BURNS McDONNELL

APM STATIONS
CONDITION ASSESSMENT

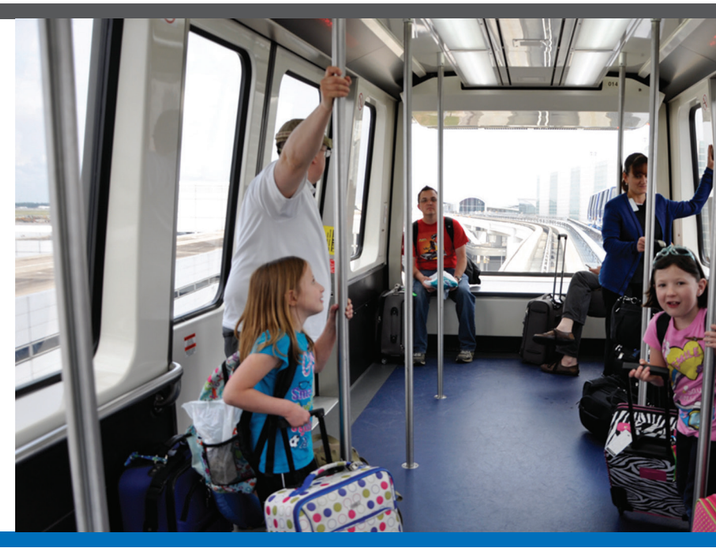
SUBMITTED TO

HOUSTON AIRPORTS

Project Number: 83498

June 2015

CREATE AMAZING.



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ACRONYM DIRECTORY

ACI	Actual Condition Index
AISC	American Institute of Steel Construction
ALRM	Fire Alarm System
ARCH	Architectural System
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ATS	Automatic Transfer Switch
BAS	Building Automation System
BMcD	Burns & McDonnell
BOMA	Building Owners and Managers Association
CIBSE	Chartered Institution of Building Service Engineers
CLDG	Cladding
CLNG	Ceilings
DM	Deferred Maintenance
DOOR	Doors
DX	Direct Expansion
EAMS	Enterprise Asset Management System
ELEC	Electrical Systems
EPDM	Ethylene Propylene Diene Monomer
ESCA	Escalator System
FAA	Federal Aviation Administration
FACP	Fire Alarm Control Panel
FCI	Facility Condition Index
FCU	Fan Coil Unit
FINI	Finishes
FIRE	Fire /Life Safety System
FLOR	Floors
GIS	Geographic Information Systems
HAS	Houston Airport System
HVAC	Heating, Ventilation and Air Conditioning System
Hz	Hertz
IBC	International Building Codes
IECC	International Energy Conservation Code
IGA	Insulated Glass Unit
ITT	Inter Terminal Train
KVA	Kilovolt Amps
kW	Kilowatt
LFSA	Life Safety
LS	Low Slope
LUN	Logical Unit Number
MCC	Motor Control Center
MVSW	Moving Sidewalks
NAC	Notification Appliance Circuit
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEFA	National Equipment Finance Association

ACRONYM DIRECTORY

NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NGAS	Natural Gas System
NRCA	National Roofing Contractors Association
O&M	Operations & Management
OA	Outdoor Air
OEM	Original Equipment Manufacturer
PBB	Passenger Boarding Bridge
PCA	Pre-Conditioned Air
PEMB	Pre Engineered Metal Building
PM	Preventative Maintenance
PNL	Panel
REST	Restrooms
ROM	Rough Order of Magnitude
ROOF	Roof System
RPZ	Reduced Pressure Zone
RV	Replacement Value
SANI	Sanitary Sewer System
SAT	Supply Air Temperature
STRL	Structural System
STRM	Stormwater System
TAS	Texas Accessibility Standards
TSA	Transportation Security Administration
UMC	Uniform Mechanical Code
UPC	Uniform Plumbing Code
VA	Volt Ampere
VAV	Variable Air Volume
VCT	Vinyl Composition Tile
VFD	Variable-Frequency Drive
VTR	Vent through Roof
WALL	Walls
WATR	Water System

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

A. BACKGROUND HISTORY

This report represents the evaluation of individual assets within the Automated People Mover (APM) stations at George Bush Intercontinental Airport, Houston, TX. The APM facilities originally opened in 1999 with stations located at Terminals B and C. Phase II of the APM expanded the service to Terminal D/E in 2005. Phase III expanded the APM to Terminal A in 2010. The APM was designed to service passengers moving between terminals for all air carriers and is operated on a common use basis with all facilities allocated by the Houston Airport System (HAS). The APM uses Bombardier vehicle and control systems and it is currently operated and maintained by Bombardier. The APM station building infrastructure includes all major building architectural, structural, electrical, mechanical, and plumbing assets.

The assessment and this report serve multiple purposes. The survey and assessment logged architectural, structural, electrical, mechanical, and plumbing asset information electronically, creating a database of assets. Record drawings and existing asset management systems were used as the basis for data collection.

The Burns & McDonnell team was tasked with establishing a baseline asset database of equipment and infrastructure which will be utilized and updated when maintaining and renovating the facility and for capital improvement planning. The database is built for integration with HAS Infor-based enterprise asset management system (EAMS) and existing GIS. The database of surveyed assets includes asset information, issues, observations, and deficiencies found during the building survey.

B. GOALS AND OBJECTIVES

The goals and objectives of this assessment were to develop a database of architectural, structural, mechanical, electrical, and plumbing elements or assets in terms of condition, effectiveness, and longevity. The specific goals include:

· Develop a database summarizing architectural, structural, mechanical, electrical, and plumbing building equipment.

· Identify system level deferred maintenance. Deferred maintenance includes code compliance issues, deficiencies, modernization, and equipment repair or replacement recommendations.

· Summarize present condition of equipment utilizing an Actual Condition Index (ACI) and Facility Condition Index (FCI) rating. The FCI is calculated as the ratio of deferred maintenance versus complete replacement costs.

· Provide overall observation summaries of architectural, structural, mechanical, electrical, and plumbing systems including their current maintenance policies and procedures. Provide recommendations for improvements to enhance the service lives of the system assets.

· Quantify useful life expectancy and deferred maintenance costs for each system.

· Develop a system level planning matrix based on **Priority**, **Near,** and **Long Term** deferred maintenance and capital improvement recommendations.

· Estimate Rough Order of Magnitude costs for replacement and/or upgrades to systems included in this study. Costs are provided at the system level grouped by planning category.

C. RECOMMENDED COST

The recommendations to address deferred maintenance are grouped into standard categories described below:

1. **Priority:** Completion recommended in 0-3 years
2. **Near Term:** Completion recommended in 4-7 years
3. **Long Term:** Completion recommended in 8+ years

Systems were ranked into the planning categories described above, based on the Actual Condition Index, Facility Condition Index, and remaining service life as established by the scope of work. The procedures for determining these values are further defined in **Chapter I – Procedures.**

Below is a summary of the Deferred Maintenance (DM) Costs and associated Replacement Value (RV) Costs for each Planning Category at the System Level. The total system deferred maintenance costs and total system replacement value costs are based on the assessed systems. All DM and RV costs include indirect costs and consider renovation in an existing facility.

A breakdown of costs by system and planning category for each terminal station is provided below in **Table 1.** Additional detail of the costs at the component and asset level is provided in the respective system sections of **Chapter II – System Findings** and in Appendix C. The FCI provided below is based on the straight ratio of the deferred maintenance versus the replacement value costs at the system level and is not a weighted average at the component level.

EXECUTIVE SUMMARY

System	Planning Category	DM Costs	RV Costs
ARCH A	Priority	$786,450	$786,450
ARCH A	Near Term	$0	$0
ARCH A	Long Term	$0	$6,977,833
ARCH A Total		**$786,450**	**$7,764,283**
ARCH B	Priority	$729,120	$729,120
ARCH B	Near Term	$0	$0
ARCH B	Long Term	$0	$4,857,471
ARCH B Total		**$729,120**	**$5,586,591**
ARCH C	Priority	$114,660	$114,660
ARCH C	Near Term	$0	$0
ARCH C	Long Term	$0	$5,044,811
ARCH C Total		**$114,660**	**$5,159,471**
ARCH D	Priority	$297,675	$297,675
ARCH D	Near Term	$0	$0
ARCH D	Long Term	$0	$6,473,980
ARCH D Total		**$297,675**	**$6,771,655**
ARCH TOTAL		**$1,927,905**	**$25,281,999**
ELEC A	Priority	$331	$331
ELEC A	Near Term	$0	$0
ELEC A	Long Term	$0	$611,448
ELEC A Total		**$331**	**$611,779**
ELEC B	Priority	$4,814	$4,814
ELEC B	Near Term	$0	$0
ELEC B	Long Term	$0	$550,802
ELEC B Total		**$4,814**	**$555,616**
ELEC C	Priority	$0	$0
ELEC C	Near Term	$0	$0
ELEC C	Long Term	$0	$573,469
ELEC C Total		**$0**	**$573,469**
ELEC D	Priority	$1,764	$1,764
ELEC D	Near Term	$0	$0
ELEC D	Long Term	$0	$659,346
ELEC D Total		**$1,764**	**$661,110**
ELEC TOTAL		**$6,909**	**$2,401,974**

System	Planning Category	DM Costs	RV Costs
FIRE A	Priority	$0	$0
FIRE A	Near Term	$0	$0
FIRE A	Long Term	$0	$271,083
FIRE A Total		**$0**	**$271,083**
FIRE B	Priority	$147	$147
FIRE B	Near Term	$0	$0
FIRE B	Long Term	$0	$230,274
FIRE B Total		**$147**	**$230,421**
FIRE C	Priority	$147	$147
FIRE C	Near Term	$0	$0
FIRE C	Long Term	$0	$243,827
FIRE C Total		**$147**	**$243,974**
FIRE D	Priority	$441	$441
FIRE D	Near Term	$0	$0
FIRE D	Long Term	$0	$298,949
FIRE D Total		**$441**	**$299,390**
FIRE TOTAL		**$735**	**$1,044,869**
HVAC A	Priority	$183,750	$183,750
HVAC A	Near Term	$0	$0
HVAC A	Long Term	$0	$432,630
HVAC A Total		**$184,485**	**$1,661,248**
HVAC B	Priority	$279,300	$279,300
HVAC B	Near Term	$0	$0
HVAC B	Long Term	$0	$337,080
HVAC B Total		**$183,750**	**$616,380**
HVAC C	Priority	$279,300	$279,300
HVAC C	Near Term	$0	$0
HVAC C	Long Term	$0	$337,080
HVAC C Total		**$279,300**	**$616,380**
HVAC D	Priority	$29,400	$29,400
HVAC D	Near Term	$0	$0
HVAC D	Long Term	$0	$327,390
HVAC D Total		**$29,400**	**$356,790**
HVAC TOTAL		**$676,935**	**$3,250,798**

System	Planning Category	DM Costs	RV Costs
STRL A	Priority	$88,200	$88,200
STRL A	Near Term	$0	$0
STRL A	Long Term	$0	$7,268,294
STRL A Total		**$765,135**	**$10,607,292**
STRL B	Priority	$54,390	$54,390
STRL B	Near Term	$0	$0
STRL B	Long Term	$0	$7,302,104
STRL B Total		**$88,200**	**$7,356,494**
STRL C	Priority	$64,680	$64,680
STRL C	Near Term	$0	$0
STRL C	Long Term	$0	$7,291,814
STRL C Total		**$54,390**	**$7,356,494**
STRL D	Priority	$41,160	$41,160
STRL D	Near Term	$0	$0
STRL D	Long Term	$0	$9,059,659
STRL D Total		**$41,160**	**$9,100,819**
STRL TOTAL		**$948,885**	**$34,421,100**

Table ES.1 System Planning & Costs Breakdown

D. SUMMARY OF SYSTEMS OBSERVATION & RECOMMENDATIONS

The APM Stations were surveyed to assess the overall condition and maintenance needs of the building. The purpose of the survey was to investigate and identify major components that make up the facility systems within the building envelope with a focus on condition, deferred maintenance costs, replacement costs, and useful life expectancy. Below is a summary of the overall condition of each system, observations made, and recommendations for repairs, recapitalization upgrades, and replacement of assets surveyed. Additional condition assessment information of each system and components can be found in Chapter II and Appendix C. The approach and methodology used for each system to complete the assessment is described in Chapter I - Procedures.

The observations and recommendations noted below are based on the findings at the time of the condition assessment. The planning category ranking of the items is based on the methodology and approach described above and in detail in **Chapter II.**

Many issues and deficiencies have been placed in a planning category based on remaining service life as well as the functional and operational criticality of the asset. Issues and deficiencies that are minor in nature are listed as priority items even if there is a low risk of failure and do not immediately impact the functionality or operations of the overall system or facility. The issues/deficiencies will have actionable work orders associated with them and will be addressed when HAS staff has been provided stakeholders input, budget, and requirements. By the definition of deferred maintenance, if these items are addressed they can bring the asset to a like new condition and therefore extend the overall service life of the system. Not addressing these issues may cause further deterioration and/or reduced service life of the asset.

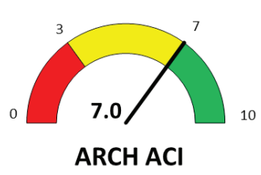
All priority items are recommended to be addressed with the next 0-3 years. While a majority of the assets that fall in the near and long term planning categories are based on remaining service life, they could be addressed sooner if HAS stakeholders deem appropriate and budget is available. Some equipment can be run to failure with little impact to facilities, while others such as electrical and HVAC should be considered for replacement prior to exceeding typical service life.

It is recommended, at a minimum, updating the condition assessment every 3-5 years for all issues and deficienies not addressed. This will determine if full replacement or repair is warranted at that time.

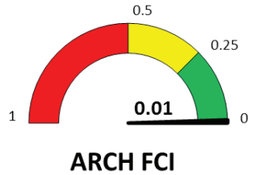
At the beginning of each system summary section there are graphs provided that depicts the average Actual Condition Index (ACI) and the Facility Condition Index (FCI) at the system level. It is important to note that these are based on the average ACI and FCI of each component for each system.

EXECUTIVE SUMMARY

1. ARCHITECTURE SYSTEM (ARCH)



ARCH ACI



ARCH FCI

Overall, the architectural systems within the APM Stations are in good condition as indicated by the above ACI and FCI ratings. There were approximate 120 minor deferred maintenance items noted during the assessment. These items are described in detail in Section A of Chapter II and in Appendix C and summarized generally below.

Priority

We were informed that all glass at the curtain wall at the south side of the train guide way at Terminal B was removed in early May of this year, with the installation of a perforated panel to occur sometime in the near future. The existing framing and anchors, and the new perforated panels should be designed to meet current code load requirements as well as air pressure loads from the trains.

Interior and exterior gaskets should be inspected and gaskets reinstalled or installed where missing at the curtain wall at the north side of the train guideway at Terminal B.

Remove existing glass at the east and west return elevators, at the curtain wall at the north side of the train guideway at Terminal B.

The two lites of glass adjacent to the landing at the top of the exit stairs at the east end of Terminals B and C should be removed and replaced with glass that meets safety glazing requirements.

Metal backer is slightly dislodged at a panel to panel joint at the top of one panel on the north elevation, at the recessed wall at the west end of Terminal A. Panel and/or panel backer plate needs to be adjusted so backer plate is properly installed and open joint is eliminated.

Deterioration of finish on metal panels on the north elevations of Terminals B and C needs to be further investigated. Removal and testing of representative panels to determine the cause of the finish deterioration will be required. The remediation should be based on results of additional investigation.

Splice joints in subsill require resealing at curtain wall on north elevation of Terminal B. Install new seal at horizontal joint between subsill and metal panels. Marry new seals to all existing seals.

Resealing of splice joints in parapet cap is required at the roof of Terminal B. Install new seal at horizontal joint between cap and metal panels. Marry new seals to all existing seals.

Vertical panel to panel joints on the north elevation of Terminal B are not sealed at the top of the joints where they intersect with the curtain wall subsill. Sealant should be added to these joints to eliminate the open holes. Marry new seals with the additional seals at the subsill.

Metal panel at the bottom, center of the north elevation of Terminal B has been damaged from impact. Replace panel.

Rework parapet caps at the top of the metal panel walls at the north and south sides of the guideways at Terminal C so that they effectively shed water. Reseal all splice joints in the parapet caps and marry new seals to existing seals.

Investigate dark staining of metal panels on south elevation of Terminal D/E at louver/concrete structure penetration through panel wall. Removal of the louvers in this area will be required to confirm the source(s) of the dark staining. Eliminate source of staining once determined. Clean panels.

Inspect all metal panels at Terminal D/E for proper installation of gaskets at panel joints. Reset dislodged gaskets or install new where missing.

Inspect metal panels at the end of the guideways at Terminal D/E for proper sealant installation. Cut out and reseal all failed joints. Add new sealant where seals are missing. Marry new seals with existing seals.

Clean all glass, metal framing and metal panels at all terminals on a regular basis to minimize dirt build-up and maintain aesthetic appearance. Investigate means for minimizing or eliminating conditions that promote roosting of pigeons, thus eliminating additional dirt build-up and staining.

Investigate replacement of dented panels on the south elevation of Terminal C.

2. ELECTRICAL SYSTEM (ELEC)

ELEC ACI

ELEC FCI

The APM stations located in Terminals B and C built in 1999 are similar in design and construction. Both of these stations are beginning to show many of the same deficiencies within the electrical systems. The lighting levels in both of the stations do not meet the current code, and the fixtures that are installed are older and not as energy efficient as the current models available. The existing infrastructure is approaching 17 years in age and begging to show some signs of aging. While the systems are still operational there are some items that are in need of replacement/repair. Refer to the recommendations list located below.

While at the APM stations that are located in Terminals A and D/E are newer, 2009 and 2004 respectively,and are in better working condition than their counterparts located in Terminals B & C, they are still beginning to show some signs of aging. The lighting levels within the space meet code, and the fixtures used are more efficient, there is an issue with the battery packs in the emergency lighting in Terminal D/E.

The following is a summary list of recommendations for each planning category.

Priority

Terminals B & C

Replace the existing light fixtures that have now exceeded their recommended service life. Install new energy efficient lights with day lighting sensors that will minimize electrical consumption yet still meet the requirements for light levels prescribed by IES. New emergency lighting shall be incorporated into the design of the new lighting layout.

Replace the existing fire alarm notification devices located in the stations. Provide new devices that will achieve the required candela output for the devices located within the station.

The existing transformers and panels located within the station have exceeded the service life of the equipment and should be replaced.

Terminals A & D/E

The existing battery packs for the emergency lighting located within Terminal D/E have exceeded their anticipated life and should be replaced with new batteries. The emergency battery packs that are serving the station will need to be rewired. Staff indicated that when the batteries are energized they are shorting out the fixtures.

Missing dead fronts, space covers shall be installed in the panels located in these terminals to ensure that they are code compliant.

Repair and replace all missing components in the system to include but not limited to missing lamps located throughout the station as well as several panels not having an Arc Flash Hazard label on them.

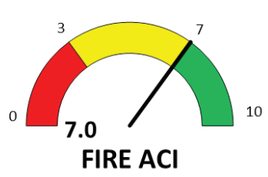
Near Term

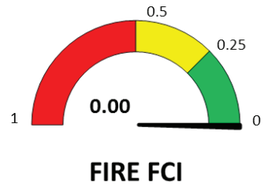
Replace light fixtures and transformers located in Terminal D/E as they are within 5 years of remaining service life for the fixtures.

Long Term

Replacement of switchgears, switchboards, panel boards, transformers, UPS, and lighting contactors within Terminals A & D/E based on remaining service life of the equipment. With routine maintenance and proper air circulation to allow heat dissipation will extend the service life of these devices

3. FIRE/LIFE SAFETY SYSTEM (FIRE)





The existing fire protection systems in place within the confines of the APM stations are operational and in good condition. The team assessed the fire protection systems in the context of the current codes adopted by the City of Houston, which is identified below. It is recognized that the current codes were not in effect at the time the facility was designed and constructed; however, most, if not all of the deficiencies identified have been in the codes since before the facility was constructed.

Typically, buildings are not fully code compliant when it comes to fire protection systems.

For example, if one sprinkler is not spaced correctly, the system as a whole is not in compliance; however, this type of deficiency may have minimal impact on the life safety of occupants within the building. There are different severity levels of code deficiencies, and the deficiencies identified in this facility are generally minor in nature. However, it is recommended that the deficiencies identified in this evaluation be corrected within the priority planning category identified because many of the issues left unresolved overtime may accumulate and lead to a situation where the fire protection system may not perform as intended during an event.

The deficiencies identified during the field assessment and presented in this report are based on the current City of Houston building code effective 12/31/2010, which is the 2006 IBC with City of Houston Amendments. All references to the IBC in the Fire Protection System sections refer to the current City of Houston building code. The current City of Houston sprinkler system code and fire alarm code are the 2007 editions of NFPA 13 and NFPA 72, respectively, per the IBC. All references to NFPA 13 and NFPA 72 in the Fire Protection System sections refer to the 2007 editions.

In the APM station at Terminal A and D/E there may be some issues related to the spacing of the sprinkler heads throughout the areas. Without record drawings of the sprinkler head locations there may be an issue with the spacing of the heads. The spacing issues are noted as a potential deficiency and associated deferred maintenance costs are included. The spacing of sprinklers in these areas was identified as potentially not meeting ordinary hazard requirements.

Without as-built sprinkler drawings of the installed systems stating the design densities, the inspection team could not determine if the current design densities met the minimum code requirements during the walk-through. Conservative assets and deferred maintenance costs were created for these areas based on the assumption the entire sprinkler system in the areas in question required modification; however, after an analysis of the as-built plans and/or hydraulic calculations, the design densities in these areas may in fact be code compliant.

It is recommended that conducting a thorough desk-top analysis based on as-built conditions would be useful to determine whether these areas in question are designed for ordinary hazard densities. If it is found these areas were designed for light hazard densities, an investigation of the existing system would be required to determine the amount of renovation work needed to bring the existing system up to ordinary hazard requirements.

The following is a summary list of observations and recommendations for each planning category. The costs associated with deferred maintenance noted in **Section C** above are based on the costs to address the items below.

Priority

Portions of the APM stations contained spacing of sprinklers which may not meet ordinary hazard requirements of NFPA 13. Without as-built drawings which were not available during the evaluation and additional hydraulic analysis, it is unknown whether these areas meet current code requirements. It is recommended that a thorough desk-top analysis based on as-built conditions to determine whether these areas in question are designed for ordinary hazard densities. If it is found these areas were designed for light hazard densities, an investigation of the existing system would be required to determine the amount of renovation work needed to bring the existing system to ordinary hazard requirements.

Replace or install escutcheon plates that are currently missing or not installed properly in their current location.

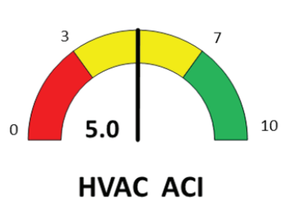
Near Term

Nothing identified.

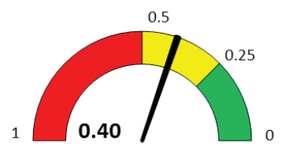
Long Term

Nothing identified.

4. HVAC SYSTEM (HVAC)



HVAC ACI



HVAC FCI

All of the APM HVAC equipment located in the APM stations that serve Terminal A, Terminal C, and Terminal D/E were surveyed during the previous assessment of the mechanical systems that are located within the APM stations. The mechanical equipment that is located in Terminal B was assessed as part of this effort.

The majority of the HVAC equipment is in operating condition, but is nearing the end of the design life as set forth by ASHRAE design standards. Only the physical information was taken during the assessment. For a more thorough determination of the equipment's ability to maintain the space temperature it is recommended that the mechanical units located in the area be commissioned to verify the unit's performance.

Priority

The two air handling units that are serving the APM station at Terminal B are within three years of their typical service life. Replacement of these units is recommended.

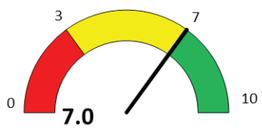
Near Term

There were no items observed during the time of the assessment that would fall under the near term category.

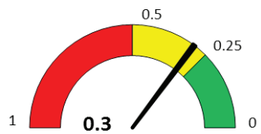
Long Term

There were no items observed during the time of the assessment that would fall under the long term category.

5. Sanitary Sewer System (SANI)



SANI ACI



SANI FCI

The sanitary sewer systems located within the APM stations are in good condition. The following is a summary list of observations and recommendations and comprise the total deferred maintenance costs for each planning category.

Priority

There were no observed deferred maintenance items during time of assessment that would fall under the priority planning category.

Near Term

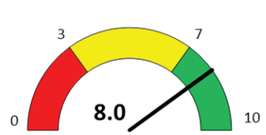
There was no observed deferred maintenance items observed during the time of the assessment that would fall under the near term category. It is recommended to clean the waste lines on a regular basis, tighten connections and replace any rusted or corroded pipe that is observed.

Long Term

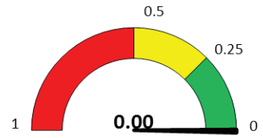
The sanitary waste and vent piping that was assessed was in good working condition at the time of assessment. Piping is service weight cast iron. A majority of the sanitary waste and vent piping was not accessible (i.e., above ceilings, behind walls, below grade, etc.) during the assessment. Typical issues associated with the sanitary waste and vent piping may exist such as insufficient hangar support for horizontal and vertical piping and leaks at piping connections/fittings.

The actual condition index of the sanitary vent piping is 7 and sanitary waste is 7. The piping is represented in the database as one asset point per piping type for the entire facility. Using the methodology included in **Chapter I**, the replacement costs are based on typical costs per square foot and the deferred maintenance was calculated at 30% the replacement value costs and placed in the long term category for budgeting purposes.

