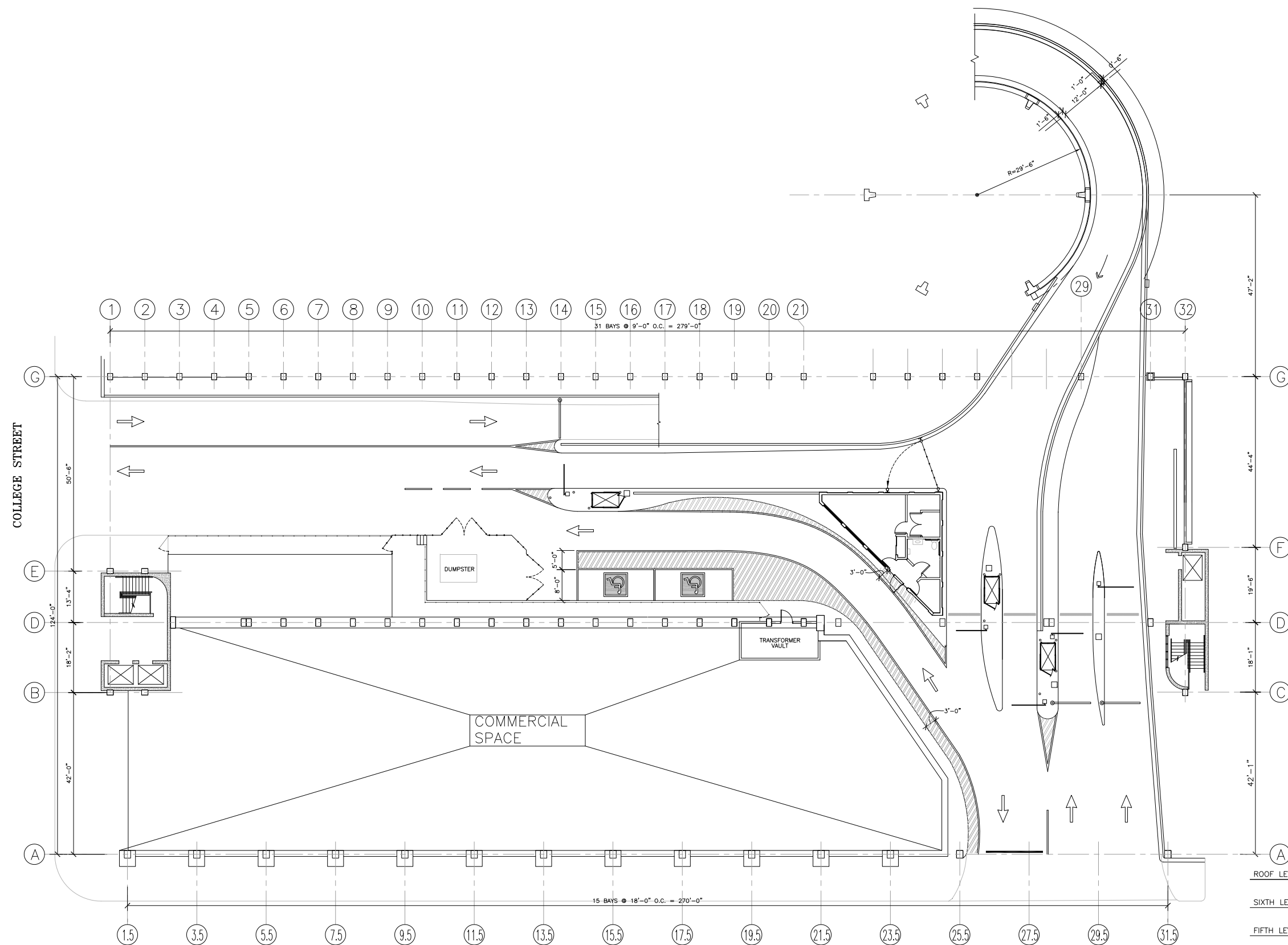


SUB-GROUND LEVEL STRIPING PLAN
SCALE: N.T.S.