6. STRUCTURAL SYSTEM (STRL)



STRUCTURAL ACI



STRUCTURAL FCI

Minor cracking in concrete and masonry structural members, and minor corrosion of steel members, is to be expected as structures age. These sorts of observations were noted in the comments for an asset, but not considered an issue (and no deferred maintenance costs assigned) unless it was severe enough to degrade the mission or service life of the element. In cases where possible movement in the structure or accelerating corrosion was suspected, an issue was created with a recommendation to monitor the element, and a nominal deferred maintenance cost included to cover annual inspection.

The following is a summary list of observations and recommendations for each planning category.

Priority

Guideway: Patch and repair spalled concrete at locations where rebar is exposed.

Guideway: Apply injectable epoxy into wide cracks on guideway rails.

Substructure: The substructure consists of concrete columns supporting both the guideway and the terminal stations. Minor spalling, excessive pot marks, and delamination of surface coatings are com mon on many of the columns.

Near Term

Superstructure: Investigate as-built conditions for anchor bolts at the walkway column adjacent to Terminal A Station that were not constructed according to best practices.

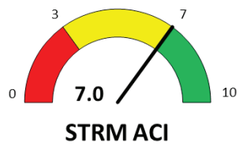
Long Term

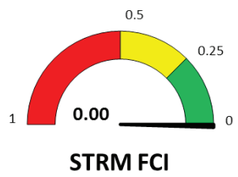
Guideway: The walkways surrounding the guideway show signs of shrinkage cracking where concrete joints are far apart.

Superstructure: The exposed superstructure primarily consists of steel columns with steel beams, girders, and lateral bracing. In most areas where the superstructure is exposed, it is generally covered in a sprayed on fireproofing. The superstructure is in very good condition.

Walls: All walls inside the terminal stations are covered in drywall or other façade. The walls are in good condition with minor cracking due to shrinkage and structural movement. Repair of these cracks should be considered aesthetic.

7. STORM WATER SYSTEM (STRM)





Overall, the storm water system, consisting mainly of roof drains and piping, that was observed within the APM stations is in good condition.

Priority

There were no deferred maintenance items observed within the storm water system that fell into the priority planning category.

Near Term

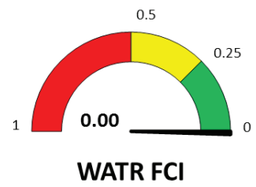
There were no items that were observed in the field that fell into the near term planning category.

Long Term

The storm water piping that was assessed is well supported by pipe hangers and riser clamps. Piping is service weight hub less cast iron and the piping is original construction. The piping was in good working condition overall at the time of assessment. No issues were recorded at the time of the as sessment. There will be a need to maintain the strainers located at the roof drain.

It is recommended to continue to clean all of the strainers on a regular basis as well as re-paint strainers to prevent the accumulation of any rust.

8. WATER SYSTEM (WATR)



There is a water system located within the terminals at each of the APM stations. There was minimal water piping located within the mechanical rooms located within the APM stations. The water system that is located in the APM stations is in good condition with minimal deferred maintenance.

Priority

In mechanical rooms, it was observed that no pipe guard was provided for piping that rested on unistrut hangers. It is recommended to provide and install pipe guards to protect pipe against dissimilar metals corrosion (copper pipe resting on metal hangers).

Near Term

There is no deferred maintenance items observed that fell into the priority planning category.

Long Term

There is no deferred maintenance items observed that fall into the long term planning category.

E. OPERATIONS & MAINTENANCE RECOMMENDATIONS

An assessment of the effectiveness of current maintenance policies, procedures and periodicities to maintain the required, defined, level of service was completed as part of the field investigation and systems overview. Recommendations for improvement of maintenance policies, procedures, and periodicities to improve life cycle performance and/or level of service for each system are presented in **Chapter II - System Findings & Recommendations**.

CHAPTER I
PROCEDURES

CHAPTER I - PROCEDURES

A. GENERAL PROCEDURE

The survey process began by compiling an electronic database with current drawings from GIS and existing record documents; 100% of the representative assets were surveyed. The existing building drawings were used to determine equipment to survey in the stations of the Automatic People Mover (APM) and create an electronic database. All assets surveyed were documented utilizing doForms tablet based application. The data collected was preserved in the electronic database for future use in the Houston Airport System (HAS) Infor Enterprise Asset Management System (EAMS). Where equipment nameplates or equipment labels were not present, the asset was added to the database and assigned a name based on the nearby equipment naming conventions or the surveyor's judgment of an appropriate name.

Review of the assets and APM station facilities was conducted during the month of April 2015 to the extent reasonably possible. The evaluation consisted of a visual inspection of the various assets, review of record drawings, and interviews with maintenance personnel.

Assets and conditions were assessed by a team of Burns & McDonnell engineers and architects to determine and document nameplate information, location, age, condition, and risk effect where applicable. Additional descriptions and comments were added for any other notes or details.

HAS and Bombardier escorts were utilized and any safety or security issues were discussed on a daily basis. The results of this sampling of assets were used to develop the recommendations and ranking of systems by planning categories described above.

The survey team conducted interviews with HAS and Bombardier staff familiar with the facilities. These interviews provided an overall system summary, as well as shed light on known existing issues and challenges. Existing maintenance schedules and logs were reviewed when available. Building systems specifications and operating manuals were requested and reviewed when available. Construction documents were available on a limited basis to the survey teams on-site.

Some interstitial spaces could not be accessed due to various site constraints. In these rare

cases, the asset or deficiency was noted as inaccessible and as much data as possible was collected.

All assets surveyed were added to a database and were documented as the nameplate indicated. Where equipment nameplates or equipment labels were not present, the asset was added to the database and assigned a name based on the nearby equipment naming conventions or the surveyor's judgment of an appropriate name.

For each asset, the following information was collected:

- Equipment Name
- Equipment Number
- Manufacturer
- Model Number
- Serial Number
- Installation Date
- Capacity
- Floor
- Room
- Condition
- Service Status
- Location
- Equipment Type
- Description
- Additional Comments and Observations

After all available nameplate information was entered, a description of the asset was included along with any additional comments regarding the specific piece of equipment. In addition to the nameplate data collected, digital photographs were taken of each asset or deficiency. The floor, room, and location listed for each asset were intended to guide a user to within the approximate area where that asset was found during the survey. Finally, the life expectancy, deferred maintenance, and replacement cost of each piece of equipment were estimated.

B. DEFERRED MAINTENANCE AND REPLACEMENT COSTS

The estimated value of deferred maintenance and the current replacement costs, at the "system" hierarchy level was based on the 100% sampling. The deferred maintenance value is based on present day costs to address deficiencies and/or code compliance and bring the system back to its original condition. Deferred maintenance does not include the costs for future scheduled preventative maintenance measures.

An estimated replacement and deferred maintenance cost was obtained for each architectural, structural, mechanical, electrical, and plumbing asset and recorded in the assessment database. The replacement cost was based on various resources including equipment vendors, estimating publications such as RS Means, and prior project experiences. The deferred maintenance costs were based on the actual issue or deficiency and in some cases were based on a pro-rated value of the actual replacement costs based on the remaining life. This was applied to linear assets such as pipe, wire, and ductwork and is further explained in **Section A** of this chapter.

If the asset had no issues, deficiencies, or code compliance to address, the deferred maintenance costs were zero, even if the ACI was less than 10. If the asset was near the end or beyond its useful service life, the deferred maintenance costs were equal to the replacement value costs.

C. REMAINING SERVICE LIFE

Based on the type of equipment, the life expectancy of mechanical assets was generated utilizing the following references:

· Associated Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) HVAC Application Handbook 2011

· Building Owners and Managers (BOMA) guide

· The U.S. Department of Energy guides

· Chartered Institution of Building Service Engineers (CIBSE) guide

References are utilized as applicable and adjusted as necessary based on experience, field conditions, and indications of O&M procedures.

Life expectancies of electrical equipment limited by the scope of this report were determined by the following criteria:

· How long was the equipment expected to operate and provide consistent service under normal circumstanes from date of installation?

· If failure occurs, will parts be available?

· When should replacement begin to assure consistent service and parts availability?

Vendor documents indicate that electrical equipment remains in production approximately 17-20 years before being replaced with new technology. Parts are generally available for the following five to ten years. Maintenance also has a major effect on life spans of equipment. Properly maintained equipment will last much longer than neglected equipment. A more accurate assessment of each piece of equipment can be attained by more invasive inspection and testing of the interior components of the equipment. Invasive inspection and testing were outside the scope of this project. Based on manufacturer's replacement records and industry standards, life expectancies for electrical equipment included in this report will be 30 years.

Building structural systems are designed to exceed the anticipated service life of the building itself. While a specific design life is rarely pinpointed for permanent structures, both the wind and seismic loads required by the building code are based upon 50 year recurrence intervals. As such, structural systems generally are considered to have a design life between 40 and 60 years. However, the service life of the structural system can easily extend far beyond this design life period, as long as it is monitored for deterioration and any deficiencies addressed in a timely manner.

The typical life expectancy for the framing system for a glazed curtain wall system is approximately 40 years. Varying life expectancies can be expected for the subcomponents of a curtain wall system. Glass has an expected life expectancy of 20+ years, although this could be less for insulated glass units (IGU's) that are assembled with lesser quality materials and sealants. Glazing gaskets can be expected to last 25+ years if made from silicone, neoprene or high-quality EPDM materials, and less than 10 years if made from butyl or poor quality neoprene or EPDM materials. Silicone sealants used within and at perimeters of curtain walls have an expected service life of 25+ years, while urethane and butyl materials have a life expectancy of 10 years or less. Quality paint (Kynar-based) or anodized (Class I) finishes on metal framing can be expected to last 25+ years, while lower quality paints (polyester or acrylic-based) and anodized (Class II) finishes can be expected to last < 25years. Exposure to jet engine exhaust (burned and unburned hydrocarbons) can lead to accelerated deterioration of these materials and finishes.

The typical life expectancy for the metal panels and their back-up framing system is approximately 40 years. Varying life expectancies can be expected for the subcomponents of a metal panel system. Glazing gaskets can be expected to last 25+ years if made from silicone, neoprene or high-quality EPDM materials, and less than 10 years if made from butyl or poor quality neoprene or EPDM materials. Silicone sealants used within and at perimeters of metal panels have an expected service life of 25+ years. Quality paint (Kynar-based), anodized (Class I), or galvanized (G90) finishes on panels or metal support framing can be expected to last 25+ years, while lower quality paints (polyester or acrylic-based), anodized (Class II), and galvanized (<G90) finishes can be expected to last < 25 years. Exposure to jet engine exhaust can lead to accelerated deterioration of these materials and finishes.

Gypsum wallboard has an expected service life of 40 years and gypsum board ceiling has an expected life of 25 years.

Acoustic ceiling tile has an expected service life of 25 years. Carpet tiles have a service life of 15 years and terrazzo floor can function throughout the life of the building.

Interior hollow metal doors have an expected service life of 100 years, while exterior hollow metal doors have an expected service life of 30 years.

D. ASSET DEFICIENCIES

If it was determined by the surveying engineer or architect that an asset had a deficiency, the deficiency was entered into the database and tied to that specific asset. Digital photographs were taken to highlight the deficiencies' location with regards to the asset. A general description of the deficiency was entered, and any proposed solutions or additional comments were added so that the maintenance staff would be able to resolve the issues as quickly as possible.

Deficiencies discovered for the surveyed systems included in the scope of the project are provided in this report and as part of the database. Additionally, any violation of the prevailing building code that became obvious was noted in the report. Violations of current building codes were documented whether they were a part of the scope of the project or not wherever they were encountered.

E. DETERMINING CONDITION

A condition was assessed for each architectural, structural, electrical, mechanical, and plumbing asset and/or system identified under the scope of the project. The surveyor's assessment of condition was based on a number of factors such as the age of the asset, risk of failure, and visible or audible problems. Visual inspection was only performed on the outside of the equipment. No physical or destructive testing was conducted. Further testing may help better identify which assets beyond their designed life expectancy are at a greater risk of failure. The equipment was rated based on the following criteria:

Rating	Descriptive Criteria
10	Fully operational asset, fully meets mission requirements, like new asset, 20+ years remaining service life.
7	Fully operational asset, fully meets mission requirements, 10+ years remaining service life except for specific components as may be identified.
5	Fully operational asset, meets minimum mission requirements, 5+ years remaining service life except for specific components as may be identified.
3	Reduced operability and/or degraded mission capability, and/or less than three years remaining service life for identified conditions, and/or near-term obsolescences of key system components or repair parts may impact maintainability.
0	Non-operational, and/or the asset does not meet mission requirements, and/or current design needs are not met by this asset's basis of design, and/or the asset cannot be adequately maintained due to obsolescence of key system components or repair parts.

Table 1.1 Equipment Rating Criteria

Using the criteria above, it was assumed each rating descriptive criteria was an 'and/or' statement. For example: If asset is fully operational, meets mission requirements but has 3 years or less remaining service life it would receive a rating of 3.

· If typical service life of a new asset is only 5 years and it is brand new, the ACI is a 5; new asset with 10 years typical service life would receive an ACI of 7, etc.

· If typical service life is less than 20 years, it can never receive an ACI of 10

· If asset is fully operational, meets mission requirements, has 20+ years remaining service life but has some components that need replaced, it would receive an ACI of 7.

Years of remaining service life was the starting point for ACI calculations, and the ACI value could only go down based on overall condition. An item in perfect condition with 12 years remaining service life could not be extended from an ACI of 7 to an ACI of 10 because it did not meet the minimum requirement of having 20+ years of remaining service life.

F. AREAS SURVEYED

This assessment of the four station systems included the following:

Architectural System (ARCH)

Electrical System (ELEC)

Fire/Life Safety System (FIRE)

HVAC System (HVAC)

Roof System (ROOF)

Sanitary Sewer System (SANI)

Structural System (STRL)

Storm Water System (STRM)

Water System (WATR)

G. ESTIMATING

The Rough Order of Magnitude (ROM) cost estimates were developed utilizing in-house estimating historical information and databases, and local pricing information. These should be used for general planning purposes only. Due to the level of information available and the preliminary nature of these estimated costs, ROM estimate accuracy is anticipated to be +/- 40%.

Cost estimates are based on specialized databases for different industries including aviation. Labor productivity (man-hours) for the different tasks is derived from construction experience in the different trades. The mechanical and electrical productivity rates come directly from the Mechanical Contractors Association Estimating Manual and the National Electrical Contractors Association (NECA) estimating handbook.

Replacement costs for assets not specifically identified in cost estimating systems were derived through comparison to similar assemblies as well as verification with manufacturers and suppliers. These costs are inclusive of ancillary tasks and costs associated with the demolition and replacement. For example, the replacement cost of a water closet would include demolition and replacement of the bowl, flush valve, and carrier in addition to contingencies for sanitary and domestic water coordination. There would also be contingencies for minor repair or replacement of wall and floor finishes. Since these assets are considered on an individual basis, economies of scale are not factored. Additional costs taken into account are the premiums associated with performing work in a fully operational facility.

Assets which are part of a system spread out over a large area are estimated on a case by case basis. Where the size or scope of the deficiency was explained in the description field, the replacement estimate reflected that specific condition. Where the limits of the condition or deficiency were not well defined, the replacement estimate used a typical scale, such as floor to floor height for a column. Another good example of this type of asset would be flooring. There may be several data points identifying issues with one flooring system. In this case, the replacement value is for a fraction of the floor based on the number of floor-related data points.

Deferred maintenance and replacement value ROM estimates were utilized for the FCI ratio. These include both direct and indirect costs. Indirect costs (design engineering, engineering services during construction, permits, topographic services, inspections, third party services, general conditions, contingency, etc.) associated with the full system wide replacement value for this work are included as 47% of the direct costs. Direct costs include labor, material and ancillary costs associated with the repair/replacement within the existing facility. No costs for environmental remediation were included.

Where possible to identify, deferred maintenance costs reflect those that would be reasonably required to return the asset to fully functional “like new” condition. A good example would be an exterior door asset identified as having significant surface rust. Deferred maintenance would include corrosion mitigation, repainting with a contingency for replacement of deteriorated hardware.

Deferred maintenance costs were built in multiple ways, depending on the physical characteristics and function

of the component. Unless otherwise noted, planar components such as walls, floors, and ceilings had costs built around bringing the area requiring maintenance and its common adjacent components to "like new" condition. For example, if a ceiling tile is damaged, replacing one tile would look out of place in the field of ceiling tiles. Instead, the adjacent tiles, up to an intersection, joint, or unobtrusive stopping point, would be replaced. Replacement value for this area was determined by the cost to replace the ceiling tiles and grids for the same common area. For singular items, such as doors and precast concrete panels, deferred maintenance was calculated similar to that of a piece of equipment. The cost noted includes a dollar value to perform necessary procedures to bring that piece of equipment to "like new" condition. Replacement value includes the cost to wholly replace that singular piece of equipment.

Replacement values for linear assets such as piping, wire, cable, conduit, and ductwork were estimated based on typical costs per square foot with 20% escalation for replacing in an existing facility. The ACI was assigned to the pipe, ductwork, wire, etc. based on areas where it was accessible and could be observed. Specifics on how the ACI was applied for each system are discussed in the methodologies below. The deferred maintenance costs were based on the observed condition of the overall components and as such were assigned a percentage of the total replacement value based on the following logic and formula:

ACI 10 = 0% of replacement value

ACI 7 = 30% of replacement value

ACI 5 = 50% of replacement value

ACI 3 = 70% of replacement value

ACI 0 = 100% of replacement value

In an example of a linear system such as piping whose replacement costs are $1,000,000 and the ACI was 7, the deferred maintenance costs would be 30% of replacement, or $300,000.

Full extent of work required and actual costs will be dependent upon the timing and completed design of the modifications. Costs are shown in 2015 dollars. No escalation has been added for projecting estimated costs to future project dates.

H. METHODOLOGY AND APPROACH

Visual assessments were completed from ground accessible areas in public locations and in locked mechanical/electrical rooms on both levels of the stations and around the exterior of the building. Ladders and lifts were used as necessary to access certain areas, specifically the exterior glazing and metal panels.

Interviews were conducted with the O&M staff during the assessment process to gather more intimate, day to day knowledge of the facilities. O&M staff provided information regarding installation dates, renovation dates, perceived causes of component decay and rough maintenance schedules. Staff input was entered on an asset by asset basis, where applicable.

CHAPTER II
SYSTEM FINDINGS & RECOMMENDATIONS

CHAPTER II - SYSTEM FINDINGS & RECOMMENDATIONS

The information gathered to develop the assessment of this facility is summarized below at the system and component level. The asset description, function, condition, and recommendations are presented as a summary at the component level.

The detailed ACI, FCI, Remaining Service Life, issues and recommendations information about each component surveyed is found in the tables presented in **Chapter I.** Building code summaries referenced in this chapter are found in **Appendix B.**

Below is a summary of each component by System. The information describes the components assessed, their function, overall condition, observations, issues, deferred maintenance and O&M recommendations.

A. ARCHITECTURAL SYSTEM (ARCH)

1. ASSET DESCRIPTION

Architectural components assessed at each of the stations at Terminals A, B, C and D/E consist of exterior cladding, gypsum board walls, hard tile walls, column surrounds, gypsum board and acoustic ceilings, carpet tiles, terrazzo flooring, hard tile floors, aluminum entrances, hollow metal doors and roofing.

Exterior cladding protects the structural system and interior spaces from the weather, and aiding in maintaining the interior environment (temperature and humidity). The exterior cladding for the APM stations at each of the terminals consists of glazed curtain walls and metal wall panels.

Curtain wall systems are typically utilized as the exterior component of a building, providing an aesthetic look and weather protection for the structure and other interior areas. Glazed curtain wall systems are typically designed with extruded aluminum framing members that are typically in-filled with glass to provide daylighting at vision areas, or in-filled with glass or metal panels at spandrel (non-vision) areas. Curtain walls do not provide support for the main building structure, but are designed to resist their own dead loads as well as wind loadings.

Curtain walls are installed at all elevations of each station, primarily at the public areas. At Terminals A and B, curtain walls are also installed at the air and landsides of the train guideways to provide additional protection from the elements.

Metal panel wall systems are also used as the exterior component of a building, providing an aesthetic look and weather protection for the structure and interior areas. These types of systems are typically designed with extruded aluminum framing members attached to steel studs, and may also be assembled with a backup sheathing and air and water barrier to prevent air and/or water infiltration into the interior. Metal panels can also be glazed into curtain wall systems. These types of systems do not provide support for the main building structure, but are designed to resist their own dead loads as well as wind loadings.

Metal panels are also installed at spandrel (non-vision) areas at all elevations of each station, including at the soffits that form the exterior closure for the underside of the stations. At Terminal A, metal panels are typically gasket-glazed into the curtain walls at the upper level, while a dry-joint metal panel system is installed at the recessed elevations. At Terminals B and C, the metal panel systems are installed with silicone sealant at the joints between panels. At Terminal D/E, the majority of the metal panels have gaskets installed at the joints between panels, although sealant is installed at the panels at the ends of the guideways.

Gypsum board walls with metal studs are used in the public and non-public spaces. Gypsum board walls are used to define the use and to control access to various spaces in the APM's. Gypsum board walls are painted to provide a protective and aesthetic finish.

Column covers are generally constructed of gypsum board and are used in the public spaces of Terminal A. Column covers evaluated were in public spaces with a high level of foot traffic. Column covers are meant to protect and decorate the structural system of the building. Column covers were commonly an extension of the adjacent wall construction and painted to provide an aesthetic and washable finish.

Gypsum board ceilings are used in various areas of the public spaces. Gypsum board ceilings create a plenum above the ceiling for building systems, and provide a finished interior for patrons below. They are painted to provide an aesthetic and washable finish

Acoustic tile ceilings evaluated are used throughout most of the APM spaces. Acoustic tile ceilings systems efficiently create a finished area and a usable plenum above the ceiling plane. Acoustic tile ceilings are typically 24-inch by 24-inch or 24-inch by 48-inch tiles and create a plenum space above for building infrastructure as well as add aesthetic and acoustic benefits.

Carpet tiles are square sections of carpet used in place of rolled carpeting. Carpet tiles are used for aesthetic and acoustic purposes, creating visual interest and softening the floor while deadening sound. Carpet tiles are efficient to install and can be replaced in small sections if tiles become stained or worn which eliminates the need to replace carpet in an entire area. Carpet tiles are manufactured as squares that are generally eighteen

by eighteen inches.

Terrazzo is a cementitious composite floor material that is designed to be highly durable and aesthetically pleasing floor material for areas of high traffic. Terrazzo consists of marble, quartz, granite, glass, or other suitable chips poured with a cementitious binder. Terrazzo is cured and then ground and polished to a smooth uniformly textured surface.

Automatic aluminum entrances evaluated are primarily horizontal sliding entry vestibule doors. Entrances to the APM have multiple pairs of doors. The number of alternative doors offers some redundancy of service if any one door is inoperable; however, a loss of traffic capacity will be evident at peak traffic hours when inoperable door units are encountered.

Hollow metal doors and frames evaluated include doors to ancillary or auxiliary spaces from the public spaces and exterior doors from the apron or roof level into an enclosed space. Door assemblies include single and double doors.

Other furniture evaluated was for office spaces related to the operation of the APM system. This included one office for each of the APM stations.

2. CONDITION SUMMARY

The curtain wall and metal panel systems at the Terminal A station are typically in good condition with no major deficiencies noted. Normal dirt builds up and some staining was noted at the metal panels at the upper level. More significant dirt build-up due primarily to pigeon droppings was observed at the metal panels and curtain walls at the recessed elevations, where access to cleaning is more difficult. One dislodged metal backer panel at a panel to panel joint also needs to be repositioned at the recessed elevation at the west end of the north elevation.

At the Terminal B station, one lite of glass was reported to have broken and fallen from the curtain wall system at the south side, west return, of the train guideway area in December of 2014. Investigation of the curtain wall system found that the glass in this area has typically moved laterally or walked within the framed openings, causing loss of support along one edge, and possible damage to the edges of the glass. Several of the glass panels were removed from their openings and reset using setting blocks and/or silicone sealant to minimize future movement of the glass. One remaining lite of glass at the west return elevation was removed during the investigation and reset.

Although the glass was generally in good condition as was the aluminum framing, removal and resetting of the remaining glass panels is recommend for safety. HAS has indicated that there is a project in place to remove the glass and replace it with perforated metal panels. This panel replacement project should be coordinated with inspection and resetting of the glass panels. Replacement of the glass with perforated metal panels should alleviate concerns of glass panels breaking or falling out of the frames provided. Installation of the panels includes positive attachment by fastening with non-corrosive fasteners.

The curtain wall system at the north side of the train guideway was reported to have been replaced in 2005 after the existing glass and aluminum framing was damaged by a hurricane. The currently installed system is in generally good shape, with only a couple of dislodged or missing gaskets observed on the interior and exterior. All gaskets at this system should be inspected and the gaskets reset or installed as required. Splice joints in the subsill flashing also need to be resealed. The other curtain wall systems at this station are in good condition with no obvious deficiencies noted.

Metal panels on the east, west and south elevations are in good shape, with normal dirt build-up and staining typically occurring at and below the horizontal joints between panels. The panels and sealant joints need to be cleaned. The metal panels on the north elevation are generally in good shape, although the dirt build-up and staining is considerable and more prevalent. The panel finish appears to be permanently stained by the presence of dirt in the surrounding atmosphere. One damaged panel that should be replaced was observed near the middle of the north elevation at the bottom of the wall. Missing sealant at the top of the vertical panel joints where they intersect with the window sill and sealing of the splice joints in the parapet cap also need to be addressed.

The curtain wall systems at the Terminal C station are in typically good shape, with no obvious or wide spread areas of concern. One minor concern is whether the two glass lites directly adjacent the landing are safety glazed or plate glass. For safety purposes safety glazing is needed. Metal panels on the east, west and south elevations are in good shape, with normal dirt build-up and staining typically occurring at and below the horizontal joints between panels. The panels and sealant joints need to be cleaned. The metal panels on the north elevation are in generally good shape, although the dirt build-up and staining is considerable and appear to have permanently stained the panel finish. The metal parapet caps at the top of the metal panel walls are not sloped properly to shed water, and the splice joints need to be resealed. Two dented panels were also noted on the south elevation, although the damage is only an aesthetic concern.

The curtain wall systems at the Terminal D/E station are in typically good shape, with no obvious or wide spread areas of concern. Dirt build-up on the glass and metal framing should be cleaned during normal maintenance.

Metal panels are in typically good shape, with normal dirt build-up and staining. The panels should also be cleaned as part of normal maintenance. Dark staining was observed on the south elevation where louvers occur above the panels, and the concrete structure penetrates the panel wall. The majority of the panels at this station have gaskets at the panel joints that are typically in good shape. A few conditions were observed where gaskets have become partially dislodged from the joints and need to be reset. Metal panels at the ends of the guideways appear to have sealant at the panel joints, with some adhesion loss or missing seals observed. All seals should be inspected and missing or failed seals replaced.

Concerns over the stability of the glazing in the panels of the APM's, most importantly Terminal B APM, caused the operator to reduce the operating speed of the APM's to reduce the potential for further damage or the fall out of glass panels. The replacement project of installed vented metal panels in-place of the glass panels is expected to allow the APM's to return to normal operating speed.

Gypsum board walls overall are in good condition with minor areas of damage pointed out in the **System Summary Table.**

Column surrounds and enclosures are in good condition and with regular maintenance, cleaning, painting (where appropriate), and repair, the cover should be in service indefinitely.

Gypsum board ceilings are generally in good condition. The most common issue throughout the system is staining or deterioration due to water leaks. No active leaks were encountered so it is unknown if the damage is from previously fixed pipe leaks or active roof leaks. The staining did appear as though it was from previous leaks and are not on-going issues.

Acoustic tile ceilings reviewed are in good condition and meet mission requirements for providing functional interior spaces. The most common issue throughout the system is staining that appears to be due to water leaks. No active leaks were encountered so it is unknown if the damage is from previously fixed pipe leaks or active roof leaks. The staining did appear as though it was from previous leaks and are not on-going issues.

Carpet tiles evaluated are functional, but in various states of wear based on their location. Expected service life of carpet tiles is reduced when used in high traffic areas, as in the case of Terminal A where the high traffic areas are in need of replacement.

Terrazzo overall is in good condition with some cracks noted throughout. There were several locations where patches were made that were poorly matched. The patches appear to be sound and do not present a tripping or falling hazard. The issues of concern here are aesthetic only.

Aluminum entrances meet the design intention and are generally in good condition. The service life can be and is being extended with a thorough maintenance program, as outlined in the **Operations & Maintenance Recommendations** section below. Evidence was noted of regular maintenance which appears to maintain the doors in good performance.

Interior hollow metal doors are in good condition, while exterior doors need maintenance including cleaning, painting, and repair/replacement of hardware.

Furniture currently used in the APM offices associated with the stations is outdated, worn and tattered and in some cases unsafe to use. Furniture should be replaced if it cannot be repaired.

3. DEFERRED MAINTENANCE OBSERVATIONS & RECOMMENDATIONS

Deferred maintenance items described below fall into the near and long term categories. These are deficiencies that will have actionable work orders associated with them, and could be addressed as stakeholders input and requirements determine. For example, carpet tiles are subject to high wear and tear in high traffic areas and may not necessitate priority or near term planning based on functionality or compliance, but public perception of wear and tear may elevate the stakeholders' desire to replace before the effective service life is expired. The issues noted for components in the near and long term planning categories do not degrade the overall function and mission of the spaces they are located in and therefore are not a priority item.

Priority

· Door hardware that is loose or minimally functioning should be repaired or replaced to avoid injury or further deterioration of the hardware or door. Several of the sliding doors serving the APM cars are loose and need to be adjusted.

· Replace damaged or stained ceiling tile. Stained ceiling tile that has become stained from a water leak may cause mold growth. It is difficult to determine the moisture conditions of stained tile and is simplest to replace.

· Removing all existing glass at the curtain wall at the south side of the train guideway at Terminal B to eliminate the potential for future breakage and falling of glass.

· Systematic and regular cleaning of all glass, metal framing and metal panels will extend the service life of these components.

· Replace the two lites of glass directly adjacent to the landing at the top of the exit stairs at the east end of the station at Terminal C. The installed glazing is required to be safety rated and safety glazing is typically marked as such. No marking was evident on the glazing. Safety glazing should be installed if the existing glass is not safety glazing.

· Metal panels on the east, west and south elevations are in good shape with normal dirt build-up and staining which typically occurs and appear to have stained the panel finish. Further investigation as to the cause and repairs for this aesthetic issue is required.

· Miscellaneous Work should be performed to maintain in-place work and minimize further dam age.

That work includes:

- Re-anchor loose door frames, this is typically found at the base of the frames of the sliding doors into/out-of the APM train cars where carts and luggage bangs up against the frame.

- Close and latch the access panels for the compartments of the overhead signage at the doors to the APM train cars. Many of the access panels are not completely latched or closed.

- Install/replace missing items like small sections of flooring base (stainless and rubber), missing cover plates, and light fixture lenses.

Near Term

· Gypsum board walls where damaged should be patched and painted. Although not a function of life safety issue, repairs that are not made can expand in the scope of the damage causing large scale repairs.

· Doors that are damaged should be patched and painted.

· Metal backer is slightly dislodged at a panel to panel joint at the top of one panel on the north elevation, at the recessed wall at the west end of Terminal A. Panel and/or panel backer plate needs to be adjusted so backer plate is properly installed and open joint is eliminated.

· Develop a regular cleaning program for the metal panels on the APM's of Terminal B and Terminal C. Panels that are dirty or stained may become permanently discolored if not cleaned regularly and properly.

· Splice joints in subsill require resealing at curtain wall on north elevation of Terminal B. Install new seal at horizontal joint between subsill and metal panels. Marry new seals to all existing seals.

· Remove, reshape and reinstall metal coping that has become warped such that it ponds water.

· Resealing of splice joints in parapet cap is required at the roof of Terminal B. Install new seal at horizontal joint between cap and metal panels. Marry new seals to all existing seals.

· Vertical panel to panel joints on the north elevation of Terminal B are not sealed at the top of the joints where they intersect with the curtain wall subsill. Sealant should be added to these joints to eliminate the open holes. Marry new seals with the additional seals at the subsill.

· Metal panel at the bottom, center of the north elevation of Terminal B has been damaged from impact. Replace panel.

· Rework parapet caps at the top of the metal panel walls at the north and south sides of the guideways at Terminal C so that they effectively shed water.

· Reseal all splice joints in the parapet caps and marry new seals to existing seals.

· Inspect all metal panels at Terminal D/E for proper installation of gaskets at panel joints. Reset dislodged gaskets or install new where missing.

· Inspect metal panels at the end of the guideways at Terminal D/E for proper sealant installation. Cut out and reseal all failed joints. Add new sealant where seals are missing. Marry new seals with existing seals.

· Roofing systems need to be inspected and cleaned yearly to prevent damage to the roofing, insulation, supporting deck or supporting structure as well as interior finishes.

Long Term

· Clean all glass, metal framing and metal panels at all terminals on a regular basis to minimize dirt build-up and maintain aesthetic appearance.

· Investigate means for minimizing or eliminating conditions that promote roosting of pigeons, thus eliminating additional dirt build-up and staining.

· Investigate replacement of dented panels on the south elevation of Terminal C.

· Clean carpets to extend the useful service life.

· Replace severely worn carpet to eliminate tripping hazards.

4. OPERATIONS & MAINTENANCE RECOMMENDATIONS

Speaking with O&M staff and completing field assessments, it is apparent that there are no systematic failures in the architectural components of this facility. Despite not having detailed PM plans available, typical maintenance performed by the O&M staff and contractors has been adequate in providing a functional exterior enclosure and safe, usable interior spaces. Where deficiencies are noted due to lifespan issues or wear and tear, it is recommended that these issues be addressed and continue with the current maintenance program.

It is recommended that a detailed PM plan be developed that follows industry standards. These recommendations include the following checklists and frequency:

· Automatic Sliding Doors to be inspected annually by an American Association of Automatic Door Manufacturers certified inspector.

· Automatic Sliding Doors to be inspected by O&M staff quarterly for general cleaning, adjusting and functional testing.

· Hollow Metal Doors and Hardware to be inspected annually by O&M staff to ensure hardware is properly functioning for security purposes.

· Clean carpets weekly and shampoo carpets quarterly.

· Clean hard surface floors, windows, walls, ceilings and artwork, as maintained by current O&M standards.

· Clean exterior glass, metal framing and metal panels bi-annually.

· Cleaning and inspection of roofing annually.

· Semi-annually review and replace damaged/missing ceiling tile.

B. ELECTRICAL SYSTEM (ELEC)

The main source of power for Terminal A is provided by two 12.47KV transformers rated at 3000KVA. The transformers feed the main switchgear MSGA1 and MSGA2 located in the basement. A main bus from the switchgear distributes power throughout the Terminal A core building. The north and south concourses are both serviced by two 12.47KV transformers rated at 1500KVA. Power is then distributed throughout the concourses.

1. ASSET DESCRIPTION

Electrical system components assessed in Terminal A consist of panel boards, transformers, uninterruptible power supply (UPS), and general lighting. Panel boards distribute power throughout the APM station including power to offices, shops, and public spaces. Panel boards in the facility range from 100 to 600A. They have various voltages of 120V, 208V and 480V with both single and three phase configurations. Panel boards are located throughout the facility and fed mainly from the main switchgear or transformers. Larger 480 volt distribution panels and smaller branch panels are throughout Terminal A.

Transformers are essential to the power distribution system to provide power at the voltages required for user equipment. Recorded transformers in the facility range from 6KVA to 75KVA. All are distribution transformers for voltage step-down from 480V to 120/208/240V systems.

Uninterruptible power supplies (UPSs) provide temporary power to critical loads in the case of a power outage. Recorded UPSs in the facility ranged from 10KVA to 40KVA. UPSS1, UPSS2, UPSN1, and UPSN2 are all located on the third floor. UPPS1 is fed from PNL L3SS and feeds PNL LUS1. UPSS2 is fed from PNL L3ST and feeds PNL LUS2. UPSN1 is fed from PNL L3NT and feeds PNL LUN1. UPSN2 is fed from PNL L3N2 and feeds PNL LUN2. UPS4, UPS5, UPS8, and UPS9 are located on the north concourse. They are fed from PNL 2LBN, PNL 2LDW, PNL 1LAN, and PNL 1LDN respectively. Each UPS feeds a panel corresponding with its name.

Burns and McDonnell performed light level samples in all public areas within Terminal A and D/E. Foot-candle readings were taken in intervals and averaged to determine if light levels were adequate. All recorded light levels were adequate for each surveyed space.

General purpose lighting consists of fluorescent troffer lighting fixtures in public spaces. APM Stations consist mainly of can down-lights. Egress fixtures consist of linear fluorescent fixtures and down-lights with emergency battery ballasts and exit fixtures throughout the facility. Lighting is controlled manually via wall switches in the work areas and is switched separately from the office areas. Additional lighting contactors will which are housed in the electrical rooms control the lighting in the stations as well. The facility does not have a lighting control panel for the interior lights. The exterior fixtures are controlled via lighting contactors. The majority of the linear fluorescent lighting fixtures have T8 in the public spaces. There are also recessed can lights along the APM Stations that have compact fluorescent lamps.

2. CONDITION SUMMARY

Terminals A and D/E

In general the majority of the electrical equipment is in good condition. The electrical panels and transformer should continue to function property throughout the remaining years of their service life. The lighting in both stations will continue to provide adequate lighting with proper maintenance and replacement of faulted lamps.

Terminals B and C

The majority of the electrical equipment in the APM stations is near the end of their service life. The electrical panels and transformers will need to be replaced to ensure proper use of all the electrical devices within the space. The UPS in both terminal stations will require routine maintenance and battery replacement throughout the next few years to ensure proper functioning of the system.

3. DEFERRED MAINTENANCE OBSERVATIONS & RECOMMENDATIONS

Priority

· Lighting fixtures with the emergency battery packs in Terminal D/E will need to be rewired, due the current wiring shorting out the existing lamps. An unswitched conductor will need to be connected to each battery to alleviate this problem. Simply replacing the lamp will only continue the process. There were five deferred maintenance items for the panel board component recorded in the priority planning category. Panel boards are near or have exceeded their rated service life. It is recommended these assets be replaced to avoid any unexpected failure.

· There were two deferred maintenance items for the transformer component recorded in the priority planning category. Existing issues include assets that are near or have exceeded their rated service life. Issues also include transformers that are abnormally loud. It is recommended that a replacement of all assets that are near or have exceeded their rated service life to avoid any unexpected failure. It is recommended that all abnormally loud transformers be further tested. The appropriate maintenance shall be applied to any and all affected transformers which are out of sync as exhibited by excessive humming or noise anomalies.

· The lighting in Terminals B&C will need to be replaced due to the overall condition and light output produced by the fixtures. Several emergency battery packs will need to be replaced as well. The installation of new energy efficient high lumen output downlights will greatly improve the lighting in this space. Installing a minimum of two daylight sensor to control the dimming functions of the downlights to accommodate the incoming daylight will greatly increase the energy savings as well.

Near Term

· There were two deferred maintenance items for the panel board component recorded in the near term planning category. Existing issues mainly included missing or loose dead fronts and space covers. It is recommended that all assets with missing components be repaired.

Long Term

· The majority of the electrical equipment in APM Stations Terminals A and D/E fall into the long term planningcategory due to the remaining service life. It is recommended using the methods listed below in **Section 4** to properly maintain these devices.

· Office furniture should be replaced in its entirety. The average offices would include one office desk, on ergonomic desk chair, one plan reading table, one ergonomic tall chair for the plan reading table and one lockable file cabinet.

4. OPERATIONS & MAINTENANCE RECOMMENDATIONS

It is recommended that a detailed PM plan be developed that follows OEM recommendations, industry best practices, and NFPA 70B - Recommended Practice for Electrical Equipment Maintenance. These recommendations typically include the following checklists and frequency (frequency may need to be increased for non-conditioned or harsh environments):

· Conductors – Examine insulation for cracks and deterioration.

· Air circuit breakers and disconnect switches – Clean per manufacturer's recommendations. Operate breaker to ensure function.

· Molded case circuit breakers - Clean per manufacturer's recommendations. Operate breaker to ensure function. Larger duty circuit breakers (225A or above) should be electrically tested to ensure operation of trip elements.

· Battery stations/ chargers - Clean per manufacturer's recommendations. Check terminals and connections for tightness

· Exterior feeder cables and bus – Inspect for deterioration. Recommend to de-energize cables if they

need to be touched or moved during maintenance.

· Dry Type Transformers – Record annual readings. De-energize and check cables for tightness.\

· Protective relays – Inspect and test annually per manufacturer's recommendations.

· UPS systems - Clean and test per manufacturer's recommendations.

· Install arc flash hazard labels where missing.

· Observe all safety precautions and use of personal protective equipment during all maintenance activities.

· Keep records of all PM activities.

Additional recommendations include creating a line of contact between maintenance and inventory officials and make maintenance personnel aware of parts that are no longer being ordered. It is recommended for the O&M staff to update feeder schedules and obtain proper reading for all panels. The process to coordinate electrical room access during outages or other work should be reviewed and modified as required.

C. FIRE/LIFE SAFETY SYSTEM (FIRE)

1. ASSET DESCRIPTION

Sprinkler systems provide a means to automatically discharge water in the event of a fire in the immediate area of the fire. The sprinkler systems located in the various APM stations throughout the facility are comprised of valves, sprinkler heads, piping, fittings, air compressors (for dry pipe systems), water flow switches, supervisory switches, fire department connections, and inspector's test connections. During a fire event, sprinkler systems automatically provide water to control a fire and prevent the fire from spreading to other areas by wetting adjacent combustibles.

Fire alarm systems provide a means to automatically detect a fire, notify personnel of a fire event, and monitor suppression systems. Fire alarm systems are comprised of conduit/wiring, smoke detectors, manual pull stations, addressable modules, amplifier panels, NAC panels, strobes, horns, fire suppression panels (pre-action or clean agent panels), fire alarm control panels, etc. During a fire event, fire alarm systems automatically detect a fire and notify the building occupants and the central monitoring station of the fire event. The systems also monitor the integrity of the fire alarm and fire suppression systems by sending trouble and supervisory signals to the central monitoring station. For an alarm event, the central monitoring station sends an alarm signal to the local fire department.

Life safety features pertain to building construction features intended to limit the spread of fire and smoke or to facilitate occupant egress. Life safety features are comprised of fire barriers, exit stairs, fire rated doors, exit access travel distances, common path travel distances, etc.

2. CONDITION SUMMARY

The fire protection system that is currently installed in the APM stations was install appears to have been updated in the fall of 2009. This assumption is based on the fact that all the Totalpac 2 units located in the mechanical rooms indicate that they were installed during this time frame. The current systems are operable and are in good condition and meet mission requirements and/or intended use; the remaining service life of the existing sprinkler assets is 20+ years.

The existing fire alarm system was observed in the field and appeared to be in good condition. There are some issues with the coverage provided by the notification system located within Terminal B & C.

The existing clean agent system serving the control room for the APM station location in Terminal A shall remain. This is the only control room observed that had a clean agent system located within it. The remaining control rooms were served by a wet pipe system.

3. DEFERRED MAINTENANCE OBSERVATIONS & RECOMMENDATIONS

After the field survey, several deferred maintenance recommendations were identified and are provided below. The items noted below are based on the field observations made at the time of the assessment, and do not necessarily represent all deficiencies in the facility. All deferred maintenance recommendations are provided with deferred maintenance costs in the Fire Protection System Summary Table below, unless noted otherwise.

Priority

· There were some minor spacing deficiencies throughout the areas that are in the APM stations. All of

the minor deficiencies identified are located in the Fire Protection System Summary Table. These minor deficiencies include but are not limited to missing escutcheon plates, cover plates, or escutcheon plates interfering with discharge of the sprinkler.

· In the mechanical room for APM station at Terminal B it was observed that there was a sprinkler that did not have sprinkler guards. Listed sprinkler guards should be installed where sprinklers are subject to mechanical injury per NFPA 13.

· Throughout mechanical and electrical rooms in the facility, addressable control and relay modules were located more than 3 ft. away from devices or circuits they controlled, which is not code compliant per NFPA 72. These fire alarm modules typically controlled air handling units or door hold opens. These modules should be relocated to ensure that they are within 3 feet of the devices/circuits that they control.

Near Term

There were no issues and recommendations made in the near term planning category.

Long Term

The sprinkler system valves tagged for inventory purposes are located in the long term planning category. No deferred maintenance costs were associated with the sprinkler system valves because no issues were observed.

4. OPERATIONS & MAINTENANCE RECOMMENDATIONS

After speaking with O&M staff and completing the field assessments, it is apparent the current maintenance policies, procedures, and periodicities are adequate to maintain the required level of service of the fire sprinkler, fire alarm, and life safety systems.

The sprinkler assets are maintainable with respect to repair parts availability and accessibility. The O&M staff stated there are spare sprinkler heads and sprinkler wrenches available onsite. Other items not onsite, such as specialty valves, sprinkler piping, etc. are readily available from sprinkler manufacturers.

It is recommended that there be continued annual/semi-annual assessments of the sprinkler systems in accordance with NFPA 25. The following examples of NFPA 20 assessments and periodicities, which the O&M staff should continue, are not all inclusive. It is recommended that there will be continued monthly assessments of pressure gauges, hydraulic nameplates, control valves, and pre-action valves to confirm normal operation, identification signs are present, no obstructions to valve access, no physical damage, and no leakage. It is further recommended that quarterly assessments of alarm devices, piping, fire department valves, and fire department connections to confirm normal operation, identification signs are present, no obstructions to valve access, no physical damage, and no leakage.

It is important that there is verification of the existing systems' densities and they are in accordance with the current edition of NEFA 13.

Regular testing of the fire alarm systems should follow what is prescribed by NFPA 72.

It is recommended that verifying the existing systems' densities are in accordance with the current edition NFPA 13, and building and fire code assessments be continued.

D. HVAC SYSTEM (HVAC)

1. ASSET DESCRIPTION

The HVAC system for the APM stations is served from Air Handling Units that are located within the footprint of the APM stations. The majority of the HVAC equipment was assessed during the initial Terminal Assessments of the mechanical systems. The APM station that is located in Terminal B was the only APM stations that was not assessed and is included in this report.

There is a single two-pipe multi-zone air-handling unit that serves as a thermal conditioning unit for the temperature within the APM station. There is also a dedicated air handling unit that is providing fresh air (ventilation air) to the air handling unit that serves the station. In addition to proving the required outside air per ASHRAE standard 62.1 the outside air handling unit is providing pressurization of the terminal station. The air handling units are critical to the operation of the airport. If the equipment fails, space temperatures will be affected in the terminal areas, and if the outside air handling units fail there is the potential of allowing infiltration into the building at one of the many openings within the building envelop. There is a Fan Coil unit serving the equipment rooms that are currently located at Terminal B APM station.

The air handling units are double wall insulated galvanized sheet metal construction. The casings are equipped with doors to access the interior of the equipment for maintenance. The coils are constructed with copper tubes, aluminum fins, with galvanized steel casings. The cooling coils have stainless steel drain pans. Fan motors are mounted on the interior of the casing on vibration isolation bases, with motors in the air stream.

Controls of the units are through the BAS (Building Automation System). The systems were observed to be operational during the assessment. The assessment of the systems was visual in nature, and did not include a functional check of the systems to ensure that they were operating as originally designed.

The unit is controlled from a local thermostat located within the zone it serves.

The supply air from the multi-zone unit is routed in insulated sheet metal duct work with installation. The return to the space is through a return air louver located on the wall of the mechanical room. The room is being used as a return air plenum. The outside air is ducted through the outside air handling unit to a grille in the mechanical room. It is then mixes with the return air prior to entering the air handling unit servicing the APM stations.

2. CONDITION SUMMARY

The air handling units are in fair to good condition with minor observations. Both of the units are in excess of 16 years of age. The majority of the units are greater than 10 years old.

Outside Air Handling Unit Summary

The unit is a constant volume air handling unit that discharges directly into the mechanical room which is acting as a return air plenum; the outside air is mixed with the return air that is drawn into the multi-zone air handling unit. Previous observations of outside air handlers at the airport showed they were programmed to shut down when the outside air drops below 40˚F (adjustable) which causes the building pressure to go negative as well as limit the amount of fresh air supply to the terminal. The hot and chilled water valves are programmed to modulate to 100% open when the fan is turned off.

The OA units utilize refillable carbon filters. There is no indication on the units as to frequency and the last time carbon was replaced.

Multi-Zone Air Handling Unit Summary

The existing multi-zone air handling unit is a constant volume two pipe air handling unit that is maintaining the temperature within the APM station. The system was not observed on the BAS, similar units that have been observed on the site indicate that this unit is a constant volume discharge air temperature set points that are adjustable via the BAS graphics.

The FCUs was located in the data room that is adjacent to the mechanical room and is utilized to cool that space independently of the multi-zone air handling unit.

The hydronic distribution piping that was assessed is mostly original construction and was from external examination was in good working condition at the time of assessment. No destructive testing or removal of internal components was used during the assessment. The internal conditions of the piping were not evaluated or tested.

The HVAC ductwork that was assessed was the original construction and in good working condition.

The existing diffusers located in the APM stations at both Terminal B and Terminal C are having issues with particulates being placed on the wall or ceiling next to the discharge of the diffuser. There are two possible scenarios that are causing this issue.

- The ductwork in these areas needs to be cleaned to remove any dirt or debris that has become trapped.
- At the diffuser, the discharge velocity is great enough that the debris from the plenum space, or the space itself, becomes entrained and deposited on the ceiling or the sidewall. To resolve, provide a lower velocity at the diffusers.

3. DEFERRED MAINTENANCE OBSERVATIONS & RECOMMENDATIONS

Priority

The two existing air handling units are in excess of 16 years old and are 3 years away from their recommended service life and should be replaced. When the units are replaced the outside air ductwork should be routed to the back of the multi-zone unit. The multi-zone unit ductwork configuration can be modified to accommodate the new unit. Due to the size, function and general layout of the space the new air handling system that serves the APM stations should be designed as a single zone variable volume air handling unit to conserve energy.

The locations where there are accumulations of debris near the sidewall diffuser should be examined to determine the cause of the issue. When a cause for the debris is identified the situation should be considered a near term priority.

Near Term

Fan Coil Units (FCU) are in the near term planning category. The FCU needs minor O&M procedures: Check/change filters, updated equipment labeling, and gauges installed on chilled water supply and return.

Long Term

The HVAC ductwork systems and the chilled and hot water piping systems are categorized in long term planning. Some modifications will be required to adapt the new air handling units to the existing mechanical ductwork located in the mechanical room.

4. OPERATIONS & MAINTENANCE RECOMMENDATIONS

The majority of the equipment assessed is installed in locations that make them accessible and maintainable. The manufacturers that have been utilized are reputable and are industry leading companies. There should be no issue with the availability of repair parts.