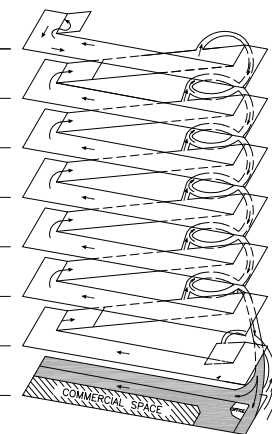
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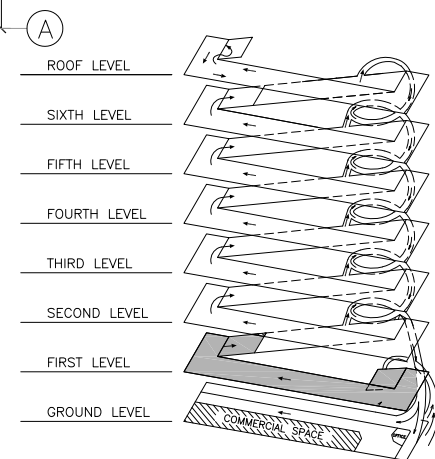
GROUND LEVEL STRIPING PLAN
SCALE: 3/32"=1'-0"

CROWN STREET



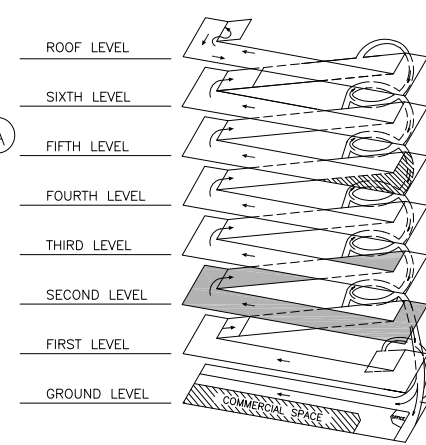
ISOMETRIC DIAGRAM

NO.	DATE	BY
REVISONS		
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DRAWING NO.		
ST-1.OG		
SCALE & D.S.NTS K.D.S..		
DATE: APRIL 2020		
PROJECT NO. 20-19171.00-2		
NHPA NO. 20--001		
DESIGN KDS	DRAWN KDS	CH'KD. KDS



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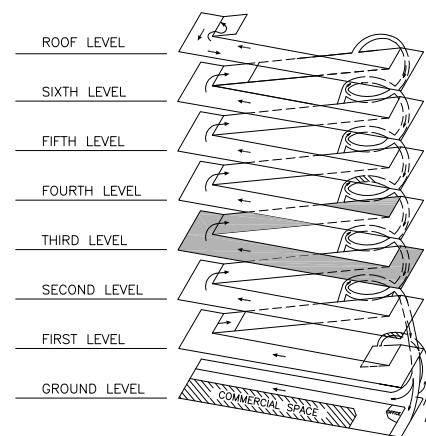
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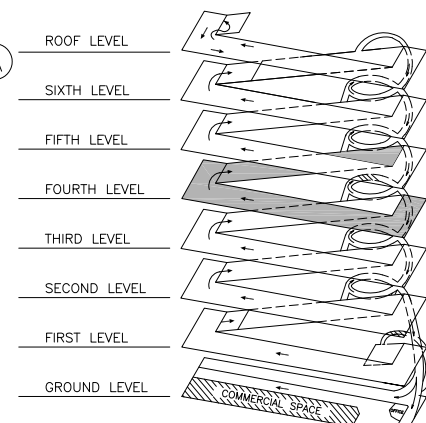
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Design Management[illegible]



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CONDITION APPRAISAL, YEAR 2020
NHPA PROJECT #20-001
NEW HAVEN
CONNECTICUT