Observations of the equipment indicated several items that may be addressed by O&M and PM activities. Detailed PM plans were not provided to review. Assumption is that there are not written procedures in place.

It is recommended that a detailed written PM plan be developed for the O&M staff that follows typical OEM recommendations for the equipment in the facility. Typical items should include:

· Provide a written checklist for the equipment that requires assessments, and cautious the inspector to initialize the items as they are verifying functionality.

· Store the checklist for the units in a central location to be examined at any time to see if there are trends at the unit.

· Sensors and thermostats should be tested and calibrated on yearly basis.

· Filter differential pressure should not exceed more than 0.5" DP across the pre-filter and no more than the design differential static pressure for the final filter.

PM items and frequency for specific component types:

· Air Handling Units, Fan Coil Units, should be inspected quarterly (lubrication, belts, coil cleanliness, filters, valve and damper operation, and control sequence validated).

· Hydronic piping:

(1) The differential pressure sensors for the inlet strainers on the pumps should be calibrated and alarms verified to maintain system efficiency.

(2) Check and clean strainers on a routine bases (Quarterly)

(3) Monitor/maintain chemical treatment plan (Monthly)

(4) Sample piping systems in remote / random locations (Yearly)

· Chemical treatment: The chemical treatment plan for the hydronic heating water systems should be verified to ensure it is adequately maintained to prevent premature degradation of the piping and heat exchanger components.

· Control Valves: The control valves on the high temperature hot water system require immediate maintenance. The high temperature of the system requires the valves to be high quality valve. Verify the valve is rated for system operating parameters.

It is recommended that a detailed PM plan be developed for the O&M Staff that follows typical OEM recommendations for the HVAC ductwork system. Based on industry best practices, recommendations specific to the HVAC ductwork include:

· Maintain filter cleanliness and integrity in the associated supply units. (Quarterly)

· Verify cleanliness of ductwork systems and clean as needed. (Random assessment Yearly)

· Random assessments for integrity of insulation systems (Yearly)

· Random ductwork pressure testing for leakage (Yearly)

E. SANITARY SEWER SYSTEM (SANI)

1. ASSET DESCRIPTION

The sanitary sewer piping is installed within the mechanical rooms. The floor and hub drains are contained within these rooms.

2. CONDITION SUMMARY

The drain's body and grate cover as well as the piping observed were in good working condition throughout the APMs.

3. DEFERRED MAINTENANCE OBSERVATIONS & RECOMMENDATIONS

There are no deferred maintenance observations or recommendations for the sanitary sewer system.

4. OPERATIONS & MAINTENANCE RECOMMENDATIONS

The sanitary sewer system is maintainable and accessible, and meets the mission requirements of the sanitary sewer system.

It is recommended that a detailed Standard Operating Procedure and PM plan be developed for the O&M Staff that follows typical OEM recommendations for the sanitary sewer system and incorporates any items specific to the system installed in the facility. Based on industry best practices, and the team's experience, we suggest the following be adhered to for the sanitary sewer system:

· Routinely check piping, both interior and exterior, for any rust or corrosion. Repaint and, if necessary, replace any piping showing significant signs of rust or corrosion to prevent further damage and possible leaks.

· Replace roof curbs and sanitary vent penetrations in locations where vent VTRs have been damaged.

· Check wall and roof penetrations for proper sealing to ensure no leaks exist.

· Check hubless cast iron piping couplings for tight connections and tighten as necessary to prevent any future disconnect or leaks (Quarterly).

F. STRUCTURAL SYSTEM (STRL)

1. ASSET DESCRIPTION

The structural system for the terminal stations consists of an elevated slab supported by concrete bents and girders. Elevated concrete floor slabs provide support for architectural floor finishes, and in some cases, act as diaphragms in the lateral load resisting system of the building structure.

The superstructure of this building consists of steel beams and columns. Lateral support and curtain wall support is provided by painted steel braced frames. These components provide vertical and lateral support for the building.

Structural walls resist the vertical and lateral forces acting on the structure. These consist of concrete masonry, composite metal panels, and curtain walls. Most of the exposed structural steel members are located on the exterior of the structure or supporting curtain walls at the bottom of the escalators.

2. CONDITION SUMMARY

In general, the elevated slabs for the terminal stations are in good condition. The concrete columns of the substructure are also in good operating condition, but do have minor issues. These include concrete spalling, pot marked concrete indicative of excessive voids within the column, and delamination of surface coatings. The guideway support bents do show significant concrete spalling, resulting in exposed rebar, at the

joint with the guideway decking in some places, but the bents themselves are in good condition, only showing minor shrinkage cracking.

At the terminal stations, the concrete walkways for the guideway exhibit mild shrinkage cracking. This is typical of concrete construction and is more evident in areas with widely spaced concrete joints. Shrinkage cracks (as

opposed to movement cracks) should not increase in quantity or size over time. The guideway within the station area exhibits moderate cracking in some places, to the extent that condensation from the trains was seen dripping into the cracks.

The exposed structural superstructure, which is either painted or has spray-on fireproofing, is in good condition with no noticeable flaking. At Terminal A, further investigation into the as-built condition of the anchor bolts for the east side maintenance walkway roof needs to occur. In its current condition, the anchor bolts do not comply with structural steel best practices.

Inside the terminal stations, much of the walls are covered in architectural finishes. Two types of cracks can be seen on the walls, stress cracking and cracking due to poor quality in drywall installation. Stress cracking is generally present where the wall changes cross section, such as at corners, and is not typically a cause for concern.

3. DEFERRED MAINTENANCE OBSERVATIONS & RECOMMENDATIONS

Priority

· Patch and repair spalled concrete at locations where rebar is exposed.

Near Term

· Apply injectable epoxy into wide cracks in guideway rails.

· Investigate as-built conditions for anchor bolts that were not constructed using best practices.

Long Term

Items included in the long term planning category are minor in nature and do not affect the structural integrity of the building. Addressing these items can extend the service life of the overall structural system.

· Monitor minor cracks in walls and slabs for signs of movement.

· Patch concrete spalls and cracks on columns and reseal concrete.

· Remove corrosion and repaint noted structural elements.

· Apply surface coating to concrete exposed to the elements to prevent damage.

· Repair cracks in drywall.

4. OPERATIONS & MAINTENANCE RECOMMENDATIONS

A crack monitoring program should be considered to identify areas which show signs of ongoing deterioration. Concrete should be repaired as a priority item whenever spalling exposes rebar, as this can lead to corrosion and reduced structural integrity of the system. Recommend applying a weather-resistant surface coating to all columns to prevent damage.

Painted structural steel should be monitored for signs of corrosion, and finishes repaired or replaced at the first signs of deterioration to prevent future corrosion. Any damage to fireproofing should be promptly repaired. Steel exposed in exterior areas should be monitored for signs of animal and bird nesting; any nests should be removed promptly and measures taken to prevent future roosting.

G. STORM WATER SYSTEM (STRM)

1. ASSET DESCRIPTION

The storm water system for the APM stations consists of roof drains and overflow drains and associated piping.

2. CONDITION SUMMARY

The storm water piping is original construction and was in good working condition at the time of assessment. No deferred maintenance issues were recorded at the time of assessment.

The age of the roof drains and overflow drains on the roof of the APM's vary with the age of the construction/ renovation of the APM station roof.

The roof drains and overflow drains that were observed as part of the condition assessment were in good working condition at time of assessment.

3. DEFERRED MAINTENANCE OBSERVATIONS & RECOMMENDATIONS

Priority

There were no deferred maintenance items that fell into the priority planning.

Near Term

There were no deferred maintenance items that fell into the near term planning.

Long Term

The majority of the roof drains and overflow flow drains assessed at the APM Stations fall into the long term planning category due to the low risk effect of impacting the functionality of the systems and the overall condition of the drains and the piping within the facility. It is recommended that the existing strainers should be cleaned because of accumulated blockage to ensure proper flow at the overflow drains. Clean, prime, and paint strainers that are showing signs of rust or deterioration.

4. OPERATIONS & MAINTENANCE RECOMMENDATIONS

The storm water system assessed during the condition assessment is maintainable, accessible and meets mission requirements of the storm water systems at the APM stations. Detailed PM plans are not in place for the storm water system. It is recommended that a detailed Standard Operating Procedure and PM plan be developed for the O&M staff that follows typical OEM recommendations for the storm water system and incorporates any items specific to the system installed in the facility. Based on industry best practices and the teams experience, recommendations specific to the storm water system include:

· Routinely check piping, both interior and exterior, for any rust or corrosion. Repaint and, if necessary, replace any piping showing significant signs of rust or corrosion to prevent further damage and possible leaks.

· Check wall and roof penetrations for proper sealing to ensure no leaks exist (Quarterly).

· Check hubless cast iron piping couplings for tight connections and tighten as necessary to prevent any future disconnect or leaks (Quarterly).

· Routinely check roof drains and overflow drains for any blockage and clear as required. Check and clean the roof drain strainers as well.

· Check surrounding roof areas for any water ponding. This could be a result of a clogged drain or strainer (Quarterly).

· Check roof drains to verify that strainers are properly connected to the drain base, so as to properly catch any potential debris that might block or clog the roof drains or overflow drains (Yearly).

· Check float switch within each pit, and if not already installed, provide and install a float guard to protect against potential blockage or obstructions to the float.

· Check sump pit for debris that may cause partial blockage for piping and clean as required. Additionally, clean sump pump of dirt, gravel, sand, and other debris to increase efficiency of equipment (Monthly).

· Develop a lead lag schedule to increase efficiency and life of the equipment.

H. WATER SYSTEM (WATR)

1. ASSET DESCRIPTION

The water system consists of domestic water piping located in the APM station footprint.

2. CONDITION SUMMARY

The domestic water piping that was observed within the APM station did not show any deficiencies within the piping. No deferred maintenance issues were recorded for these assets.

3. DEFERRED MAINTENANCE OBSERVATIONS & RECOMMENDATIONS

Priority

In mechanical rooms, it was observed that no pipe guard was provided for piping that rested on unistrut hangers. It is recommended to provide and install pipe guards to protect pipe against dissimilar metals corrosion (copper pipe resting on metal hangers).

Near Term

There is no deferred maintenance items observed that fell into the priority planning category.

Long Term

There is no deferred maintenance items observed that fall into the long term planning category.

4. OPERATIONS & MAINTENANCE RECOMMENDATIONS

The components of the water system are maintainable, easily accessible and meet mission requirements, but detailed PM plans are not in place for these components that are maintained by HAS.

It is recommended that a detailed Standard Operating Procedure and PM plan be developed for the O&M staff that follows typical OEM guidelines for the water system and incorporates any items specific to the system installed in the facility. Based on industry best practices it is recommended that domestic water heaters and domestic water heat exchangers include:

· Check piping connections to the water heaters to ensure there is no rust or corrosion buildup which would cause damage to the insulation and thus reduce the unit's efficiency.

· Routinely check piping for any rust, corrosion, torn insulation or leaks, and replace insulation, pipe or fittings as needed (Semi-Annually).

APPENDIX A
SERVICE LIFE REFERENCES

APPENDIX A - SERVICE LIFE REFERENCES

Houston Airport System (HAS)
APM Materials Service Life Expectancies
Architectural Elements

Category / Element	General Description	Service Life		References
		Estimated Minimum (in Years)	Estimated Maximum (in Years)	
Ceilings				
Gypsum Board	Unfinished	30	70	Association of Wall and Ceiling Industries International
Paint on Gypsum Board	Acrylic Latex	5	10	Glidden Company and Sherwin Williams - Technical Support
Acoustic Ceiling Systems	Tile and Grid	10	30	Cost Modeling Limited and USG Technical Support
Doors				
Interior Hollow Metal	Standard Duty	80	100	Industry standard/Professional Experience
Interior Hollow Metal	Sliding	80	100	Industry standard/Professional Experience
Interior Hollow Metal	Fire Rated	80	100	Industry standard/Professional Experience
Interior Aluminum	Brushed Aluminum	25	30	Industry standard/Professional Experience
Exterior Hollow Metal	Standard Duty	25	30	Industry standard/Professional Experience
Exterior Aluminum	Brushed Aluminum	8	10	Industry standard/Professional Experience
Automatic Operators	Standard Duty	10	15	Stanley Access Systems - Technical Support
Elevator Doors	Stainless Steel	40	50	ThyssenKrupp Technical Support
Paint on Interior Doors	Enamel	10	20	Glidden Company
Paint on Exterior Doors	Industrial Enamel	10	20	Glidden Company and NACE Paper 08279
Floors				
Terrazzo		Lifetime	Lifetime	National Terrazzo and Mosaic Association
Carpet	Commercial Grade	9	13	Carpet and Rug Institute - Adjusted for AP Application
Concrete	Unfinished	Lifetime	Lifetime	Industry standard/Professional Experience
Vinyl Composition Tile	1/8" Thick - Through pattern	10	25	Cost Modeling Limited
Roofs				
Metal	Standing Seam Metal	30	50	National Roofing Contractors Association
Metal	Insulated Metal Panel	20	50	National Roofing Contractors Association
Built Up Roofing, Asphalt	Four Ply Asphaltic	20	25	National Roofing Contractors Association
Single Ply	Non-Reinforced EPDM (Synthetic Rubber)	10	20	National Roofing Contractors Association
Single Ply	Reinforced EPDM (Synthetic Rubber)	10	30	National Roofing Contractors Association
Single Ply	TPO, PVC, Hypalon (Hybrid Polymer)	10	30	National Roofing Contractors Association
Gutters and Downspouts	Prefinished Steel or Aluminum	20	40+	Cost Modeling Limited
Walls				
- Exterior Walls				
Brick	Veneer	Lifetime	Lifetime	Brick Institute of America
Concrete Masonry	Insulated	Lifetime	Lifetime	Cost Modeling Limited
Stone	Veneer	100	100+	Industry Standard/Professional Experience
Metal	Uninsulated	30	50	Cost Modeling Limited
Metal	Insulated Composite	30	50	Industry Standard/Professional Experience
Curtain Wall	Aluminum Frame with Insulated Glass	30	40	Cost Modeling Limited
Curtain Wall Sealants	Silicone	15	20	Athena Sustainable Materials Institute
- Interior Walls				
Gypsum Board on Metal Studs	Unfinished	30	70	Association of Wall and Ceiling Industries International
Paint on Gypsum Board	Architectural Coating	5	20	Glidden Company and Sherwin Williams - Technical Support
- Insulation				
Wall, Rigid	Closed Cell Polystyrene	Lifetime	Lifetime	CertainTeed Corporation - Technical Support
Wall, Batt	Fiberglass	Lifetime	Lifetime	CertainTeed Corporation - Technical Support
Roof, Rigid	Closed Cell Polystyrene or Polyisocyanurate	Lifetime	Lifetime	CertainTeed Corporation - Technical Support
- Paint				
Exterior on Steel	Industrial Enamel	7	15	Glidden Company and NACE Paper 08279
Repainting of Gypsum Board	Architectural Coating	5	20	Athena Sustainable Materials Institute and Sherwin Williams Technical Support
Windows				
Glazing (Glass) Insulated		10	30	Athena Sustainable Materials Institute
Glazing (Glass) Single Pane		20	20+	Industry Standard/Professional Experience
Aluminum Window Frames	Aluminum	40	50	Cost Modeling Limited
Glazing Gaskets	High Quality	15	35	Industry Standard/Professional Experience
Glazing Sealants	High Quality	15	35	Industry Standard/Professional Experience
Anodized Finishes	High Quality	20	30	Industry Standard/Professional Experience
Miscellaneous				
Handrails	Painted Steel	Lifetime	Lifetime	Industry Standard/Professional Experience
Guardrails	Painted Steel	Lifetime	Lifetime	Industry Standard/Professional Experience
Column Surrounds	Prefinished	Lifetime	Lifetime	Industry Standard/Professional Experience
Sealants - On Concrete	Polyurethane	15	25	Industry Standard/Professional Experience
Sealants - Door and Window Frames	Polyurethane	15	25	Industry Standard/Professional Experience
Sealants - Miscellaneous Interior	Polyurethane	15	25	Industry Standard/Professional Experience
Sealants - Miscellaneous Exterior	Polyurethane	15	25	Industry Standard/Professional Experience

APPENDIX B
CODE SUMMARY

APPENDIX B - CODE SUMMARY

Code Summary

This Appendix is a summary of the Building Code requirements in effect at the time the last major construction project occurred which was the construction of IAH Terminal A. Burns & McDonnell review of site conditions and building code deficiencies focused on current building conditions related to current building codes.

The basis of review is to remedy non-compliant conditions so the facilities are brought in line with current building code practices and standards. The list of applicable building codes included below and represents applicable codes at the time of construction of Terminal A. These code references are included as a reference for previous design conditions.

Following the list of codes and standards used in the design of Terminal A is a list of current codes. Review of the APM stations and potential deficiencies is based on current codes and standards.

Original Building Code

Building Code requirements and code status during original IAH Terminal A Construction:

Original Design/Construction: 1965 - 1969

- Uniform Building Code (UBC) 1961 Edition with City of Houston Amendments (HBC) 1963
  - Occupancy Classification: Group A (Primary Use, Transportation Terminal)
  - Construction Type: Type I
  - Fire Suppression: Existing Full building Automatic Sprinklers
- Uniform Fire Code (UFC) 1963 Edition
- National Electrical Code (NEC) 1963
- International Mechanical Code (IMC) 1963
- International Plumbing Code(IPC) 1963

IAH Terminal A Improvements and Additions: Central Building / North and South Concourse Buildings:

IAH Terminal A Improvements and Additions Construction: 1995 – 2002.

- Uniform Building Code (UBC) 1991 Edition with City of Houston Amendments (HBC) 1991 Edition
  - Occupancy Classification: Group A-2.1 (Primary Use, Transportation Terminal)
  - Construction Type: Type I
  - Fire Suppression: Existing Full building Automatic Sprinklers
- Uniform Fire Code (UFC) 1991 Edition
- National Electrical Code (NEC) 1993
- Uniform Mechanical Code (UMC) 1991
- Uniform Plumbing Code(UPC) 1991

Current Building Code Requirements

The following construction codes are currently being enforced by the City of Houston:

- 2006 International Building Code (with City of Houston Amendments)
- 2006 International Fire Code (with City of Houston Amendments)
- 2006 Uniform Plumbing Code (with City of Houston Amendments)
- 2006 Uniform Mechanical Code (with City of Houston Amendments)
- 2011 National Electrical Code (with City of Houston Amendments)
- 2009 I.E.C.C. or ASHRAE 90.1-2007 (Commercial) (with City of Houston Amendments)
- Texas Health & Safety Code Section 754.001 - Safety Device Requirement For Passenger Elevators
- 2012 Architectural Barriers - Texas Accessibility Standards (TAS)

Current applicable National Fire Protection Association (NFPA) Standards:

- NFPA 13 Installation of Sprinkler Systems
- NFPA 14 Installation of Standpipe and Hose Systems
- NFPA 20 Installation of Centrifugal Fire Pumps
- NFPA 30 Flammable and Combustible Liquids
- NFPA 72 National Fire Alarm Code
- NFPA 80 Fire Doors and Fire Windows
- NFPA 110 Emergency And Standby Power Systems
- NFPA 407 Aircraft Fuel Servicing
- NFPA 780 Installation of Lightning Protection Code

Codes and standards not referenced in the City of Houston Building Code but may contain helpful information:

- AC No: 150/5220-21C - Aircraft Boarding Equipment.
- AC 150/5360-13 - Planning and Design Guidelines for Airport Terminal Facilities
- NFPA 101 Life Safety Code
- NFPA 415 - Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways.

City of Houston Code Enforcement Representative stated that the application of building codes to existing HAS buildings is on a case by case basis due to the complexity of projects and the number of specialized codes and standards applicable to air terminal construction. Plan approval of building alterations typically includes:

- Confirmation that the proposed occupancy group does not exceed the existing use
- Review of all structural modifications and effects on existing structure
- Review of life safety issues including emergency exiting distance, path width
- Compliance with fire rated construction requirements of structure components, floors, walls and roof systems

Additions, alterations or repairs to existing buildings are addressed in IBC 2006 Existing Building Code, Section 302. Application of current building codes to new construction shall conform to the following:

- Unless otherwise specified, current editions of all listed or referenced codes will govern and will be the basis of design for areas of Terminal A that area to be remodeled.
- Compliance with NFPA standards is required by the City of Houston, either directly or by reference from other codes.
- Compliance with NFPA standards that are not required by the City of Houston may assist in the resolution of specific technical issues.
- Areas of that are not remodeled will be evaluated for compliance with relevant code requirements. These areas will be evaluated with respect to either remaining “as is” or with respect to their relationship to adjacent areas that will be remodeled.

APPENDIX B - CODE SUMMARY

Any modifications made to the original design shall comply with the following statements:

Where repairs are made to structural elements of an existing building, and uncovered structural elements are found to be unsound or otherwise structurally deficient, such elements shall be made to conform to the building code requirements for new structures.

APPENDIX C
ASSET SUMMARY TABLES

APPENDIX C - ASSET SUMMARY TABLES

Airport	Building_Number	Level	Room_Name	APM_Station_Location	System_List	System	Architectural_Component List	Component	Component_Description	SysFunction	YrInstalled	DesignLife	RemainingYears	Operational	Performing	MaintNeeded	MaintCost	ACI	Comments	Description	Recommendations	Planning Category
IAH	APM	Elevated Platform	South elevation at train platform	A	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior cladding	2009	50	45	Y	Y	Clean metal panels	$50,000	10	Some dirtbuilup but no obvious deficiencies	Metal panel system at door entry wall with dry joints (metal but no sealant)	Clean metal panels	Priority
IAH	APM	Elevated Platform	North elevation at train platform	A	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior cladding	2010	50	45	Y	Y	Clean metal panels	$50,000	10	Considerable dirt buildup and pigeon droppings	Metal panel systems at each side of train area	Clean metal panels	Priority
IAH	APM	Elevated Platform	north elevation from train platform	A	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Weather protection; daylight	2010	25	20	Y	Y	None	$6,000	10	Glass and framing have considerable dirt buildup and pigeon droppings	Glass and aluminum framing system at north train area	Clean glass and aluminum framing	Priority
IAH	APM	Elevated Platform	South elev, west end of APM-A; set-back metal panel wall at escalator	A	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior cladding	2010	50	45	Y	Y	Clean as part of normal maintenance program	$100,000	10	Dirt build-up-system appears to be dry-joint system (no sealant at joints)	General dirt streaking from water run down	Clean as part of normal maintenance program	Priority
IAH	APM	Elevated Platform	South elev, west end of APM-A; set back glazing system at escalator	A	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	2010	50	45	Y	Y	Clean glass as part of normal maintenance program.	$35,000	10	Dirt build-up	Glass has moderate to heavy dirt build-up.	Clean glass as part of normal maintenance program.	Priority
IAH	APM	Elevated Platform	South elevation at south end of APM-A; set back glazing system at escalator	A	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	2010	50	45	Y	Y	Clean as part of normal maintenance program.	$20,000	10	Dirt build-up	Horizontal framing has dirt build-up	Clean as part of normal maintenance program.	Priority
IAH	APM	Elevated Platform	Stairwell at east end	A	Architectural (artwork, millwork, …)	ARCH		CLDG	Cladding	Screen wall for stairs	2010	50	45	Y	Y	Clean dirt from panels and support framing	$80,000	10	No deficiencies; just dirt build-up on panels and support steel	Perforated aluminuml panels	Clean dirt from panels and support framing	Priority
IAH	APM	Elevated Platform	North elev at west end	A	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior cladding	2010	50	45	Y	Y	Access wall and adjust backer panel at joint as required to eliminate displacement	$15,000	10	Backer metal displaced at panel joint	Joint in metal panel system	Access wall and adjust backer panel at joint as required to eliminate displacement	Priority
IAH	APM	Elevated Platform	North elev at west end	A	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	2010	50	45	Y	Y	Clean panels	$25,000	10	No obvious defiecciencies as viewed from the ground; just dirt buildup	Metal backed joint system; no sealant in joints	Clean panels	Priority
IAH	APM	Elevated Platform	North elev	A	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element Protection; Daylighting	2010	50	45	Y	Y	Clean glass and aluminum framing	$30,000	10	No obvious deficiencies as observed from ground; just dirt buildup	Dirt buidup	Clean glass and aluminum framing	Priority
IAH	APM	Elevated Platform	North elev at east end	A	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	2010	50	45	Y	Y	Clean panels	$25,000	10	No obvious deficiencies as viewed from the ground; just dirt buildup	Metal backed joint system; no sealant in joints	Clean panels	Priority
IAH	APM	Elevated Platform	West end of train area	A	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Exterior Wall Cladding	2010	25	10	Y	Y	Clean glass and aluminum framing	$4,000	10	Curtain wall glazing system used as screen wall at end of train guideway; open at perimeter of CW system	Dirt build-up and pigeon droppings	Clean glass and aluminum framing	Priority
IAH	APM	Elevated Platform	South elev, west end of APM-A; set back glazing system at escalator	A	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Exterior Wall Cladding	2010	25	20	Y	Y	Monitor for future leakage	$0	7	Sealant adhered to concrete and edge of trim covers where concrete structure penetrates CW system	No signs of leakage on interior	Monitor for future leakage	Long Term
IAH	APM	Elevated Platform	South elev, west end of APM-A; set back glazing system at escalator	A	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	2010	25	20	Y	Y	Clean glass and metal framing	$15,000	10	Very dirty; access is difficult due to traffic lanes below	Glass and aluminum framing have considerable dirt build-up and pigeon droppings	Clean glass and metal framing	Priority
IAH	APM	Elevated Platform	South elev at west end	A	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	2010	50	45	Y	Y	Clean panels	$15,000	10	No obvious deficiencies; just dirty	Metal backed joint system in panel; no sealant at joints	Clean panels	Priority
IAH	APM	Elevated Platform	Clerestory	A	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	2010	25	20	Y	Y	None	$0	10	Appears to be the same system as other CW at interior walls of A; could not do get close to confirm; no visible deficiencies	Interior CW	None	Long Term

APPENDIX C - ASSET SUMMARY TABLES

Airport	Building_Number	Level	Room_Name	APM_Station_Location	System_List	System	Architectural_Component List	Component	Component_Description	SysFunction	YrInstalled	DesignLife	RemainingYears	Operational	Performing	MaintNeeded	MaintCost	ACI	Comments	Description	Recommendations	Planning Category
IAH	APM	Elevated Platform	A Interior CW at west end	A	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	2010	25	20	Y	Y	None	$0	10	No deficiences noted	2-1/2x7-1/4 system; glass and gaskets look good	None	Long Term
IAH	APM	Elevated Platform	A Interior CW at south elev	A	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	2010	25	20	Y	Y	None	$0	10	No deficiencies noted	2-1/2x7-1/4 system; glass and gaskets look good	None	Long Term
IAH	APM	Elevated Platform	A Interior CW at north elev	A	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	2010	25	20	Y	Y	None	$0	10	No defieciencies noted	2-1/2 x7-1/4 system; glass and gaskets look good	None	Long Term
IAH	APM	Elevated Platform	South elev at west end	A	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	2010	25	20	Y	Y	None	$0	10	Laminatede vision glass and gaskets	Glass and gaskets look good	None	Long Term
IAH	APM	Elevated Platform	South elev @ west end	A	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	2010	50	45	Y	Y	None	$0	10	Aluminum closure at base	Splice seals and per seal look good	None	Long Term
IAH	APM	Elevated Platform	South elev @ middle	A	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	2010	25	20	Y	Y	None	$0	10	Laminated vision glass	Viracon u7; Laminated; 16 CFR 1201; Z97.1-???	None	Long Term
IAH	APM	Elevated Platform	South elevation at middle	A	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	2010	50	45	Y	Y	Clean panels and framing	$15,000	10	Metal spandrel panels and gaskets	Metal panels glazed into pressure bar CW system	Clean panels and framing	Priority
IAH	APM	Elevated Platform	South elev @ east end	A	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	2010	50	45	Y	Y	Clean panels and framing	$15,000	10	Metal spandrel panels and gaskets	Metal panels glazed into pressure bar CW system	Clean panels and framing	Priority
IAH	APM	Elevated Platform	South elev @ east end	A	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	2010	50	45	Y	Y	Clean cap and metal framing just below	$10,000	10	Seals at splices are silicone; adhering well; dirty; cap is dirty as are trim covers just below	Parapet cap, splice joints	Clean cap and metal framing just below	Priority
IAH	APM	Elevated Platform	South elev @ east end	A	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	2010	25	20	Y	Y	None	$0	10	Glass at train area; has a frit pattern; might be laminated	Vision glass	None	Long Term
IAH	APM	Elevated Platform	South elev @ east end	A	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	2010	50	45	Y	Y	None	$0	10	Gaskets are uniformly and consistently installed	Exterior gaskets	None	Long Term
IAH	APM	Elevated Platform	South elevation, west end of APM-A; set back glazing system at escalator	A	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Aluminum framing members	2010	25	20	Y	Y	Clean framing members.	$10,000	10	Dirt build-up	Horizontal framing has dirt build-up	Clean framing members.	Priority
IAH	APM	Elevated Platform	South elev, west end of APM-A; set back glazing system at escalator	A	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	2010	25	20	Y	Y	Clean glass	$5,000	10	Dirt build-up	Glass has moderate to heavy dirt build-up	Clean glass	Priority
IAH	APM	Elevated Platform	South elev, west end of APM-A; set-back metal panel wall at escalator	A	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	2010	25	20	Y	Y	Clean panels and framing	$8,000	10	Dirt build-up-system appears to be dry-joint system (no sealant at joints)	General dirt streaking from water run down	Clean panels and framing	Priority
IAH	APM	Elevated Platform	APM GROUND LEVEL	A	Architectural (artwork, millwork, …)	ARCH		CLNG	Ceiling	Access	2010	50	45	Y	Y	Paint to prevent rust and staining of ceiling	$500	10			Paint to prevent rust and staining of ceiling	Priority
IAH	APM	Elevated Platform	APM LOWER LEVEL	A	Architectural (artwork, millwork, …)	ARCH		FLOR	Floor	Protective Base	2010	50	45	Y	Y	Install missing SS base	$1,000	0	Base missing	Stainless Steel	Install missing SS base	Priority
IAH	APM	Elevated Platform	APM UPPER LEVEL	A	Architectural (artwork, millwork, …)	ARCH		WALL	Walls	Protective Wall Cover	2010	50	45	Y	Y	Adjust corner panel filler	$500	10	Corner panel trom		Adjust corner panel filler	Priority
IAH	APM	0	APM STATION	A	Architectural (artwork, millwork, …)	ARCH	Lighting	LITE	Lighting				14	Y	Y	Cleaning		7	Existing Fixtures are operational		Existing to remain	Priority

APPENDIX C - ASSET SUMMARY TABLES

Airport	Building_Number	Level	Room_Name	APM_Station_Location	System_List	System	Architectural_Component List	Component	Component_Description	SysFunction	YrInstalled	DesignLife	RemainingYears	Operational	Performing	MaintNeeded	MaintCost	ACI	Comments	Description	Recommendations	Planning Category
IAH	APM	0	APM	A	Architectural (artwork, millwork, …)	ARCH	Lighting	LITE	Lighting					Y	Y	Fixture maintenace		7	Lighting average of 16 foot candles in the general space and 115 footcandles near the train boarding doors. 66 linear fluorescents 33 spots 18 square downligts 24 cans.	Four lamps need to be replaced as well as two acrylic diffusers for the linear fixtures.	A lighting system with daylighting controls would dim the existing lighting system to accomodate the daylight would drasticly reduce energy costs. The use of LED lamps for use in the accent spot lights would cut down on maintenance.	Long Term
IAH	APM	Elevated Platform	north elevation from train platform	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Weather protection; daylight	1999	25	9	Y	Y	Clean glass and aluminum framing	$15,000	10	Considerable dirt buildup on interior side of glass and aluminum framing	Glazing system at airside	Clean glass and aluminum framing	Priority
IAH	APM	Elevated Platform	Ext north elevation from train platform	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	1999	25	9	Y	Y	Recommend remove all lites at these end walls to allow for air escape as trains enter and exit station	$15,000	5	2 of the 4 lites at west end have been removed; all 4 lites at east end are still in place	End return walls at east and west ends of north elevation at airside	Recommend remove all lites at these end walls to allow for air escape as trains enter and exit station	Priority
IAH	APM	Elevated Platform	South elevation @ east end from train platform	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protecton; daylight	1999	25	9	Y	Y	Recommend remove both lites of glass to allow for air escape as trains enter and exit station	$15,000	5	Glass was to be removed during observation but was too windy	Two lites of glass at return wall at east end	Recommend remove both lites of glass to allow for air escape as trains enter and exit station	Priority
IAH	APM	Elevated Platform	South elevation from train platform	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Glass stop	1999	25	9	Y	Y	None - Glass stop was reinstalled during the observations	$0	0	Glass stop had become dislodged and fallen from the frame	Glass stop (glazing bead) at head of the 11th large lite of glass from the east end	None - Glass stop was reinstalled during the observations	Long Term
IAH	APM	Elevated Platform	South elevation from train platform	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Glass	1999	25	9	Y	Y	Glass was repositioned in frame and sealant added at jambs to prevent further lateral movement	$0	5	Glass had shifted horizontally and had lost engagement to frame at left jamb (viewed from exterior)	Lower lite of glass, 2nd from west end of south elevation	Glass was repositioned in frame and sealant added at jambs to prevent further lateral movement	Long Term
IAH	APM	Elevated Platform	South elevation from train platform	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Glass	1999	25	9	N	Y	None	$0	5	Glass was removed as a precaution; 1/2" wide clam shell damage was noted at one vertical edge of glass	Lower lite at return wall at west elevation	None	Long Term
IAH	APM	Elevated Platform	South elevation from train platform	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	1999	25	9	Y	Y	Further investigation required to determine if anchorage is adequate.	$0	5	Aluminum framing for glazing at west end of south elevation where glass fell	Angles installed at head of aluminum frame to anchor frame into ceiling	Further investigation required to determine if anchorage is adequate.	Long Term
IAH	APM	Elevated Platform	North and south glazed walls on interior of APM B	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	1999	25	9	Y	Y	None	$0	7	No obvious signs of deterioration	IGU in CW framing; pressure bar; 2-1/2 x 71/4	None	Long Term
IAH	APM	Elevated Platform	Exterior review of East end of APM-B	B	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior wall cladding	1999	50	34	Y	Y	Clean first with soap and water; more robust cleaner if needed; sample area first	$125,000	10	Dirt build-up/stain lines	Occur typically at horiz joints	Clean first with soap and water; more robust cleaner if needed; sample area first	Priority
IAH	APM	Elevated Platform	Stair at east end of B	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	1999	25	9	Y	Y	Verify if safety glazing is provided at first two lites from right end (south) adjacent to top of upper landing		7	2 lites at upper stair landing have no safety glazing markings at bottom	IGU in Cw framing; pressure bar; 2-1/2x7-1/4	Verify glass at top of upper landing is safety glazing; If existing is not safety glazing, remove and replace glass with safety glazing.	Priority

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Airport	Building_Number	Level	Room_Name	APM_Station_Location	System_List	System	Architectural_Component List	Component	Component_Description	SysFunction	YrInstalled	DesignLife	RemainingYears	Operational	Performing	MaintNeeded	MaintCost	ACI	Comments	Description	Recommendations	Planning Category
IAH	APM	Elevated Platform	Station side north elevation at west end	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Daylighting	1999	25	9	Y	Y	Continue to clean glass and framing; monitor areas in and below for water leaks which would be a sign of problems w/ ext wall system	$10,000	10	Good shape for age. No visible defincies or concerns	Ext gaskets; appears to be a pressure bar system w/ covers; glass is IGU; silicone sealant at perimeter;glass and metal light dirt	Continue to clean glass and framing; monitor areas in and below for water leaks which would be a sign of problems w/ ext wall system	Priority
IAH	APM	Elevated Platform	Ext north elev from train platform	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	1999	25	9	Y	Y	Inspect and reseal all questionable areas to prevent water infiltration	$10,000	7	Seals are questionable for effectiveness to prevent water infiltration	Closure and seals at window sill	Inspect and reseal all questionable areas to prevent water infiltration	Priority
IAH	APM	Elevated Platform	Ext north elevation from train platform	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	1999	25	9	Y	Y	Install missing sponge gaskets	$5,000	10	Missing interior sponge gaskets top and bottom of 19th lite of glass (small) from east end	Interior Sponge gasket	Install missing sponge gaskets	Priority
IAH	APM	Elevated Platform	Ext north elevation from train platform	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	1999	25	9	Y	Y	Monitor for continued delamination; typ an aesthetic concern unless grows into glass field	$2,000	7	Insulated glass units (IGU)	Delamination of laminate at setting blocks? Noted at 15th and 16th, and 32nd-33rd small lites from east end	Monitor for continued delamination; typ an aesthetic concern unless grows into glass field	Priority
IAH	APM	Elevated Platform	North elevation - inside of exterior wall	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	1999	25	9	Y	Y	Clean framing and glass	$5,000	10	Dirty framing	Center set SF type system, i.e. snap together mullions; IGU HS inner and outer lites; may be laminated glass in IGU; sponge on interior; smeared at and near corners; can at sill, w/ one fastener at vertical mullions	Clean framing and glass	Priority
IAH	APM	Elevated Platform	Ext north at west end	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element Protection; Daylighting	1999	25	9	Y	Y	Inspect entire elevation for missing or dislodges gaskets; install new gaskets where missing; reset dislodged gaskets	$25,000	3	Missing exterior gaskets	Two end lites at west end; lower lite missing gasket at head; upper lite missing gaskets at both jambs and at head	Inspect entire elevation for missing or dislodges gaskets; install new gaskets where missing; reset dislodged gaskets	Priority
IAH	APM	Elevated Platform	Ext north at west end	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Exterior Wall Cladding	1999	25	9	Y	Y	Ok	$0	10	General info only	West end wall	Ok	Long Term
IAH	APM	Elevated Platform	Ext north	B	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	1999	50	34	Y	Y	Install silicone bridge seal at all splice joints; seal horiz joint between cap and metal panel; marry all seals with existing seals	$25,000	7	Metal parapet cap	Splice joints may be bed sealed but no sealant visible	Install silicone bridge seal at all splice joints; seal horiz joint between cap and metal panel; marry all seals with existing seals	Priority
IAH	APM	Elevated Platform	Ext north	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Exterior Wall Cladding	1999	25	9	Y	Y	Monitor for further deterioration; aesthetic concern only	$0	7	Bronze anodized alum finish	Some finish deterioration due to elements and aircraft exhaust	Monitor for further deterioration; aesthetic concern only	Long Term
IAH	APM	Elevated Platform	Ext north elev	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element Protection; Daylighting	1999	25	9	Y	Y	Inspect all and re-install all disengaged gaskets; set gasket corners in sealant	$10,000	7	Exterior gaskets	Partially disengaged gaskets typ at head near right end	Inspect all and re-install all disengaged gaskets; set gasket corners in sealant	Priority
IAH	APM	Elevated Platform	Ext north	B	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	1999	50	34	Y	Y	Replace panel	$8,000	5	Damaged soffit panel	Panel was torn at bottom where returned to form soffit	Replace panel	Priority

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IAH	APM	Elevated Platform	Ext north	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element Protection; Daylighting	1999	25	9	Y	Y	None	$0	10	Glass is insulated (double-pane)	Glass marked as Oldcastle heat strenthened - both lites	None	Long Term
IAH	APM	Elevated Platform	Ext north	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element Protection; Daylighting	1999	25	9	Y	Y	Gasket was reset in field during observations; no additional work needed	$0	10	Exterior gaskets	One gasket slightly dislodged	Gasket was reset in field during observations; no additional work needed	Long Term
IAH	APM	Elevated Platform	Ext north elev	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element Protection; Daylighting	1999	25	9	Y	Y	None	$0	7	IGU; outside glazed system; 2-1/2" system	Weeps in can 24"; gaskets pretty tight at corners	None	Long Term
IAH	APM	Elevated Platform	Ext north elev	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Exterior Wall Cladding	1999	25	9	Y	Y	Add sealant at all splice joints; install seal at horiz joint between sill flash and top of panel; marry new seals to all existing seals	$25,000	7	Splice joint in sill flashing	Splice seals not continuos down the vertical face; horiz jt flash to panel not sealed	Add sealant at all splice joints; install seal at horiz joint between sill flash and top of panel; marry new seals to all existing seals	Priority
IAH	APM	Elevated Platform	Ext north elevation	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Exterior Wall Cladding	1999	25	9	Y	Y	Add sealant so vertical panel joint is completely sealed off to underside of sill flashing	$5,000	5	Sealant at vertical joint @ panel below window	Seal stops ~1" below wdw sill flashing	Add sealant so vertical panel joint is completely sealed off to underside of sill flashing	Priority
IAH	APM	Elevated Platform	Ext north elevation	B	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	1999	50	34	Y	Y	Further investigation	$2,000	10	Metal panel wall	Deterioration of panel finish; further investigation required to determine cause; removal and testing of representative panels will be required to determine the cause of finish deterioration.	Further investigation; remediate panel finish based on findings of further investigation	Priority
IAH	APM	Elevated Platform	Ext south elev at west end at os 90 corner	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Weather Protection; Daylighting	1999	25	9	Y	Y	Reposition glass; install side blocks; check glass size and check glass edges for damage	$4,000	5	Glass shifting	Glass has moved horiz, with gaps at jambs	Reposition glass; install side blocks; check glass size and check glass edges for damage; ALL GLASS REMOVED SUBSEQUENT TO FIELD OBSERVATIONS	Priority
IAH	APM	Elevated Platform	Ext south elev 5th lite from east end	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Weather Protection; Daylighting	1999	25	9	Y	Y	Reposition glass; install side blocks; check glass size and check glass edges for damage	$4,000	5	Glass migration in opening	1/2" open gap	Reposition glass; install side blocks; check glass size and check glass edges for damage; ALL GLASS REMOVED SUBSEQUENT TO FIELD OBSERVATIONS	Priority
IAH	APM	Elevated Platform	Ext South elev; 6th lite from east end	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Weather Protection; Daylighting	1999	25	9	Y	Y	Reseal splice joint	$1,000	7	Splice joint in sill closure	Ineffective/deteriorating seal at splice	Reseal splice joint	Priority
IAH	APM	Elevated Platform	Ext South elev; near middle	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Weather Protection; Daylighting	1999	25	9	Y	Y	None	$0	10	Waviness of sill closure	Minor aesthetic concern with sill closure	None	Long Term
IAH	APM	Elevated Platform	Ext South elev; metal panels	B	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	1999	50	34	Y	Y	Clean panels	$5,000	10	Silicone sealant at joints	Adhesion is good; dirt build-up/run lines typ at horiz joints	Clean panels	Priority
IAH	APM	Elevated Platform	Ext South elev;16th lite; splice in sill can and head receptor	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Weather Protection; Daylighting	1999	25	9	Y	Y	Reseal joints	$2,500	5	Splice joint in wdw sill can/closure for panel top	Sealant has adhesion loss and deterioration	Reseal joints	Priority
IAH	APM	Elevated Platform	Ext South elev; 17th lite	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Weather Protection; Daylighting	1999	25	9	Y	Y	Clean	$4,000	10	Aluminum framing is dirty	Bronze anodized	Clean	Priority
IAH	APM	Elevated Platform	South elev; 17th big lite from west	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Weather Protection; Daylighting	1999	25	9	Y	Y	None	$0	5	Glass bites checked	Left 1/4". Rt. 3/8". Sill 1/2"	Ok; ALL GLASS REMOVED SUBSEQUENT TO FIELD OBSERVATIONS	Long Term

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IAH	APM	Elevated Platform	South elev; exterior; small lite; 17th from west end	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Weather Protection; Daylighting	1999	25	9	Y	Y	Reposition glass; add side blocks; check glass size and edges for damage	$5,000	5	Glass bite questionable	Glass has shifted	Reposition glass; add side blocks; check glass size and edges for damage; ALL GLASS REMOVED SUBSEQUENT TO FIELD OBSERVATIONS	Priority
IAH	APM	Elevated Platform	South elev-Exterior-at os 90 at west end	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	1999	25	9	Y	Y	Replace gaskets; use proper length and installation technique; tightly butt and seal corners	$5,000	5	Gasket shrinkage	Gaps at corners of gaskets; can allow excessive water in system	Replace gaskets; use proper length and installation technique; tightly butt and seal corners; ALL GLASS REMOVED SUBSEQUENT TO FIELD OBSERVATIONS	Priority
IAH	APM	Elevated Platform	Exterior review of East end of APM-B	B	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	1999	25	9	Y	Y	Clean first with soap and water; more robust cleaner if needed; sample area first	$12,000	10	Dirt/stain lines	Typ occurs at horiz joints	Clean first with soap and water; more robust cleaner if needed; sample area first	Priority
IAH	APM	Elevated Platform	Exterior review of west end of APM-B	B	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	1999	25	9	Y	Y	Clean as part of normal maintenance program.	$12,000	10	Dirt/stain lines	Typ occurs at horiz joints	Clean as part of normal maintenance program.	Priority
IAH	APM	Elevated Platform	East interior glazed walls at APM-B	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Weather Protection; Daylighting	1999	25	9	Y	Y	None	$0	10	Glass is tempered as required by code	Single Exit door into stair	None	Long Term
IAH	APM	Elevated Platform	East interior glazed walls at APM-B	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Close off station from stair	1999	25	9	Y	Y	None	$0	10	Glass and gaskets look good	Glass is single pane; lites adjacent to door are tempered per code	None	Long Term
IAH	APM	Elevated Platform	North and south glazed walls on interior of APM B	B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	1999	25	9	Y	Y	Monitor for any future water leakage or failure of IGU's (fogging)	$0	10	No obvious signs of deficiencies	Pressure bar Cw system, gasket glazed; Glass is insulated glass unit (double pane); has marking on spacer D&S-98 that means glass unit was manufactured in 1998. Not sure of D&S mark meaning	Monitor for any future water leakage or failure of IGU's (fogging)	Long Term
IAH	APM	Elevated Platform	ATO	B	Architectural (artwork, millwork, …)	ARCH		FURN	Furnishings / Furniture	Furniture	1999	20	4	Y	Y	Replace desk and chairs	$3,000	3	Desk and chairs suspect		Replace desk and chairs	Priority
IAH	APM	Elevated Platform	AP LOWER LEVEL	B	Architectural (artwork, millwork, …)	ARCH		Curtain Wall		Windows	1999	50	34	Y	Y	Clean frames	$5,000	10	Curtain Wall framing dirty from condensation	HVAC grilles above	Clean frames	Priority
IAH	APM	Elevated Platform	APM LOWER LEVEL	B	Architectural (artwork, millwork, …)	ARCH		CLNG	Ceiling	Soffit	1999	50	34	Y	Y	Replace filters and clean ductwork	$20,000	7	Soffit dirty	HVAC system	Replace filters and clean ductwork	Priority
IAH	APM	Elevated Platform	APM LOWER LEVEL	B	Architectural (artwork, millwork, …)	ARCH		WALL	Walls	Walls	1999	50	34	Y	Y	Patch and repaint	$1,000	7	Walls damaged and dirty	Painted gypsum board	Patch and repaint	Priority
IAH	APM	Elevated Platform	APM - UPPER level	B	Architectural (artwork, millwork, …)	ARCH		DOOR	Automatic Doors - Frames	Door frames at Automatic Doors	1999	25	9	Y	Y	Refasten, Repair	$1,000	7	Frames are loose and or dislodged at base	Many frames loose and/or damaged	Refasten, Repair	Priority
IAH	APM	Elevated Platform		B	Architectural (artwork, millwork, …)	ARCH		CLNG	Ceiling	Ceiling	1999	25	9	Y	Y	Replace missing and damaged tile, refit out of place tiles. Recommend replacing ceiling and grid as it is dirty and discolored.	$2,500	5	Missing, damaged ceiling tile	X	Replace missing and damaged tile, refit out of place tiles. Recommend replacing ceiling and grid as it is dirty and discolored.	Priority
IAH	APM	Elevated Platform	APM - UPPER LEVEL	B	Architectural (artwork, millwork, …)	ARCH		WALL	Walls	Walls	1999	50	34	Y	Y	Patch walls, touch up paint, wash walls	$4,000	7	Walls are damaged and dirty	Damage mostly from base replacement	Patch walls, touch up paint, wash walls	Priority
IAH	APM	Elevated Platform		B	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Weather Protection; Daylighting	1999	25	9	Y	Y	Remove and reinstall loose gaskets, inspect all others	$12,000	5	Gaskets have come loose	Glazing gasket	Remove and reinstall loose gaskets, inspect all others	Priority