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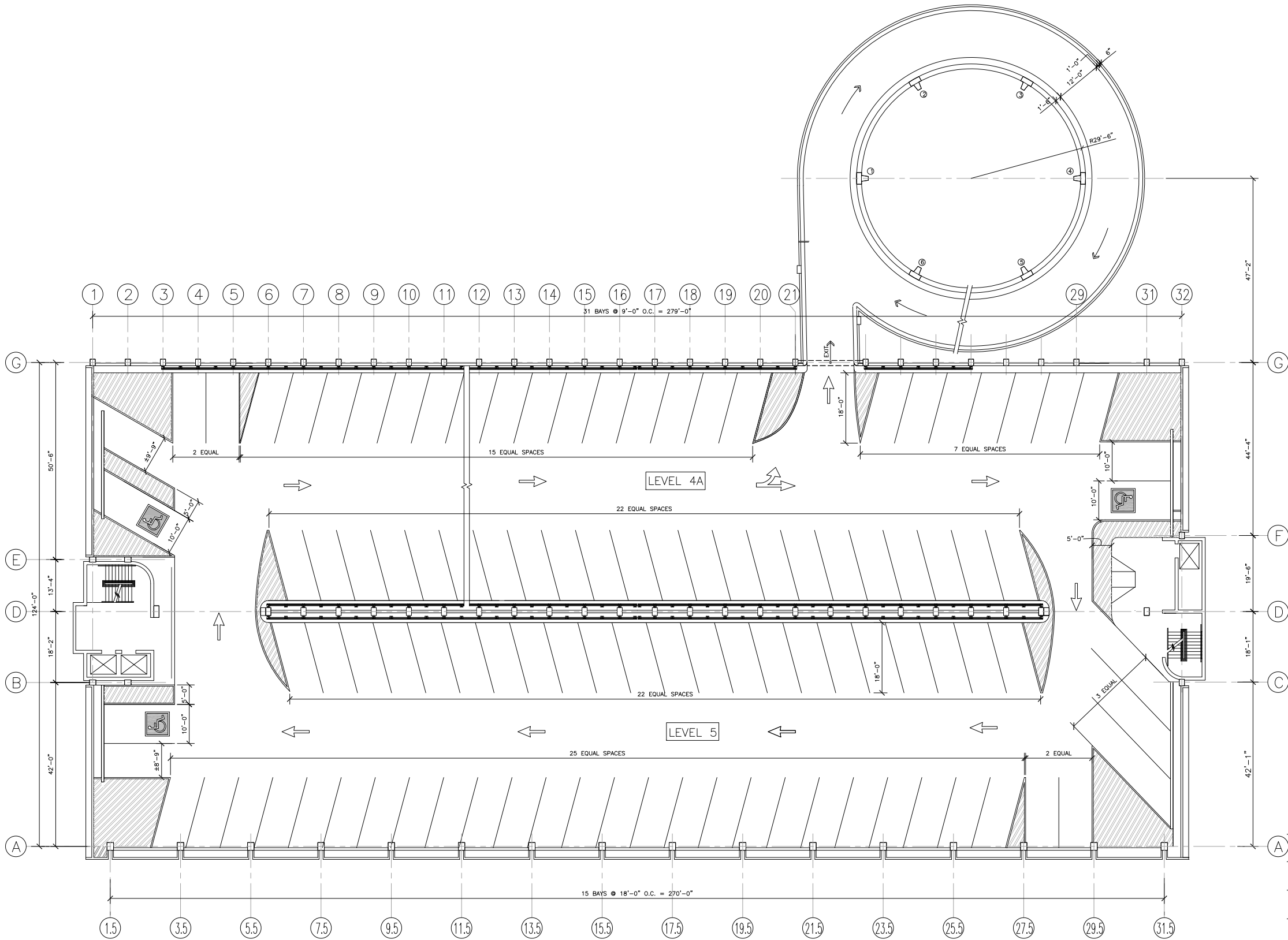


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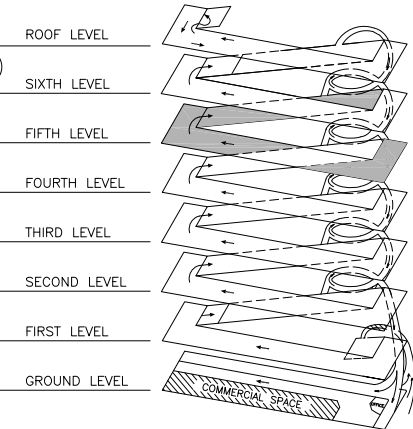
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REVISIONS		
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ST-1.4		
SCALE: NTS		
DATE: APRIL 2020		
PROJECT NO. 20-19171.00-2		
NHPA NO. 20-001		
DESIGN KDS	DRAWN KDS	CH'KD. KDS

NEW HAVEN
NHPA PROJECT #20-001
CONDITION APPRAISAL, YEAR 2020
CONNECTICUT

DESIGNMAN
Design Management



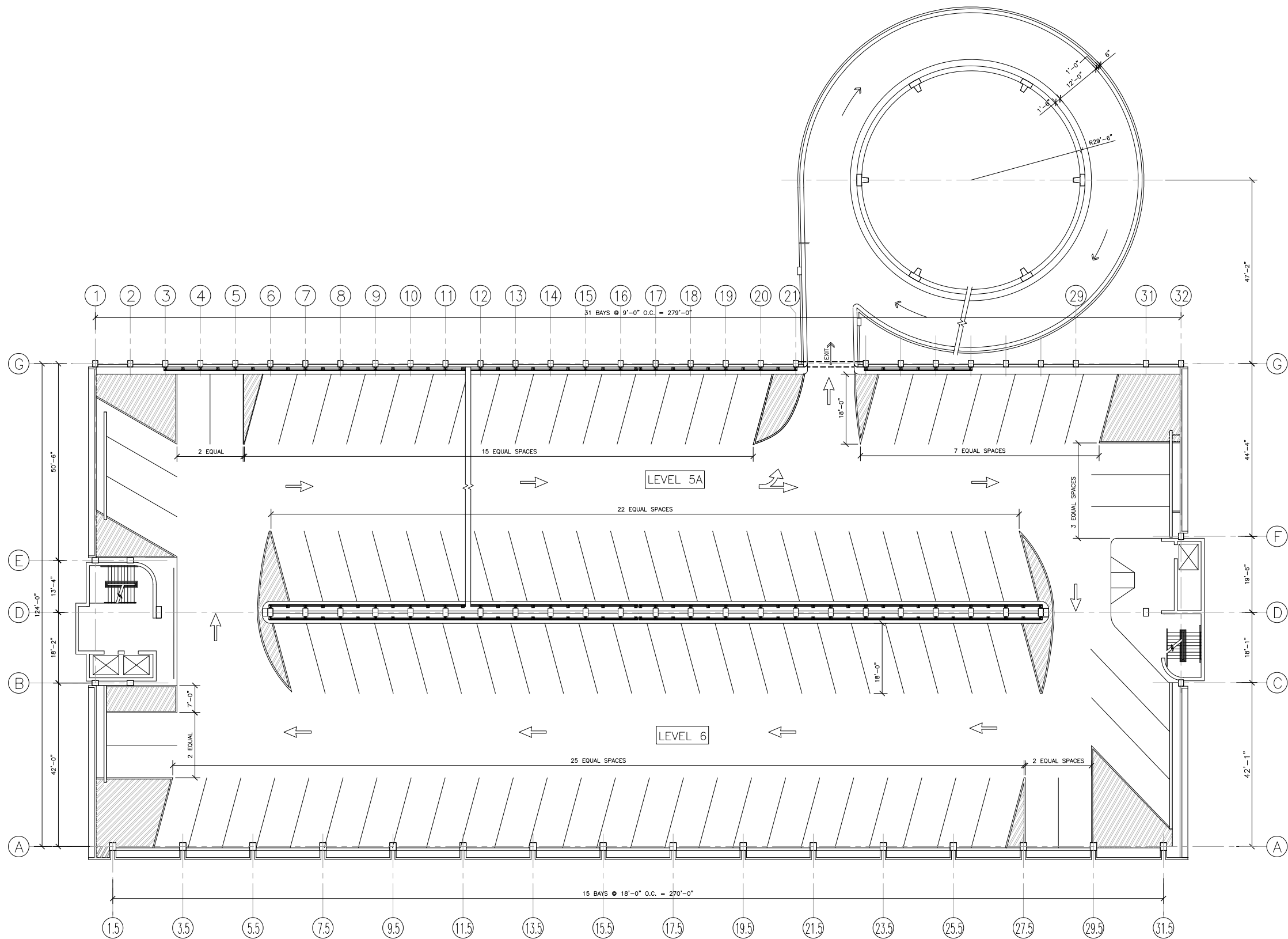
FIFTH LEVEL STRIPING PLAN
SCALE: N.T.S.