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IAH	APM	Elevated Platform	APM - UPPER level	B	Architectural (artwork, millwork, …)	ARCH		FLOR	Floor	Flooring	1999	50	34	Y	Y	Reattach/repair base	$1,000	5	Base has come loose		Reattach/repair base	Priority
IAH	APM	Elevated Platform		B	Architectural (artwork, millwork, …)	ARCH		CLNG	Ceiling	Ceiling	1999	50	34	Y	Y	Further investigation needed	$0	5	Damaged gypsum board ceiling	Appears as bubbling from water	Further investigation needed	Long Term
IAH	APM	0	APM Control Room	B	Architectural (artwork, millwork, …)	ARCH	Lighting	LITE	Lighting				4	Y	Y	Lamp replacement and cleaning	$45,000	0	Lighting fixtures are fairly aged. Performance of fixtures has diminished due to debris.		Replace lamps and install new fixtures.	Priority
IAH	APM	0	APM B	B	Architectural (artwork, millwork, …)	ARCH	Lighting	LITE	Lighting				4	Y	N	Fixture maintenance needed.	$45,000	0	There are 155 total lights installed and 33 lights need to be replaced. There were two emergency batterries that need to be replaced.	The station has an average lighting level of 9 footcandles and 8 footcandles in the escalator lobby. This level is well below the recommended lighting level (30fc in station/15 lobby). Additional exit lights need to be installed to indicate the egress areas.	Replace all existing fluorescent can lights with new LED cans. A lighting control sytem that will dim the lights to accomodate the incoming daylight. These recommendations will drasticly reduce energy and maintenace costs.	Long Term
IAH	APM	0	APM B	B	Architectural (artwork, millwork, …)	ARCH	Lighting	LITE	Lighting					Y	N	Fixture maintenance needed.		3	There are 155 total lights installed and 33 lights need to be replaced. There were two emergency batterries that need to be replaced.	The station has an average lighting level of 9 footcandles and 8 footcandles in the escalator lobby. This level is well below the recommended lighting level (30fc in station/15 lobby). Additional exit lights need to be installed to indicate the egress areas.	Replace all existing fluorescent can lights with new LED cans. A lighting control sytem that will dim the lights to accomodate the incoming daylight. These recommendations will drasticly reduce energy and maintenace costs.	Priority
IAH	APM	Elevated Platform	Stair at east end of C	C	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Daylighting	1999	25	9	Y	Y	Verify if safety glazing is provided at first two lites from right end (south) adjacent to top of upper landing	$0	7	2 lites at upper stair landing have no safety glazing markings at bottom	8 lite wide CW at stair; IGU's; appears to be tubular CW with pres bars and trim covers	Verify glass at top of upper landing is safety glazing; If existing is not safety glazing, remove and replace glass with safety glazing.	Long Term
IAH	APM	Elevated Platform	North elev at west end	C	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	1999	50	34	Y	Y	Further investigate to determine cause of finish deterioration	$5,000	7	Metal panel wall	Deterioration of panel finish; further investigation required to determine cause; removal and testing of representative panels will be required to determine the cause of finish deterioration.	Further investigation; remediate panel finish based on findings of further investigation	Priority
IAH	APM	Elevated Platform	North elev at east end	C	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	1999	50	34	Y	Y	Further investigate to determine cause of finish deterioration	$5,000	7	Metal panel wall	Top panel deterioration only along vertical jts; as you go down, goes from horizontal through field of panel; Deterioration of panel finish; further investigation required to determine cause; removal and testing of representative panels will be required to determine the cause of finish deterioration.	Further investigation; remediate panel finish based on findings of further investigation	Priority
IAH	APM	Elevated Platform	North elev. @ east end	C	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Weather Protection; Daylighting	1999	50	34	Y	Y	Reseal splice joints; rework cap to shed water	$10,000	7	Metal cap	Splice joints sealed along top but sealant hard; cap holding water	Reseal splice joints; rework cap to shed water	Priority
IAH	APM	Elevated Platform	South elev above 1st col from west	C	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Weather Protection; Daylighting	1999	50	34	Y	Y	Clean panels and sealant joints	$10,000	10	Dirt run lines	Dirt run lines from metal cap and from horiz joints	Clean panels and sealant joints	Priority
IAH	APM	Elevated Platform	South elev above 1st col from west	C	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Weather Protection; Daylighting	1999	50	34	Y	Y	Seal splice joints; rework cap to shed water	$12,000	7	Metal cap	Splice joints not sealed; horiz surface cupped and holding water	Seal splice jts; rework cap to shed water	Priority
IAH	APM	Elevated Platform	South elev-metal cap at top of wall above 3rd col from east	C	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Weather Protection; Daylighting	1999	50	34	Y	Y	Seal splice joints; rework cap to shed water	$12,000	7	Metal cap	Splice joint not sealed and horiz surface is cupped and typ holds water	Seal splice joints; rework cap to shed water	Priority
IAH	APM	Elevated Platform	South elev-1st horiz panel jt from top; large silicone seal	C	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Weather Protection; Daylighting	1999	50	34	Y	Y	None	$0	10	Large silicone joint	Large silicone joint in good condition	None	Long Term
IAH	APM	Elevated Platform	South elevation-above 3rd col from east end	C	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Weather Protection; Daylighting	1999	50	34	Y	Y	Aesthetic concern only	$0	10	Random dents	First and second panel from top above 3rd col from east	Aesthetic concern only	Long Term

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IAH	APM	Elevated Platform	South elevation-metal panels @ east end	C	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Weather Protection; Daylighting	1999	50	34	Y	Y	Clean panels	$5,000	10	Staining	Dirt run-lines typically coming from horizontal sealant joints	Clean panels	Priority
IAH	APM	Elevated Platform	South elevation-metal panels @ east end	C	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Weather Protection; Daylighting	1999	50	34	Y	Y	Clean sealant in conjunction with cleaning metal panels	$5,000	10	Dirt build-up	Silicone sealant joints with dirt buildup	Clean sealant in conjunction with cleaning metal panels	Priority
IAH	APM	Elevated Platform	South elevation - metal panels @ east end	C	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Cap top of wall	1999	50	34	Y	Y	Seal splice joints in cap	$8,000	7	Top of metal panel wall	Metal cap	Seal splice joints in cap	Priority
IAH	APM	Elevated Platform	APM UPPER LEVEL	C	Architectural (artwork, millwork, …)	ARCH		DOOR	Doors	Door	1999	50	34	Y	Y	OK - No Work	$0	10				Long Term
IAH	APM	Elevated Platform	APM upper level	C	Architectural (artwork, millwork, …)	ARCH		WALL	Walls	Walls	1999	50	34	Y	Y	Patch repair, paint wall	$750				Patch repair, paint wall	Priority
IAH	APM	Elevated Platform	APM UPPER LEVEL	C	Architectural (artwork, millwork, …)	ARCH		DOOR	Doors	Door frame	1999	50	34	Y	Y	Repair frame.	$500	7	Frame is damaged		Repair frame.	Priority
IAH	APM	Elevated Platform	APM UPPER LEVEL	C	Architectural (artwork, millwork, …)	ARCH		DOOR	Doors	Door	1999	50	34	Y	Y	Adjust door	$250	7	Door is loose		Adjust door	Priority
IAH	APM	Elevated Platform	APM UPPER LEVEL	C	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Weather Protection; Daylighting	1999	25	9	Y	Y	None	$0	10	NO CURTAIN WALL AT AIR SIDE OR LANDSIDE		None	Long Term
IAH	APM	Elevated Platform	APM GROUND FLOOR	C	Architectural (artwork, millwork, …)	ARCH		CLNG	Ceiling	Protective ceiling	1999	50	34	Y	Y	Repair	$1,500	3	Damaged ceiling repair		Repair	Priority
IAH	APM	Elevated Platform	APM GROUND FLOOR	C	Architectural (artwork, millwork, …)	ARCH		CLNG	Ceiling	Access panel	1999	50	34	Y	Y	Painting needed to prevent rusting and staining	$2,500	10	Rusting	Four panels	Painting needed to prevent rusting and staining	Priority
IAH	APM	Elevated Platform	APM GROUND FLOOR	C	Architectural (artwork, millwork, …)	ARCH		CLNG	Ceiling	Protective panels	1999	50	34	Y	Y	Replace panel with material in kind	$500	7	Repaired ceiling panel		Replace panel with material in kind	Priority
IAH	APM	0	APM	C	Architectural (artwork, millwork, …)	ARCH	Lighting	LITE	Lighting					Y	Y	Fixture maintenace		3	There are a of 191 lights installed, and 39 lamps that need to be replaced. There are several fixtures that are not installed properly in the ceiling.	The station has an average lighting level of 18 footcandles in the station and 11.5 average in the escalator lobby. These levels are well below the recommended lighting levels.	Replacing the existing fluorescent cans with LED types and installing a lighting control system that would dim the installed lighting to allow the incoming daylight to illuminated the space. The implementation of these recommendations would greatly reduce energy and maintenance costs.	Priority
IAH	APM	Elevated Platform	North ext wall at D	D	Architectural (artwork, millwork, …)	ARCH		CLDG	Cladding	Exterior cladding	2005	25	15	Y	Y	Clean w/ normal maintenance; monitor seals at bottom for deterioration	$5,000	10	No obvious deficiencies	Aluminum column covers	Clean w/ normal maintenance; monitor seals at bottom for deterioration	Priority
IAH	APM	Elevated Platform	North ext wall at D	D	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	2005	25	15	Y	Y	Clean as part of normal maintenance; monitor below and inside for leakage	$5,000	10	No obvious deficiencies	Receptor at jamb, not sure whats going on at head; gaskets at mullions and horizontals; there is a starter sill with big caulk joint; wiper gasket on horiz above	Clean as part of normal maintenance; monitor below and inside for leakage	Priority
IAH	APM	Elevated Platform	North ext wall at D	D	Architectural (artwork, millwork, …)	ARCH		CLDG	Cladding	Exterior cladding	2005	25	15	Y	Y	Clean as part of normal maintenance	$5,000	10	No obvioud deficiencies	Metal standing seam type roof system used as vertical wall closure above CW	Clean as part of normal maintenance	Priority
IAH	APM	Elevated Platform	North ext wall at D	D	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	2005	25	15	Y	Y	Clean glass and metal framing ascpart of normal maintenance; monitor areas below and inside for signs of leakage	$5,000	10	CW w/split mullion; wiper gasket at split and at sill; assume a starter sill; large caulk jt below	No obvious deficiencies	Clean glass and metal framing as part of normal maintenance	Priority
IAH	APM	Elevated Platform	North exterior wall of D	D	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior cladding	2005	25	15	Y	Y	Clean as part of normal maintenance	$5,000	10	Overall good shape. Normal dirt buildup.	Metal panels with gasketed joints	Clean as part of normal maintenance	Priority

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Airport	Building_Number	Level	Room_Name	APM_Station_Location	System_List	System	Architectural_Component List	Component	Component_Description	SysFunction	YrInstalled	DesignLife	RemainingYears	Operational	Performing	MaintNeeded	MaintCost	ACI	Comments	Description	Recommendations	Planning Category
IAH	APM	Elevated Platform	CW at west end of D/E	D	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Access Control	2005	25	15	Y	Y	None	$5,000	10	No obvious deficiencies	Unitized CW (i.e.split vertical mullion)	None	Priority
IAH	APM	Elevated Platform	Stair at east end of D/E - interior glazing	D	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	2005	25	15	Y	Y	Clean all glass surfaces	$5,000	10	Glass on each side of center is dirty on stairwell side	Large IGU's in CW framing	Clean all glass surfaces	Priority
IAH	APM	Elevated Platform	Stair at east end of D/E - exterior glazing	D	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	2005	25	15	Y	Y	Clean interior and exterior glass and metal surfaces	$5,000	10	No obvious deficienties	Unitized CW	Clean interior and exterior glass and metal surfaces	Priority
IAH	APM	Elevated Platform	North elev of D/E (D-side)	D	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	2005	50	40	Y	Y	Inspect all gaskets; replace missing gaskets; reset dislodged gaskets	$20,000	7	Missing gaskets at panel jointss	Some gaskets are missing or are partially dislodged	Inspect all gaskets; replace missing gaskets; reset dislodged gaskets	Priority
IAH	APM	Elevated Platform	North elev at D at stair at east end	D	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Exterior Wall Cladding	2005	50	40	Y	Y	None	$0	10	Observed from ground	Horiz covers/ vertical SSG; no obvious deficiencies	None	Long Term
IAH	APM	Elevated Platform	North elevation D/E (D side)	D	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	2005	50	40	Y	Y	Clean panels	$20,000	10	Panel finish	Staining of panels where concrete structure intersects louvers above panel wall	Clean panels	Priority
IAH	APM	Elevated Platform	APM GROUND FLOOR	D	Architectural (artwork, millwork, …)	ARCH		CLNG	Ceiling	Protective panel	2005	25	45	Y	Y	Rome and reinstall gasket, install sealant	$15,000	7	Gasket failure sealant missing		Rome and reinstall gasket, install sealant	Priority
IAH	APM	0	APM st	D	Architectural (artwork, millwork, …)	ARCH	Lighting	LITE	Lighting				9	Y	Y	Lamp Replacement	$12,500	5	Total of 40 lamps in need of replacing.		Repair and replace lamps. Rewire emergency fixtures to pull hot conductor to serve battery packs.	Long Term
IAH	APM	0	Elec Rm.	D	Architectural (artwork, millwork, …)	ARCH	Lighting	LITE	Lighting				14	Y	Y	None		7			Existing Lighting Contactor panel to remain	Priority
IAH	APM	0	APM	D	Architectural (artwork, millwork, …)	ARCH	Lighting	LITE	Lighting					Y	Y	Lamp replacement		7	There are a total of 170 lights currently insalled and only 14 lamp that need to be replaced.	The station has an average lighting level of 32 footcandles, which just above the recommended level.	The use of LED lamps in this space would decrease maintenance and energy costs. A lighting control system that would dim the lights as the level of incoming daylight can be used to further extend the life of the installed lamps and decrease energy costs.	Long Term
IAH	APM	Elevated Platform	North CW interior	E	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Element protection; daylight	2005	25	15	Y	Y	Clean glass and framing as normal maintenance	$5,000	10	No obvious deficiencies	Cw or window wall (split verticals)	Clean glass and framing as normal maintenance	Priority
IAH	APM	Elevated Platform	South CW	E	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Access Control	2005	25	15	Y	Y	Clean glass and framing as normal maintenance	$5,000	10	No obvious deficiencies	Split mullion window wall	Clean glass and framing as normal maintenance	Priority
IAH	APM	Elevated Platform	South elev of E	E	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	2005	50	40	Y	Y	Further investigate to determine source of staining	$5,000	10	Dark staining at soffit panels at concrete column	Metal panel soffit	Further investigate to determine source of staining	Priority
IAH	APM	Elevated Platform	South elev at stair at east end of E	E	Architectural (artwork, millwork, …)	ARCH		GLAZ	Glazing	Exterior Wall Cladding	2005	25	10	Y	Y	None	$0	10	No obvious deficiencies in field of wall	Horizontal framing with SSG verticals curtain wall	None	Long Term
IAH	APM	Elevated Platform	East elev -metal panels below end of track	E	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	2005	50	40	Y	Y	Inspect and reseal all failed sealant joints	$35,000	10	Joints at metal panels	Adhesion failures of sealant to metal at joints	Inspect and reseal all failed sealant joints	Priority
IAH	APM	Elevated Platform	South elev D/E (E-side)	E	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	2005	50	40	Y	Y	Clean panels	$25,000	10	Panels are dirty and have run-line stains	Metal panels	Clean panels	Priority
IAH	APM	Elevated Platform	South elev D/E (E-side)	E	Architectural (artwork, millwork, …)	ARCH		MLPS	Metal Panel System	Exterior Wall Cladding	2005	50	40	Y	Y	Inspect all gaskets; replace missing gaskets; reset dislodged gaskets	$20,000	10	Missing gaskets at panel joints	Metal panel elevation	Inspect all gaskets; replace missing gaskets; reset dislodged gaskets	Priority

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Airport	Building_Number	Level	Room_Name	APM_Station_Location	System_List	System	Structural_System_Components	Component	Component_Description	YrInstalled	DesignLife	RemainingYears	Operational	MaintNeeded	MaintCost	ACI	Comments	Description	Recommendations	Planning Category
IAH	APM	0		A	Structural System	STRL	Walls	WALL	Walls	2010	75	70	Y	Repair drywall.	$1,000	10	Crack in drywall on ceiling.	Ceiling above NW Terminalink doors.	Repair drywall.	Long Term
IAH	APM	0		A	Structural System	STRL	Superstructure	SUPS	Superstructure	2010	60	55	Y	Further analysis neededto determine if the improper installation if sufficient.	$9,000	10	Anchor bolts observed to not have proper edge distance.	West end of station.	Further analysis neededto determine if the improper installation if sufficient.	Near Term
IAH	APM	0		A	Structural System	STRL	Substructure	SUBS	Substructure	2010	75	70	Y	No maintenance required	$2,000	10	Lateral shrinkage cracking in concrete walkway.	Both guideways	No maintenance required	Long Term
IAH	APM	0		A	Structural System	STRL	Substructure	SUBS	Substructure	2010	75	70	Y	Patch and repair concrete.	$4,000	7	Concrete spalling between slab and support beam. Rebar exposed.	End of station on north side.	Patch and repair concrete.	Priority
IAH	APM	0		A	Structural System	STRL	Substructure	SUBS	Substructure	2010	75	70	Y	Patch and repair concrete.	$4,000	7	Concrete spalling at joint between slab and support beam.	End of station on south.	Patch and repair concrete.	Priority
IAH	APM	0		A	Structural System	STRL	Substructure	SUBS	Substructure	2010	75	70	Y	Patch and repair concrete.	$4,000	10	Concrete spalling at corners. Patch.	North, 2nd column from west.	Patch and repair concrete.	Priority
IAH	APM	0		A	Structural System	STRL	Substructure	SUBS	Substructure	2010	75	70	Y	No repair needed	$1,000	10	Surface discoloration condition noted. Aesthetic only, no structural concern.	North, all columns.	No repair needed	Long Term
IAH	APM	0		A	Structural System	STRL	Substructure	SUBS	Substructure	2010	75	70	Y	Clean area, patch concrete and reapply surface coating.	$20,000	10	Flaking and spalling of concrete	Most columns	Clean area, patch concrete and reapply surface coating.	Priority
IAH	APM	0	South at west end	A	Structural System	STRL	Superstructure	SUPS	Superstructure	2010	75	70	Y	Patch to prevent further deterioration	$5,000	7	Concrete spalling	Concrete spalling at west end of train area	Patch to prevent further deterioration	Priority

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Airport	Building_Number	Level	Room_Name	APM_Station_Location	System_List	System	Structural_System_Components	Component	Component_Description	YrInstalled	DesignLife	RemainingYears	Operational	MaintNeeded	MaintCost	ACI	Comments	Description	Recommendations	Planning Category
IAH	APM	0	West elevation at south track; concrete	A	Structural System	STRL	Walls	WALL	Walls	2010	75	70	Y	Eliminate water infiltration; repair concrete	$10,000	7	Spalled concrete	Water infiltration and resulting spalling and staining of concrete	Eliminate water infiltration; repair concrete	Priority
IAH	APM	0		B	Structural System	STRL	Substructure	SUBS	Substructure	1999	75	59	Y	No maintenance required	$2,000	10	Lateral shrinkage cracking in concrete walkway.	Both guideways	No maintenance required	Long Term
IAH	APM	0		B	Structural System	STRL	Substructure	SUBS	Substructure	1999	75	59	Y	Clean and repair concrete.	$4,000	7	Rust present	West end of station at south guideway.	Clean and repair concrete.	Priority
IAH	APM	0		B	Structural System	STRL	Substructure	SUBS	Substructure	1999	75	59	Y	Clean area, patch concrete and reapply surface coating.	$20,000	10	Flaking and spalling of concrete	Most columns	Clean area, patch concrete and reapply surface coating.	Priority
IAH	APM	0		B	Structural System	STRL	Guideway	GDWY	Guideway	1999	60	44	Y	Clean rust and apply coating to prevent future oxidation.	$3,000	10	Rusting of beam seat plates.	South guideway, under walkway.	Clean rust and apply coating to prevent future oxidation.	Priority
IAH	APM	0		B	Structural System	STRL	Guideway	GDWY	Guideway	1999	60	44	Y	No repair at this time.	$1,000	10	Lateral shrinkage cracking in concrete walkway	South guideway	No repair at this time.	Long Term
IAH	APM	0		B	Structural System	STRL	Guideway	GDWY	Guideway	1999	75	59	Y	Clean out cracks and apply pressure injected epoxy into cracks.	$7,000	10	Cracking on top of APM rails	South guideway	Clean out cracks and apply pressure injected epoxy into cracks.	Priority
IAH	APM	0		C	Structural System	STRL	Substructure	SUBS	Substructure	1999	75	59	Y	No maintenance required	$2,000	10	Lateral shrinkage cracking in concrete walkway.	Both guideways	No maintenance required	Long Term
IAH	APM	0		C	Structural System	STRL	Substructure	SUBS	Substructure	1999	75	59	Y	Patch holes and reapply surface coating.	$1,000	10	Large pot marks in concrete.	North, 1st column on east	Patch holes and reapply surface coating.	Priority

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Airport	Building_Number	Level	Room_Name	APM_Station_Location	System_List	System	Structural_System_Components	Component	Component_Description	YrInstalled	DesignLife	RemainingYears	Operational	MaintNeeded	MaintCost	ACI	Comments	Description	Recommendations	Planning Category
IAH	APM	0		C	Structural System	STRL	Substructure	SUBS	Substructure	1999	75	59	Y	Clean and reapply coating.	$3,000	10	Cementitious coating peeling off.	North, 1st column on west	Clean and reapply coating.	Priority
IAH	APM	0		C	Structural System	STRL	Substructure	SUBS	Substructure	1999	75	59	Y	Clean area, patch concrete and reapply surface coating.	$5,000	10	Flaking and spalling of concrete	South, 1st column on west	Clean area, patch concrete and reapply surface coating.	Priority
IAH	APM	0		C	Structural System	STRL	Substructure	SUBS	Substructure	1999	75	59	Y	Clean area, patch concrete and reapply surface coating.	$20,000	10	Flaking and spalling of concrete	Most columns	Clean area, patch concrete and reapply surface coating.	Priority
IAH	APM	0		C	Structural System	STRL	Substructure	SUBS	Substructure	1999	75	59	Y	Clean and reapply surface coating.	$3,000	10	Rust showing through concrete.	South, 2nd column from west	Clean and reapply surface coating.	Priority
IAH	APM	0		C	Structural System	STRL	Substructure	SUBS	Substructure	1999	75	59	Y	Clean and patch concrete	$5,000	10	Pot marking in concrete	South, 2nd column from east	Clean and patch concrete	Priority
IAH	APM	0		C	Structural System	STRL	Guideway	GDWY	Guideway	1999	75	59	Y	Further investigation needed to determine if shrinkage or flexural cracking.	$5,000	10	Cracking observed in bent	Looking out East end of station.	Further investigation needed to determine if shrinkage or flexural cracking.	Long Term
IAH	APM	0		D	Structural System	STRL	Substructure	SUBS	Substructure	2005	75	65	Y	No maintenance required	$2,000	10	Lateral shrinkage cracking in concrete walkway.	Both guideways	No maintenance required	Long Term
IAH	APM	0		D	Structural System	STRL	Substructure	SUBS	Substructure	2005	75	65	Y	Clean area, patch concrete and reapply surface coating.	$20,000	10	Flaking and spalling of concrete	Most columns	Clean area, patch concrete and reapply surface coating.	Priority
IAH	APM	0		D	Structural System	STRL	Guideway	GDWY	Guideway	2005	60	50	Y	No repair at this time	$1,000	10	Lateral shrinkage cracking in concrete walkway.	South guideway.	No repair at this time	Long Term

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Airport	Building_NumberL	evel	Room_Name	APM_Station_LocationS	ystem_List	System	Structural_System_Components	Component	Component_Description	YrInstalled	DesignLife	RemainingYears	Operational	MaintNeededM	aintCost	ACIC	ommentsD	escription	Recommendations	Planning Category
IAHA	PM	0	APM UPPER LEVELD		Structural System	STRL	Guideway	GDWYG	uideway2	0057	56	5Y		Clean and repair concrete	$5,000	10	Concrete spalling at joint between decking and support	Looking out west end of station	Clean and repair concrete	Priority