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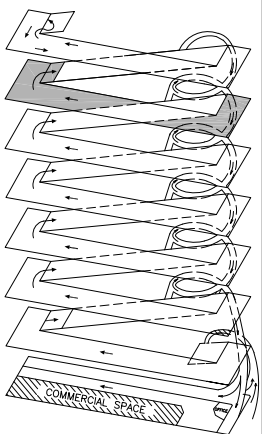
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NO.	DATE	BY
REVISIONS		
DRAWING TITLE		
FIFTH LEVEL STRIPING PLAN		
DRAWING NO.		
ST-1.5		
SCALE: NTS		
DATE: APRIL 2020		
PROJECT NO. 20-19171.00-2		
NHPA NO. 20-001		
DESIGN KDS	DRAWN KDS	CH'KD. KDS



SIXTH LEVEL STRIPING PLAN
SCALE: N.T.S.

- ROOF LEVEL
- SIXTH LEVEL
- FIFTH LEVEL
- FOURTH LEVEL
- THIRD LEVEL
- SECOND LEVEL
- FIRST LEVEL
- GROUND LEVEL

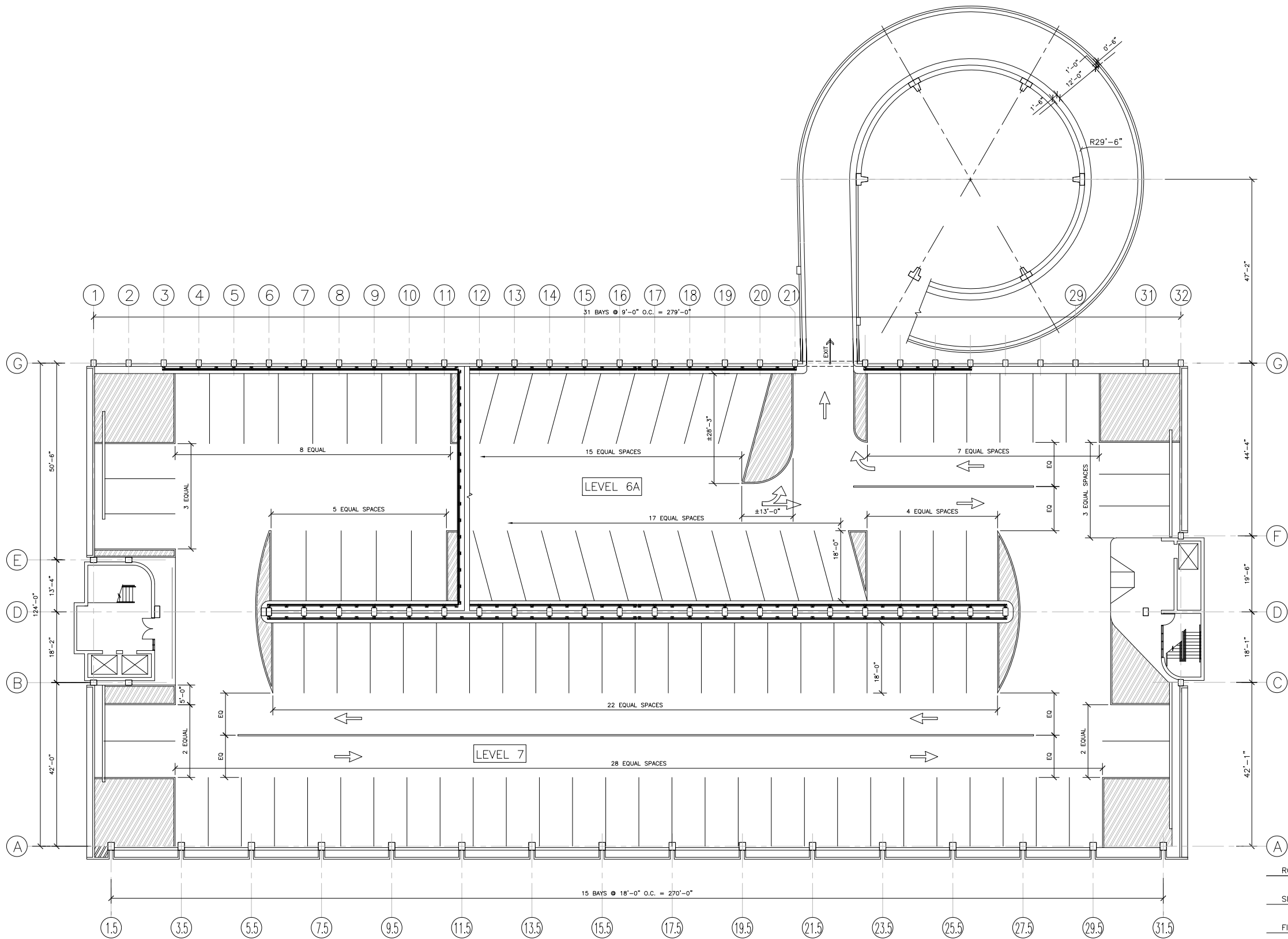


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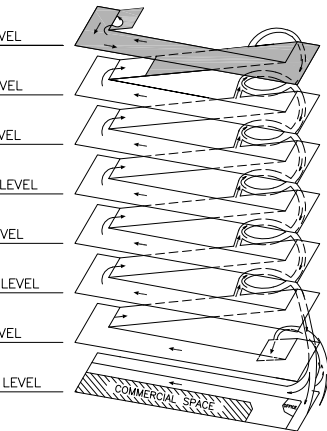
CONDITION APPRAISAL, YEAR 2020
NHPA PROJECT #20-001
NEW HAVEN
CONNECTICUT

NO.	DATE	BY
REVISIONS		
DRAWING TITLE		
SIXTH LEVEL STRIPING PLAN		
DRAWING NO.		
ST-1.6		
SCALE: NTS		
DATE: APRIL 2020		
PROJECT NO. 20-19171.00-2		
NHPA NO. 20-001		
DESIGN KDS	DRAWN KDS	CH'KD. KDS



SEVENTH LEVEL (ROOF LEVEL) STRIPING PLAN
SCALE: N.T.S.

- ROOF LEVEL
- SIXTH LEVEL
- FIFTH LEVEL
- FOURTH LEVEL
- THIRD LEVEL
- SECOND LEVEL
- FIRST LEVEL
- GROUND LEVEL



ISOMETRIC DIAGRAM

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NO.	DATE	BY
REVISIONS		
DRAWING TITLE		
SEVENTH LEVEL (ROOF LEVEL) STRIPING PLAN		
DRAWING NO.		
ST-1.7		
SCALE: NTS		
DATE: APRIL 2020		
PROJECT NO. 20-19171.00-2		
NHPA NO. 20-001		
DESIGN KDS	DRAWN KDS	CH'KD. KDS

**9. 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. 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

L. 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						
M. 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	
N. Repair	As per Engineer's Recommendation						
O. 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: CROWN STREET PARKING GARAGE

SEASON/YEAR: _____

7TH LEVEL: _____ DATE: _____ SUPERVISOR: _____

7A: _____ DATE: _____ SUPERVISOR: _____

6TH LEVEL: _____ DATE: _____ SUPERVISOR: _____

6A: _____ DATE: _____ SUPERVISOR: _____

5TH LEVEL: _____ DATE: _____ SUPERVISOR: _____

5A: _____ DATE: _____ SUPERVISOR: _____

4TH LEVEL: _____ DATE: _____ SUPERVISOR: _____

4A: _____ DATE: _____ SUPERVISOR: _____

3RD LEVEL: _____ DATE: _____ SUPERVISOR: _____

3A: _____ DATE: _____ SUPERVISOR: _____

2ND LEVEL: _____ DATE: _____ SUPERVISOR: _____

2A: _____ DATE: _____ SUPERVISOR: _____

1ST LEVEL: _____ DATE: _____ SUPERVISOR: _____

1A: _____ DATE: _____ SUPERVISOR: _____

MEZZANINE: _____ DATE: _____ SUPERVISOR: _____

STREET LEVEL: _____ DATE: _____ SUPERVISOR: _____

CROWN ST STAIR: _____ DATE: _____ SUPERVISOR: _____

COLLEGE ST STAIR: _____ DATE: _____ SUPERVISOR: _____