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FormName	Airport	Building_Number	Level	Room_Name	RoomNum	APM_Station_Location	System_List	Name_Plate_Information	System	Electrical_Component_List	Component	Component_Description	SubComponent	BarCode	Manufacturer	ModelNum	SerialNum	SysFunction	YrInstalled	DesignLife	RemainingYears	Operational	Performing	MaintNeeded	MaintCost	ACI	Comments	Description	Recommendations	Planning Category
APM Station Assessments	IAH	APM	0	B Elec Room	B107	B	Electrical System		ELEC	Electrical Panel	ELPN	Electrical Panel		I.P.APM.STAT B.ELEC0008	GE	A series		Electrical	1999	30	14			Provide Arch Flash Label	$25	7	No arc flash labels present		Provide Arc Flash label in or on Panel per NFPA 70E Section 130.	Long Term
APM Station Assessments	IAH	APM	0	APM Control Room		B	Electrical System		ELEC	Transformer	XFMR	Transformer		I.P.APM.STAT B.ELEC0007	Square D		3349-17212-055	Electrical	1999	30	14	Y	Y	Relocate refrigerator from in front of panel.	$350	7	Clearance violation, workspace		Relocate refrigerator to location away from electrical equipment.	Long Term
APM Station Assessments	IAH	APM	0	APM Control Room		B	Electrical System		ELEC	Electrical Panel	ELPN	Electrical Panel		I.P.APM.STAT B.ELEC0006	Square D	NQOD	NQOD430M225 CU	Elec. Distribution	1999	30	14	Y	Y	Remove items near the front of panel.	$350	7	There is a code violation for proper work space clearance in front of panel.			Long Term
APM Station Assessments	IAH	APM	0	APM Control		B	Electrical System		ELEC	Electrical Panel	ELPN	Electrical Panel		I.P.APM.STAT B.ELEC0005	Square D	NFQ			1999	30	14	Y	Y	None		7			This panel is currently functioning	Long Term
APM Station Assessments	IAH	APM	0	APM Control Room	B.3.33	B	Electrical System		ELEC	Electrical Panel	ELPN	Electrical Panel		I.P.APM.STAT B.ELEC0004	General Electric	AXB4		Distribution	1999	30	14	Y	Y	Provide Arch Flash Label	$25	7	Arc Flash tag missing		Provide Arc Flash label in or on Panel per NFPA 70E Section 130.	Long Term
APM Station Assessments	IAH	APM	0	APM B	B	B	Electrical System		ELEC	Electrical Panel	ELPN	Electrical Panel		I.P.APM.STAT B.ELEC0002	General Electric	AFS43s		Elec. Distribution	1999	30	14	Y		Provide Arch Flash Label	$25	7	No arc flash sticker		Provide Arc Flash label in or on Panel per NFPA 70E Section 130.	Long Term
APM Station Assessments	IAH	APM	0	APM Station	A401	A	Electrical System		ELEC	Transformer	XFMR	Transformer		I.P.APM.STAT A.ELEC0004	Square D	65TS22C	EE15T212HCU	Electrical	2009	30	24	Y	Y	Cleaning and Mounting Adjustments	$200	7	Transformer has damaged housing.		Repair mounting on vibration pads and cleand transformer housing.	Long Term
APM Station Assessments	IAH	APM	0	Elec	B107	B	Electrical System		ELEC	Electrical Panel	ELPN	Electrical Panel		I.P.APM.STAT B.ELEC0009	General Electric	A- Series	AQF3421ABXAX B4	Electrical	1999	30	14	Y	Y	Repair Door lock	$200	7	Lock on Panel is not functioning properly		Repair panel door lock, replace if needed.Install Arc Flash label in or on panel housing.	Long Term
APM Station Assessments	IAH	APM	0	APM Statio	A401	A	Electrical System		ELEC	Switch	SWCH	Switch		I.P.APM.STAT A.ELEC0003	Cutler Hammer			Electrical	2005	30	20	Y	Y	None		7			Existing Lighting Control Panel to Remain	Priority
APM Station Assessments	IAH	APM	0	APM Station	A401	A	Electrical System		ELEC	Switch	SWCH	Switch		I.P.APM.STAT A.ELEC0002	Square D		4074-224-04	Electrical	2005	30	20	Y	Y	None		7			Existing to remain	Long Term
APM Station Assessments	IAH	APM	0	APM Station	A.401	A	Electrical System		ELEC	Electrical Panel	ELPN	Electrical Panel		I.P.APM.STAT A.ELEC001	Square D	NC44s	LLCD01119N44 S-1s	Electrical	2009	30	24	Y	Y	Provide Arch Flash Label	$25	7			Provide Arc Flash label in or on Panel per NFPA 70E Section 130.	Long Term
APM Station Assessments	IAH	APM	0	Mechanical Room		B	Electrical System		ELEC	Alarm	ALRM	Alarm		I.P.APM.STAT B.ELEC0001	Notifier	RP-2001		Fire alarm	2004	30	19	Y	Y	None		7	Control panel is functioning properly.	FA Cabinet	None to record.	Long Term
APM Station Assessments	IAH	APM	0	Elec. Room	B107	B	Electrical System		ELEC	Electrical Panel	ELPN	Electrical Panel			General Electric			Electrical	1999	30	14	Y	Y	Panel Repair	$200	7			Repair panel door.	Long Term
APM Station Assessments	IAH	APM	0	Elec	B107	B	Electrical System		ELEC	Electrical Panel	ELPN	Electrical Panel		I.P.APM.STAT B.ELEC0010	General Electric			Electrical	1999	30	14	Y	Y	Panel Repair	$200	7			Repair/Replace Panel Cover	Long Term
APM Station Assessments	IAH	APM	0		B107	B	Electrical System		ELEC	Electrical Panel	ELPN	Electrical Panel		I.P.APM.STAT B.ELEC0011	General Electric			Electrical	1999	30	14	Y	Y	Provide Arch Flash Label	$25	7			Provide Arc Flash label in or on Panel per NFPA 70E Section 130.	Long Term
APM Station Assessments	IAH	APM	0		B107	B	Electrical System		ELEC	Transformer	XFMR	Transformer		I.P.APM.STAT B.ELEC0014	General Electric	9T23B3872		Electrical	1999	30	14	Y	Y	Cleaning	$75	7			Clear debris from around transformer.	Long Term
APM Station Assessments	IAH	APM	0		B107	B	Electrical System		ELEC	Transformer	XFMR	Transformer		I.P.APM.STAT B.ELEC0012	General Electric	9T23B3871		Electrical	1999	30	14	Y	Y	Cleaning	$1,200	7			Repair mounting of transformer on vibrational pad. Remove debris around transformer.	Long Term
APM Station Assessments	IAH	APM	0				Electrical System		ELEC	Switch (Time Clock)	SWCH	Switch		I.P.APM.STAT B.ELEC0015	General Electric			Electrical	1999	30	14	Y	Y	Replace lighting controls with more efficient device.	$600	7			Replace with digital astronomical type, to provide more efficient control.	Long Term
APM Station Assessments	IAH	APM	0				Electrical System		ELEC	Switch	SWCH	Switch		I.P.APM.STAT B.ELEC0016	General Electric			Electrical	2001	30	16	Y	Y	None		7			Existing to Remain	Long Term
APM Station Assessments	IAH	APM	0	Elec rm		D	Electrical System		ELEC	Electrical Panel	ELPN	Electrical Panel		I.P.APM.STAT D.ELEC0001	Eaton			Electrical	2009	30	24	Y	Y	None		7			Existing to Remain	Long Term
APM Station Assessments	IAH	APM	0	Elec Rm		D	Electrical System		ELEC	Electrical Panel	ELPN	Electrical Panel		I.P.APM.STAT D.ELEC0002	Eaton			Electrical	2009	30	24	Y	Y	None		7			Existing to Remain	Long Term
APM Station Assessments	IAH	APM	0	Elec		D	Electrical System		ELEC	Electrical Panel	ELPN	Electrical Panel		I.P.APM.STAT D.ELEC0003	Eaton			Electrical	2009	30	24	Y	Y	None		7			Existing to remain	Long Term
APM Station Assessments	IAH	APM	0	Elec		D	Electrical System		ELEC	Transformer	XFMR	Transformer		I.P.APM.STAT D.ELEC0004	Eaton	V48M28B45R		Electrical	2009	30	24	Y	Y	Repair or replace damaged housing.	$1,100	7	Housing damaged.		Repair damage housing on transformer.	Priority
APM Station Assessments	IAH	APM	0	Mech. Elec. Room	IAAPM 2.004	D	Electrical System		ELEC	Electrical Panel	ELPN	Electrical Panel			Eaton Cutler Hammer			Electrical	2009	30	24	Y	Y	Junction Box needs to be repaired.	$100	7	Junction box cover is not attached to the box		Junction box cover needs to be secured to Junction Box	Long Term

APPENDIX C - ASSET SUMMARY TABLES

FormName	Airport	Building_Number	Level	Room_Name	RoomNum	APM_Station_Location	System_List	Name_Plate_Information	System	Electrical_Component_List	Component	Component_Description	SubComponent	BarCode	Manufacturer	ModelNum	SerialNum	SysFunction	YrInstalled	DesignLife	RemainingYears	Operational	Performing	MaintNeeded	MaintCost	ACI	Comments	Description	Recommendations	Planning Category
APM Station Assessments	IAH	APM	0	APM Station	A401	A	Fire Protection		FIRE	Fire Alarm Control	FACP	Fire Alarm Control		I.B.W562.FIRE0018	Notifier			Fire alarm	2009	20	14	Y	Y	General		7			Existing to remain	Priority
APM Station Assessments	IAH	APM	0	Apm station	Mechanical	A	Fire Protection		FIRE					I.P.APM.STAT A.HVAC0001				Fire protection	2010	20	15	Y	Y	General	$0.00	7	Installed in 2010	There are two fire alarm valves and one dry pipe valve that are tied into a fire protection header. The dry pipe air is supplied by a small air compressor located on the pipe.	The existing system shall remain operational and continue with the maintenance plan to ensure that the system is operating as designed.	Priority
APM Station Assessments	IAH	APM	0	APM		A	Fire Protection	Fire protection general	FIRE		SPRK	Sprinkler						Fire protection	2009	20	14	Y	Y	General		7	The system appears in good shape and there are no apparent issues with any of the sprinkler heads	The sprinklers appear to be laid out on a 14' x 14' grid with concealed heads, there are sprinklers at each of the train doors	No apparent issues with system as currently instaled	Long Term
APM Station Assessments	IAH	APM	0	Apm station	Mech rm	B	Fire Protection		FIRE		CONT	Controls and Instrumentation		I.P.APM.STAT B.FIRE0020	Viking	Totalpac2	12079236	Fire protection	2009	20	14	Y	Y	General		7	Pre action system for the apm trams		The existing system shall remain operational and continue with the maintenance plan to ensure that the system is operating as designed.	Priority
APM Station Assessments	IAH	APM	0	Apm station b		B	Fire Protection		FIRE		VALV	Valve		I.P.APM.STAT B.FIRE0018	Tyco	TFp dpv-1	23355788	Fire protection	2009	20	14	Y	Y	General		7	Dry pipe valve for apm station		The existing system shall remain operational and continue with the maintenance plan to ensure that the system is operating as designed.	Long Term
APM Station Assessments	IAH	APM	0	Apm fire control	B107	B	Fire Protection		FIRE		PIPE	Piping		I.P.APM.STAT B.FIRE0019	Viking	Totalpac2	12079235	Fire protection	2009	20	14	Y	Y	General	$0.00	7	System installed in 10-2009		Provide general maintenance to the system.	
APM Station Assessments	IAH	APM	0	Apm b	Fire cntrl	B	Fire Protection	Marathon electric	FIRE		MOTO	Motor		I.P.APM.STAT B.FIRE0017	Unknown			Maintain line pressure	2009	20	14	Y	Y	General	$0.00	7	Unit is maintaing pressure	Air compreesor	Existing to remain	Long Term
APM Station Assessments	IAH	APM	0	APM		B	Fire Protection		FIRE		SPRK	Sprinkler						Fire protection	2009	20	14	Y	Y	General			There is not a consitent spacing for the recesed sprinklers that are located in the ceiling	The max distance between sprinkler heads appear to be 14'		Long Term
APM Station Assessments	IAH	APM	0	APM		B	Fire Protection		FIRE		SPRK	Sprinkler						Fire protection	2009	20	14	Y	N	Provide new cover plate	$100.00	0	Cover plate for recessed sprinkler missing	Missingcover plates (2) from recessed sprinklers located in front of the elevators	Provide new cover plates	Long Term
APM Station Assessments	IAH	APM	0	Mechanical room cn202		C	Fire Protection		FIRE		FACP	Fire Alarm Control		I.P.APM.STAT C.FIRE0020	Viking	Total pac 2	12079874	Fire protection	2009	20	14	Y	Y	General maintenance		7	Unit was installed in 10-2009 and is the dry pipe for the shuttle car area	Unit is maintaining the pressure as designed	Exisitnig unit to remain operational until there is a design change in the sprinklers that it serves	Long Term
APM Station Assessments	IAH	APM	0	APM		C	Fire Protection	General fire protection	FIRE		SPRK	Sprinkler						Fire Protection	2009	20	14	Y	Y	General			The spacing is not consistent; however there is no greater distance between the sprinklers ar any point than 14'. There are over 85 heads located in the space.			Priority
APM Station Assessments	IAH	APM	0	APM station		C	Fire Protection		FIRE		SPRK	Sprinkler						Fire Protection	2009	20	14	Y	N	Install new cover plate	$100.00	0	Sprinkler is missing the cover plate	Southwest light well missing coverplate	Install new coverplate at the location	Priority
APM Station Assessments	IAH	APM	0	APM D		D	Fire Protection		FIRE		SPRK	Sprinkler						Fire protection	2009	20	14	Y	N	Provide new cover plate for sprinkler head	$100.00	0	Missing cover plate from sprinkler installed in the barrell ceiling. Sprinkler is located in the northeast area of the APM	Missing sprinkler cover	Provide new cover plate for the existing sprinkler head at this location.	Long Term
APM Station Assessments	IAH	APM	0	D shuttle lobby		D	Fire Protection	N/A	FIRE		SPRK	Sprinkler						Sprinkler the APM	2009	20	14	Y	N	Provide new cover plate for sprinkler head	$100.00	0	Sprinkler cover plate is missing from sprinkler	Sprinkler cover missing from north east tram door	Provide new cover plate for the existing sprinkler head at this location.	Long Term
APM Station Assessments	IAH	APM	0	D APM		D	Fire Protection	Sidewall sprinkler	FIRE		SPRK	Sprinkler						Fire protection	2009	20	14	Y	N	Replace the existing escutcheons at the current sprinkler locations	$100.00	0	The sidewall sprinkler escutcheon is not installed properly causing a potential issue with flow	Sidewall nozzle underneath ductwork on the northwest side of fhe APM Station	Install new escutcheon for the sprinkler head	Priority
APM Station Assessments	IAH	APM	0	Term A Control Room		A	Fire Protection System		FIRE		FACP	Fire Alarm Control			Sapphire			Fire alarm	2003	20	8	Y	Y			5			Exising Panel to remain operational	Priority
APM Station Assessments	IAH	APM	0	APM Control	A401	A	Fire Protection System		FIRE		SPRK	Sprinkler		I.P.APM.STAT A.FIRE0001	Sapphire			Fire Protection	2009	20	14	Y	Y	None		7			Existing system to remain as long as the space remains in current operation and usage	Long Term
APM Station Assessments	IAH	APM	0	Elec Rm	B107	B	Fire Protection System		FIRE		FACP	Fire Alarm Control		I.P.APM.STAT B.ELEC0013	Notifier			Fire alarm	2003	20	8	Y	Y	Cleaning		5			Existing panel to remain operational	Priority
APM Station Assessments	IAH	APM	0	APM D		D	Fire Protection System	Fire protection general	FIRE		SPRK	Sprinkler						Fire protection	2009	20	14	Y	Y	General Maintenance		7	The sprinklers are laid out in the barrel of the ceiling in what appears to be a 14' x 14' grid pattern. There are sprinklers located at the tram doors as well.	Verity that there is proper coverage under the ductwork. The ductwork is approx. 4' wide and 6' below the sprinkler that is approx. 6' away		Priority
APM Station Assessments	IAH	APM	0	Mechanical room apm e		E	Fire Protection System		FIRE		VALV	Valve		I.P.APM.STAT D.FIRE0001	viking	Totalpac 2		Fire protection	2009	20	14	Y	Y	General	$0.00	7	Installed in2009	Preaction system for the apm	The existing system shall remain operational and continue with the maintenance plan to ensure that the system is operating as designed.	Priority

APPENDIX C - ASSET SUMMARY TABLES

FormName	Airport	Building_Number	Level	Room_Name	RoomNum	APM_Station_Location	System_List	Name_Plate_Information	System	Electrical_Component_List	Component	Component_Description	SubComponent	BarCode	Manufacturer	ModelNum	SerialNum	SysFunction	YrInstalled	DesignLife	RemainingYears	Operational	Performing	MaintNeeded	MaintCost	ACI	Comments	Description	Recommendations	Planning Category
APM Station Assessments	IAH	APM	0	Apm A		A	Heating Ventalation and Air Conditioning	Hvac examined	HVAC																		Units were previously surveyed		Refer to previous revommendations	Priority
APM Station Assessments	IAH	APM	0	APM		A	Heating Ventalation and Air Conditioning	Hvac general platform	HVAC		Air terminals	Diffusers						Air distribution	2009	27	21	Y		General Cleaning		7	Platform air supplied by continous linear slot diffuser. Unable to verify avtive and inactive sections. 4 2x2 plaque diffusers located under walkway to provide air to first floor	The temperature in thre space was 70 degrees	Provide fundamental commissioning of the systems to ensure that the systems are functioning as designed and as efficiently as possible	Long Term
APM Station Assessments	IAH	APM	0	Mechanical room		B	Heating Ventalation and Air Conditioning	Carrier	HVAC		Ahu	4 pipe ahu multizone		LP.APM.STAT B.HVAC0019	Carrier	39	1898x51403	Hvac	1998	20	3	Y	Y	General	$65,000.00	0	The unit is a built-up blow thru multi zone air handling unit that installed in 1998. The unit is in operational condition. There is an outside air handling unit (AHU B-3) ducted in the space that is proding the outside air.		Replace the existing air handler installed in this location with a new variable speed single zone air handling unit that serves the APM station.	Long Term
APM Station Assessments	IAH	APM	0	Apm mechanical room		B	Heating Ventalation and Air Conditioning		HVAC		Ahu	Outside air handling unit		LP.APM.STAT B.HVAC0020	Carrier		1898f41035	Cooling and heating	1998	20	3	Y	Y	General	$25,000.00	0	This is a 100% outside air handling unit that is providing air to the air handling unit, there are pre filter and carbon filters in the ductwork	Draw thru ahu with the heating coul in a pre heat position	Replace the existing air handler installed in this location with a new variable speed outside air handling unit that is tied directly into the new single zone variable volume air handling unit.	Priority
APM Station Assessments	IAH	APM	0	APM		B	Heating Ventalation and Air Conditioning	Apm general description	HVAC									Air distribution	1999	27	11	Y		The existing diffusers should be removed and cleaned. Existing surfaces surrounding the diffusers should be cleaned. Inspect the supply air ductwork to ensure that the ductworkl is free of debris.		7	42 sidewall diffusers (4" x 4'). The diffusers that are located in areas that passengers can stand there are deflectors. (4) 3 1" slot diffusers at the east glass. The linear slot diffusers are beggining to rust and show signs of detrioitation, return air louver on the first floor by the mechanical room	Face of grille is registering 68 degrees	The diffusers should be removed and cleaned. The existing ductwork located behind the diffusers should be inspected to ensure that there is not a large amount of dirt in the duct, if there is this ductwork should be cleaned. Provide functional check and test and balance of system to ensure optimal performance. Linear slot diffusers should be replaces	
APM Station Assessments	IAH	APM	0		Mechanical Room	C	Heating Ventalation and Air Conditioning		HVAC									Heating and Cooling						Refer to previous report for recommendations			These units were inspected as part of the last assessement		Refer to previous revommendations	
APM Station Assessments	IAH	APM	0	APM		C	Heating Ventalation and Air Conditioning	General spm assessment	HVAC									Air distribution	1999	27	11	Y	Y	The existing diffusers should be removed and cleaned. Existing surfaces surrounding the diffusers should be cleaned. Inspect the supply air ductwork to ensure that the ductworkl is free of debris.	$0.00	7	The return for the system is located on the lower level. Air distribution on the apm level is achieved with (4) 3 1" slot diffusers 4' in length. These diffusers are in good condition. Thre remaining air distribution in the apm is acived through 28 4' long 4" high linear slot diffusers with deflectors on them	Register temperature 65 degrees	Existing sidewall diffusrs should be removed and cleaned. The existing ductwork located behind the diffusers should be inspected to make sure that it is clean and in good condition	Long Term
APM Station Assessments	IAH	APM	0	Apm		D	Heating Ventalation and Air Conditioning	General hvac for apm	HVAC									Air distribution	2004	27	16	Y	Y	refer to previous report for recommendations at the air handling unit. Clean existing grilles.	$0.00	7	Air supplied to thr space via 22 4' long 6" high linear slott diffusers that are installed in a flat oval ductwork. There are 11 diffusers on each side of the station. The return air for the unit is returned through grilles located on the first floor.	The duscharge air temperature at thr grilles is 70 degrees	General maintenance	Long Term
APM Station Assessments	IAH	APM	0	Apm mechanical room		E	Heating Ventalation and Air Conditioning	Existing surveyed units	HVAC																		Units were previously surveyed		Refer to previous revommendations	Priority
APM Station Assessments	IAH	APM	Elevated Platform	APM- Upper Level		B	Heating Ventalation and Air Conditioning		HVAC		XXXX	Ductwork and Diffusers						Ventilation System	1999	50	34	Y	Y	Replace filters, clean ductwork.	$20,000	7	Dirt is damaging ceiling		Replace filters, clean ductwork.	Priority

APPENDIX D
ENVIRONMENTAL REPORTS

June 1, 2015

Chris Hotop, PE, LEED AP
Project Manager
Burns & McDonnell | Aviation & Federal
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Cardno ATC

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Re: Visual Assessment for Suspect Asbestos and Microbial Issues
Terminal A APM
G. Bush Intercontinental Airport, Houston Texas 77032

Dear Mr. Hotop:

Cardno ATC, retained by Burns & McDonnell, performed a limited visual assessment of suspect asbestos-containing building materials and water damaged/microbial issues of areas within Terminal A of G. Bush Intercontinental Airport pertaining to the Automated People Mover (APM). Two levels were visually assessed including the public areas of the APM Level and Departure Level as well as the Fire Control Rooms. The visual assessment was performed on May 25, 2015 with an escort from a representative of Houston Airport System, Asset Management Infrastructure. The visual assessment was performed utilizing the Texas Department of State Health Services (TDSHS) Texas Asbestos Health Protection Rules (TAHPR) 25TAC§295 and TDSHS Texas Mold Assessment and Remediation Rules (TMARR) 25TAC§295 as guidelines.

The visual assessment was performed by Cardno ATC representative, Ms. Catherine G. McLain (TDSHS Asbestos Individual Consultant License No. 10-5451 and TDSHS Mold Assessment Consultant License No. MAC0266) and was conducted to assist with the deferred maintenance risk management.

OBSERVATIONS

Based on observations documented during the assessment the following was observed:

Suspect Asbestos-Containing Building Materials:

Thermal System insulation:
- Straight Runs
- Elbows and Valves

Surfacing Materials:
- Wall Texture
- Fire-proofing Insulation

Miscellaneous Materials:
- Ceiling Panels
- 12" x 12" Vinyl Floor Tiles and Mastic
- Carpet Mastic
- Sheetrock and Joint Compound Walls
- Ceramic Tile Grout

- CMU grout
- Floor Float Material
- Fire-barrier Caulk
- HVAC Duct Sealant
- Exterior Window Glazing
- Exterior Sealants
- Exterior Roofing Material

Suspect Visible Mold Growth:
- None

Other:
- Suspect Lead-Based Paint On Structural Beams
- Suspect Lead-Based Painted Surfaces On Doors, Walls, Window Frames
- Light Ballasts Potential PCB
- Interior Fluorescent Lights
- Transformers
- Potential Mercury Containing Exit Lights and Thermostats

CONCLUSIONS

Cardno ATC did view suspect asbestos-containing materials. An asbestos survey of suspect materials is recommended prior to any renovation or demolition activities. Appropriate samples should be collected and analyzed for asbestos in compliance with the TDSHS TAHPR (25TAC §295.31-73), Occupational Health and Safety Act (OSHA) and National Emissions Standard for Hazardous Air Pollutants (NESHAP) regulations. It is estimated that a full survey of the areas associated with this Terminal will cost approximately: $5,000.00.

Cardno ATC did not view any significant water damage or microbial impacted building material; however, plastic draped over cable trays in the APM Equipment room were observed. A microbial survey is recommended to further investigate any potential water intrusion. The assessment should include a site specific Mold Remediation Protocol if applicable, in accordance with TDSHS TMARR (25 TAC §295.301-339). In all situations, any underlying cause of moisture accumulation must be rectified or fungal growth will occur or expand. It is estimated that a microbial survey/mold remediation protocol will cost approximately: $2,000.00.

All of the miscellaneous materials observed should be presumed to contain hazardous materials and classified as hazardous waste for disposal unless further tested in accordance with the federal, state and local regulations.

LIMITATIONS

This letter report has been prepared to assist Burns & McDonnell in evaluating the areas within Terminal A, of G. Bush Intercontinental Airport, associated with the APM. The conclusions presented in this report are professional opinions based solely upon visual observations of accessible areas of the site, at the time of our investigation. The opinions presented herein apply to site conditions existing at the time of our investigation and those reasonably foreseeable.

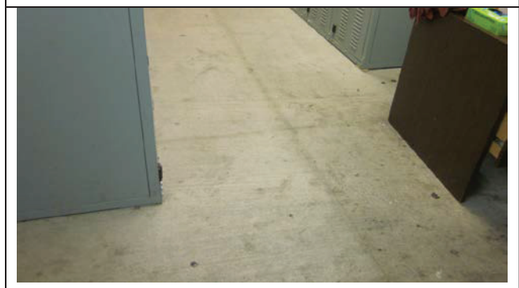
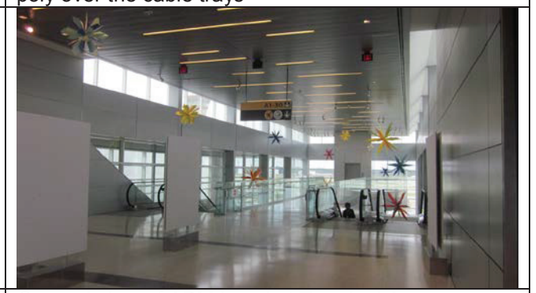
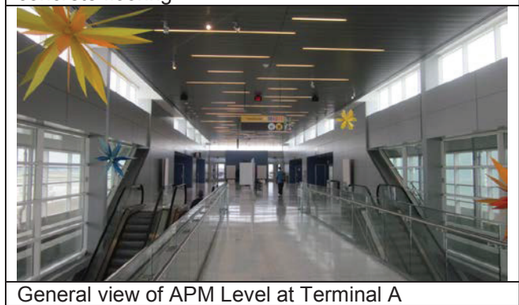
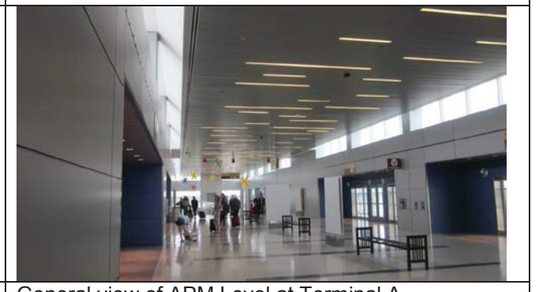
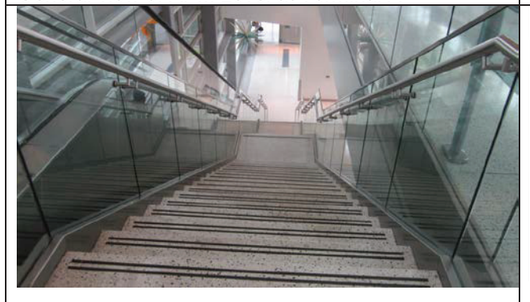
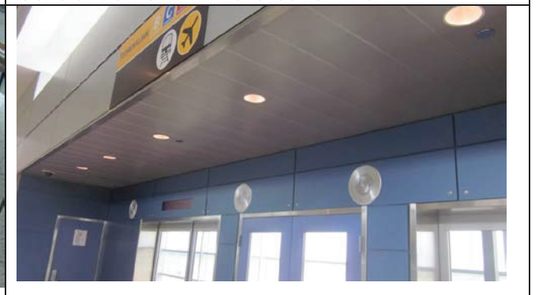
Cardno ATC cannot act as insurers, and no expressed or implied representation or warrant is included or intended in our report except that our work was performed, within the limits prescribed by our clients, with the customary thoroughness and competence of our profession at the time and place the services were rendered.

Please feel free to contact us at 713-343-4482 should you have any questions or require additional information.

Sincerely,
Cardno ATC

Catherine G. McLain, MS, CIH
Industrial Hygiene Department Manager
TDSHS AIC No. 10-5451
For Cardno ATC
Direct Line +1 713-343-4482 x231
Email: catherine.mclain@cardno.com

Attachments

	
General view of APM Equipment Room (A407)	General view of APM Equipment Room (A407). Note poly over the cable trays
	
General view of APM Equipment Room (A407) concrete flooring	General view of APM Level at Terminal A
	
General view of APM Level at Terminal A	General view of APM Level at Terminal A
	
General view of APM Level stairs going to Departure Level at Terminal A	Typical entry area to APM, panel on ceiling and walls

Cardno ATC
Shaping the Future

	
Typical entry area to APM, panel on ceiling and walls	Typical entry area to APM, panel on ceiling and walls
	
General view of windows with paneling and caulking	General view of windows with paneling and caulking

Cardno ATC
Shaping the Future

June 1, 2015

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Chris Hotop, PE, LEED AP
Project Manager
Burns & McDonnell | Aviation & Federal
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Kansas City, MO 64114

Re: Visual Assessment for Suspect Asbestos and Microbial Issues
Terminal B APM
G. Bush Intercontinental Airport, Houston Texas 77032

Dear Mr. Hotop:

Cardno ATC, retained by Burns & McDonnell, performed a limited visual assessment of suspect asbestos-containing building materials and water damaged/microbial issues of areas within Terminal B of G. Bush Intercontinental Airport pertaining to the Automated People Mover (APM). Two levels were visually assessed including the public areas of the APM Level and Departure Level as well as the APM Equipment Room/Fire Control Rooms. The visual assessment was performed on May 25, 2015 with an escort from a representative of Houston Airport System, Asset Management Infrastructure. The visual assessment was performed utilizing the Texas Department of State Health Services (TDSHS) Texas Asbestos Health Protection Rules (TAHPR) 25TAC§295 and TDSHS Texas Mold Assessment and Remediation Rules (TMARR) 25TAC§295 as guidelines.

The visual assessment was performed by Cardno ATC representative, Ms. Catherine G. McLain (TDSHS Asbestos Individual Consultant License No. 10-5451 and TDSHS Mold Assessment Consultant License No. MAC0266) and was conducted to assist with the deferred maintenance risk management.

OBSERVATIONS

Based on observations documented during the assessment the following was observed:

Suspect Asbestos-Containing Building Materials:

Thermal System insulation:
- Straight Runs
- Elbows and Valves

Surfacing Materials:
- Wall Texture
- Fire-proofing Insulation

Miscellaneous Materials:
- Ceiling Panels
- 12" x 12" Vinyl Floor Tiles and Mastic
- Carpet Mastic
- Sheetrock and Joint Compound Walls

- Covebase Mastic
- Ceramic Tile Grout
- Floor Float Material
- HVAC Duct Sealant
- Exterior Window Glazing
- Exterior Sealants
- Exterior Roofing Material

Suspect Visible Mold Growth:

- Minor Water Staining on Floor of ATO Room (B-2545)

Other:

- Suspect Lead-Based Paint On Structural Beams
- Suspect Lead-Based Painted Surfaces On Doors, Walls, Window Frames
- Light Ballasts Potential PCB
- Interior Fluorescent Lights
- Transformers
- Potential Mercury Containing Exit Lights and Thermostats

CONCLUSIONS

Cardno ATC did view suspect asbestos-containing materials. An asbestos survey of suspect materials is recommended prior to any renovation or demolition activities. Appropriate samples should be collected and analyzed for asbestos in compliance with the TDSHS TAHPR (25TAC §295.31-73), Occupational Health and Safety Act (OSHA) and National Emissions Standard for Hazardous Air Pollutants (NESHAP) regulations. It is estimated that a full survey of the areas associated with this Terminal will cost approximately: $5,000.00.

Cardno ATC did not view any significant water damage or microbial impacted building material; however, minor water stains were noted on the concrete flooring in the ATO Room (B-2545). A microbial survey is recommended to further investigate any potential water intrusion. The assessment should include a site specific Mold Remediation Protocol if applicable, in accordance with TDSHS TMARR (25 TAC §295.301-339). In all situations, any underlying cause of moisture accumulation must be rectified or fungal growth will occur or expand. It is estimated that a microbial survey/mold remediation protocol will cost approximately: $2,000.00.

All of the miscellaneous materials observed should be presumed to contain hazardous materials and classified as hazardous waste for disposal unless further tested in accordance with the federal, state and local regulations.

LIMITATIONS

This letter report has been prepared to assist Burns & McDonnell in evaluating the areas within Terminal B, of G. Bush Intercontinental Airport, associated with the APM. The conclusions presented in this report are professional opinions based solely upon visual observations of accessible areas of the site, at the time of our investigation. The opinions presented herein apply to site conditions existing at the time of our investigation and those reasonably foreseeable.

Cardno ATC cannot act as insurers, and no expressed or implied representation or warrant is included or intended in our report except that our work was performed, within the limits prescribed by our clients, with the customary thoroughness and competence of our profession at the time and place the services were rendered.

Please feel free to contact us at 713-343-4482 should you have any questions or require additional information.

Sincerely,
Cardno ATC

Catherine G. McLain, MS, CIH
Industrial Hygiene Department Manager
TDSHS AIC No. 10-5451
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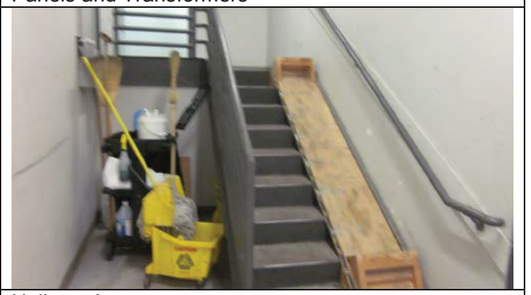
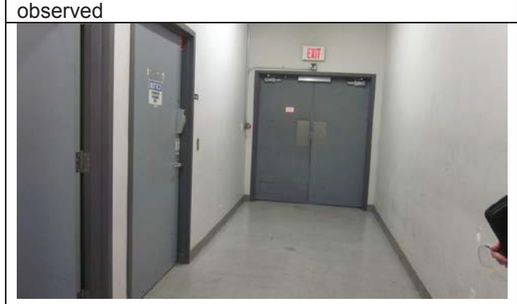
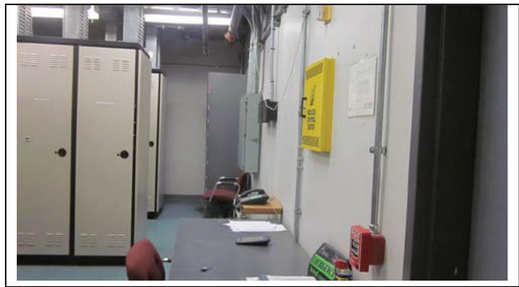
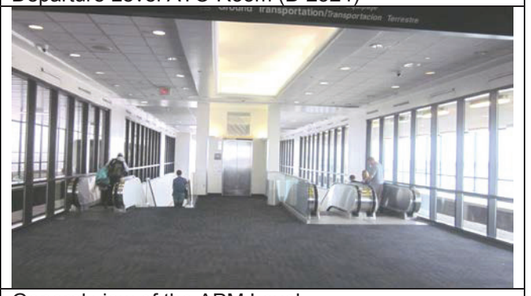
Email: catherine.mclain@cardno.com

Attachments

	
Departure Level Fire Control Panel Room	Fire Control Panel Room
	
Fire Control Panel Room	Panels and Transformers
	
Conduit penetrating wall with fire-barrier caulk observed	Hallway Area
	
Hallway Area	Departure Level ATO Room (B-2524)

Photolog of Terminal B APM
G. Bush Intercontinental Airport, Houston Texas 77032

	
Departure Level ATO Room (B-2524)	Departure Level ATO Room (B-2524)
	
General view of the APM Level	General view of the APM Level

www.cardnoatc.com

June 1, 2015

Chris Hotop, PE, LEED AP
Project Manager
Burns & McDonnell | Aviation & Federal
9400 Ward Parkway
Kansas City, MO 64114

Cardno ATC

3626 Westchase Drive
Houston, Texas 77042

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www.cardno.com

www.cardnoatc.com

Re: Visual Assessment for Suspect Asbestos and Microbial Issues
Terminal C APM
G. Bush Intercontinental Airport, Houston Texas 77032

Dear Mr. Hotop:

Cardno ATC, retained by Burns & McDonnell, performed a limited visual assessment of suspect asbestos-containing building materials and water damaged/microbial issues of areas within Terminal C of G. Bush Intercontinental Airport pertaining to the Automated People Mover (APM). Two levels were visually assessed including the public areas of the APM Level and Departure Level as well as the ATO/APM Equipment/Fire Control Rooms. The visual assessment was performed on May 25, 2015 with an escort from a representative of Houston Airport System, Asset Management Infrastructure. The visual assessment was performed utilizing the Texas Department of State Health Services (TDSHS) Texas Asbestos Health Protection Rules (TAHPR) 25TAC§295 and TDSHS Texas Mold Assessment and Remediation Rules (TMARR) 25TAC§295 as guidelines.

The visual assessment was performed by Cardno ATC representative, Ms. Catherine G. McLain (TDSHS Asbestos Individual Consultant License No. 10-5451 and TDSHS Mold Assessment Consultant License No. MAC0266) and was conducted to assist with the deferred maintenance risk management.

OBSERVATIONS

Based on observations documented during the assessment the following was observed:

Suspect Asbestos-Containing Building Materials:

Thermal System insulation:
- Straight Runs
- Elbows and Valves

Surfacing Materials:
- Wall Texture
- Fire-proofing Insulation

Miscellaneous Materials:
- Ceiling Panels
- 12" x 12" Vinyl Floor Tiles and Mastic
- Carpet Mastic
- Sheetrock and Joint Compound Walls

June 1, 2015

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Re: Visual Assessment for Suspect Asbestos and Microbial Issues
Terminal A APM
G. Bush Intercontinental Airport, Houston Texas 77032

Dear Mr. Hotop:

Cardno ATC, retained by Burns & McDonnell, performed a limited visual assessment of suspect asbestos-containing building materials and water damaged/microbial issues of areas within Terminal A of G. Bush Intercontinental Airport pertaining to the Automated People Mover (APM). Two levels were visually assessed including the public areas of the APM Level and Departure Level as well as the Fire Control Rooms. The visual assessment was performed on May 25, 2015 with an escort from a representative of Houston Airport System, Asset Management Infrastructure. The visual assessment was performed utilizing the Texas Department of State Health Services (TDSHS) Texas Asbestos Health Protection Rules (TAHPR) 25TAC§295 and TDSHS Texas Mold Assessment and Remediation Rules (TMARR) 25TAC§295 as guidelines.

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OBSERVATIONS

Based on observations documented during the assessment the following was observed:

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Surfacing Materials:
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Miscellaneous Materials:
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- 12" x 12" Vinyl Floor Tiles and Mastic
- Carpet Mastic
- Sheetrock and Joint Compound Walls
- Ceramic Tile Grout

Australia • Belgium • Canada • Colombia • Ecuador • Germany • Indonesia • Italy •
Kenya • New Zealand • Papua New Guinea • Peru • Tanzania • United Arab Emirates •
United Kingdom • United States • Operations in 85 countries

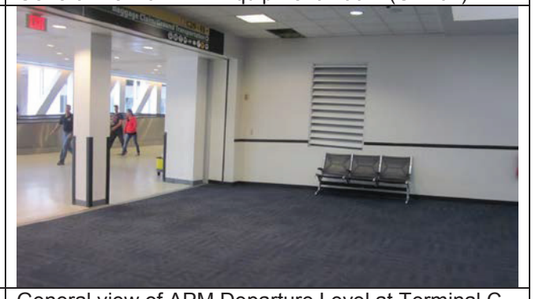
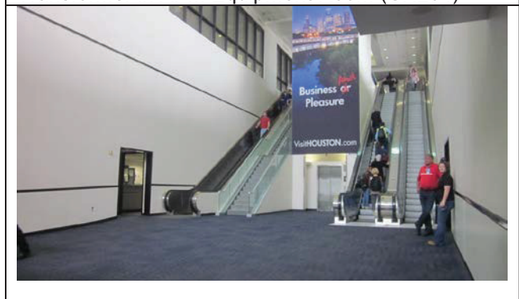
Cardno ATC cannot act as insurers, and no expressed or implied representation or warrant is included or intended in our report except that our work was performed, within the limits prescribed by our clients, with the customary thoroughness and competence of our profession at the time and place the services were rendered.

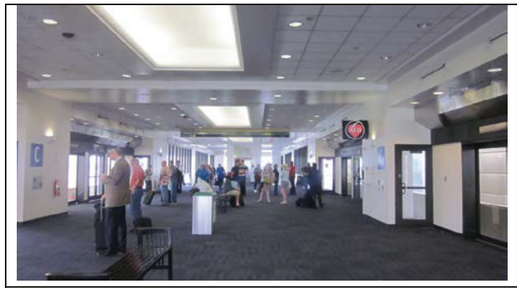
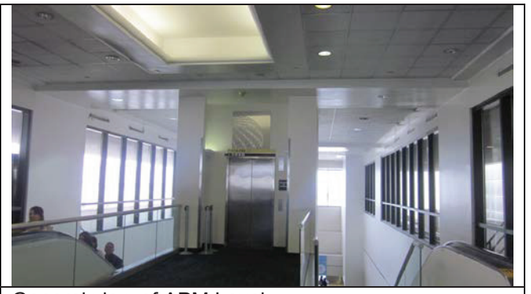
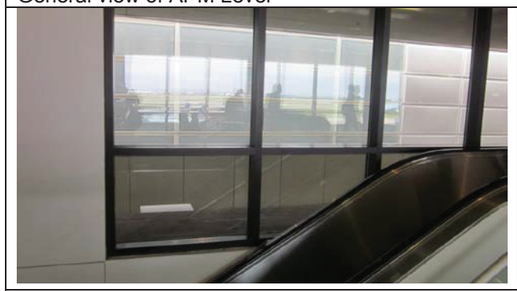
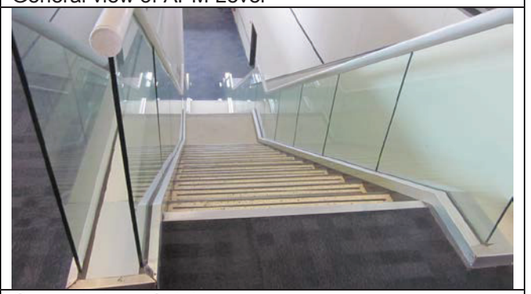
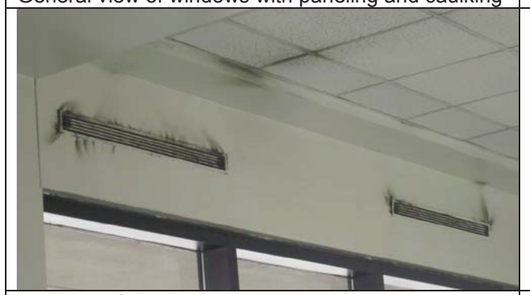
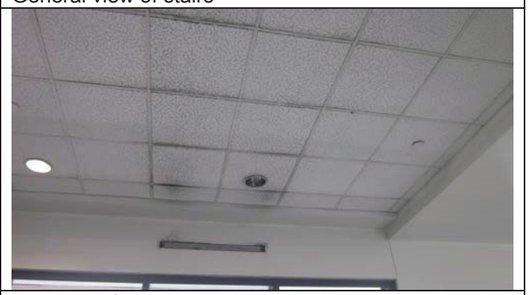
Please feel free to contact us at 713-343-4482 should you have any questions or require additional information.

Sincerely,
Cardno ATC

Catherine G. McLain, MS, CIH
Industrial Hygiene Department Manager
TDSHS AIC No. 10-5451
For Cardno ATC
Direct Line +1 713-343-4482 x231
Email: catherine.mclain@cardno.com

Attachments

	
General view of APM Equipment Room (CN204)	General view of APM Equipment Room (CN204)
	
Minor water staining on concrete flooring	General view of APM Equipment Room (CN204)
	
Transformer in APM Equipment Room (CN204)	General view of APM Departure Level at Terminal C
	
General view of APM Departure Level at Terminal C	Example of observed water staining on ceiling tiles

	
General view of APM Level	General view of APM Level
	
General view of windows with paneling and caulking	General view of stairs
	
Example of observed suspect mold growth/excessive dust on the APM Level	Example of observed suspect mold growth/excessive dust on the APM Level

June 1, 2015

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Kansas City, MO 64114

Re: Visual Assessment for Suspect Asbestos and Microbial Issues
Terminal D/E APM
G. Bush Intercontinental Airport, Houston Texas 77032

Dear Mr. Hotop:

Cardno ATC, retained by Burns & McDonnell, performed a limited visual assessment of suspect asbestos-containing building materials and water damaged/microbial issues of areas within Terminal D/E of G. Bush Intercontinental Airport pertaining to the Automated People Mover (APM). Two levels were visually assessed including the public areas of the APM Level and Departure Level as well as the ATO/APM Equipment/Fire Control Rooms. The visual assessment was performed on May 25, 2015 with an escort from a representative of Houston Airport System, Asset Management Infrastructure. The visual assessment was performed utilizing the Texas Department of State Health Services (TDSHS) Texas Asbestos Health Protection Rules (TAHPR) 25TAC§295 and TDSHS Texas Mold Assessment and Remediation Rules (TMARR) 25TAC§295 as guidelines.

The visual assessment was performed by Cardno ATC representative, Ms. Catherine G. McLain (TDSHS Asbestos Individual Consultant License No. 10-5451 and TDSHS Mold Assessment Consultant License No. MAC0266) and was conducted to assist with the deferred maintenance risk management.

OBSERVATIONS

Based on observations documented during the assessment the following was observed:

Suspect Asbestos-Containing Building Materials:

Thermal System insulation:
- Straight Runs
- Elbows and Valves

Surfacing Materials:
- Wall Texture
- Fire-proofing Insulation

Miscellaneous Materials:
- Ceiling Panels
- 12" x 12" Vinyl Floor Tiles and Mastic
- Carpet Mastic
- Sheetrock and Joint Compound Walls

- Ceramic Tile Grout
- Floor Float Material
- Fire-barrier Caulk
- HVAC Duct Sealant
- Exterior Window Glazing
- Exterior Sealants
- Exterior Roofing Material

Suspect Visible Mold Growth:

- Water issues observed in the Equipment Room and Mechanical Room
- Suspect Mold Growth observed on piping and duct system in Mechanical Room
- Water damaged building materials and duct system observed in Equipment Room
- Minor water staining around windows on APM Level

Other:

- Suspect Lead-Based Paint On Structural Beams
- Suspect Lead-Based Painted Surfaces On Doors, Walls, Window Frames
- Light Ballasts Potential PCB
- Interior Fluorescent Lights
- Transformers
- Potential Mercury Containing Exit Lights and Thermostats

CONCLUSIONS

Cardno ATC did view suspect asbestos-containing materials. An asbestos survey of suspect materials is recommended prior to any renovation or demolition activities. Appropriate samples should be collected and analyzed for asbestos in compliance with the TDSHS TAHPR (25TAC §295.31-73), Occupational Health and Safety Act (OSHA) and National Emissions Standard for Hazardous Air Pollutants (NESHAP) regulations. It is estimated that a full survey of the areas associated with this Terminal will cost approximately: $6,000.00.

Cardno ATC did view water issues and suspect microbial growth in the Equipment and Mechanical Rooms located on Departure Level. Minimal water/condensation staining was observed on window sills at APM Level. A microbial survey is recommended to further investigate any potential water intrusion or mold growth. The assessment should include a site specific Mold Remediation Protocol if applicable, in accordance with TDSHS TMARR (25 TAC §295.301-339). In all situations, any underlying cause of moisture accumulation must be rectified or fungal growth will occur or expand. It is estimated that a microbial survey/mold remediation protocol will cost approximately: $3,000.00.

All of the miscellaneous materials observed should be presumed to contain hazardous materials and classified as hazardous waste for disposal unless further tested in accordance with the federal, state and local regulations.

LIMITATIONS

This letter report has been prepared to assist Burns & McDonnell in evaluating the areas within Terminal D/E, of G. Bush Intercontinental Airport, associated with the APM. The conclusions presented in this report are professional opinions based solely upon visual observations of accessible areas of the site, at the time of our investigation. The opinions presented herein apply to site conditions existing at the time of our investigation and those reasonably foreseeable.

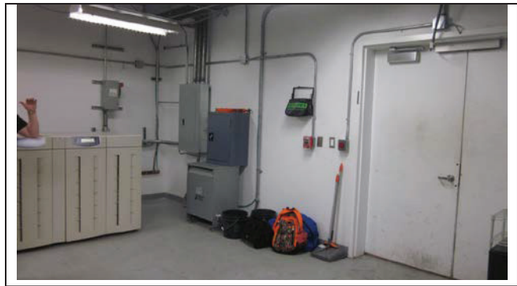
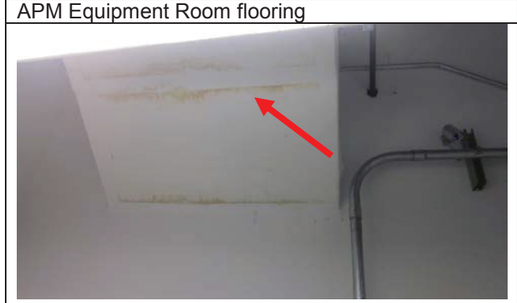
Cardno ATC cannot act as insurers, and no expressed or implied representation or warrant is included or intended in our report except that our work was performed, within the limits prescribed by our clients, with the customary thoroughness and competence of our profession at the time and place the services were rendered.

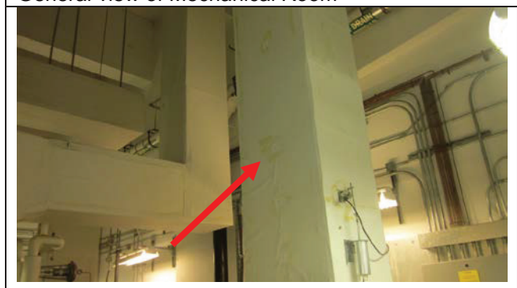
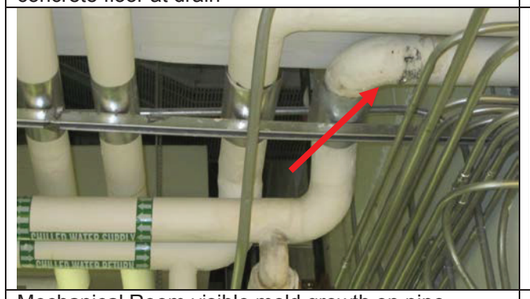
Please feel free to contact us at 713-343-4482 should you have any questions or require additional information.

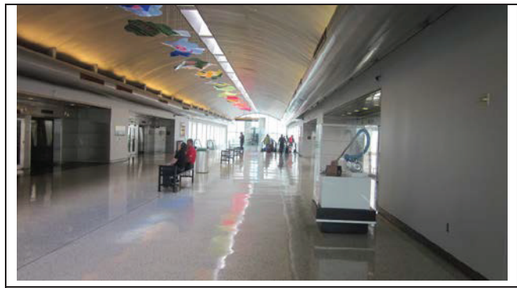
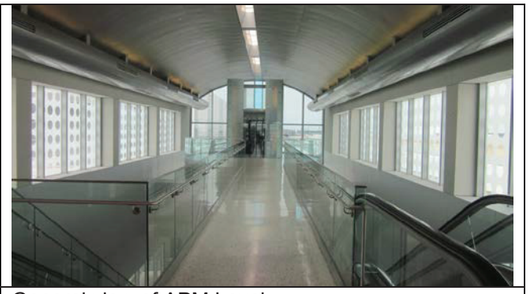
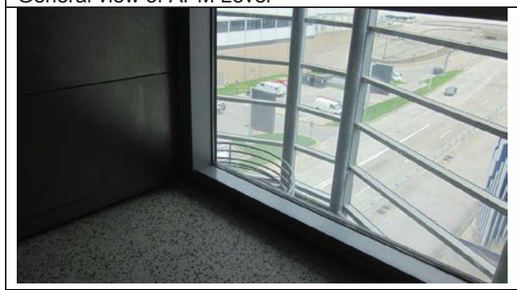
Sincerely,
Cardno ATC

Catherine G. McLain, MS, CIH
Industrial Hygiene Department Manager
TDSHS AIC No. 10-5451
For Cardno ATC
Direct Line +1 713-343-4482 x231
Email: catherine.mclain@cardno.com

Attachments

	
General view of APM Equipment Room (IA APM.2.003)	General view of APM Equipment Room (IA APM.2.003)
	
APM Equipment Room flooring	APM Equipment Room ceiling
	
APM Equipment Room water staining on duct system	APM Equipment Room water staining on duct system and a capture device with garden hose attached
	
APM Equipment Room water damaged drywall	APM Equipment Room water damaged drywall

	
General view of Mechanical Room	General view of Mechanical Room
	
Mechanical Room water staining on duct system	Mechanical Room water staining on duct system
	
Mechanical Room water staining/algae growth on concrete floor at drain	Mechanical Room water staining/algae growth on pipe insulation
	
Mechanical Room visible mold growth on pipe insulation	Mechanical Room visible mold growth on pipe insulation

	
General view of APM Level	General view of APM Level
	
General view of windows with paneling and caulking	General view of wall panel
	
Typical entry area to APM, panel on ceiling and walls	Example of observed water staining on window sill on the APM Level